

# Queensland Floods Commission of Inquiry

Final Report

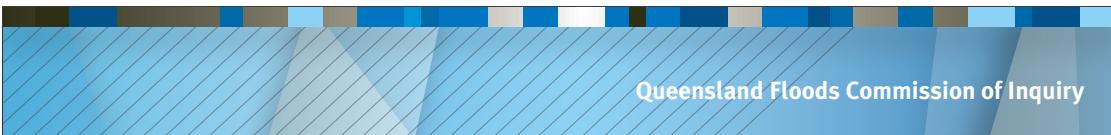
March 2012

Queensland Floods Commission of Inquiry

[www.floodcommission.qld.gov.au](http://www.floodcommission.qld.gov.au)

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Queensland Floods Commission of Inquiry

16 March 2012

The Honourable Anna Bligh MP  
Premier and Minister for Reconstruction  
Executive Building  
100 George Street  
BRISBANE QLD 4002

Dear Premier

In accordance with *Commissions of Inquiry Order (No.1) 2011*, as amended, I present the final report of the Queensland Floods Commission of Inquiry.

Yours sincerely



Commissioner  
Justice C E Holmes

400 George Street Brisbane  
GPO Box 1738 Brisbane  
Queensland 4001 Australia  
Telephone 1300 309 634  
Facsimile +61 7 3405 9750  
[www.floodcommission.qld.gov.au](http://www.floodcommission.qld.gov.au)  
ABN 82 696 762 534

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# Complete list of Final Report recommendations

## Chapter 2 Floodplain management

- 2.1 The steering committee of the Wivenhoe Dam and Somerset Dam Optimisation Study should consider whether it would be more effective for the floodplain management investigation to be removed from the Wivenhoe Dam and Somerset Dam Optimisation Study.
- 2.2 Brisbane City Council, Ipswich City Council and Somerset Regional Council and the Queensland Government should ensure that, as soon as practicable, a flood study of the Brisbane River catchment is completed in accordance with the process determined by them under recommendation 2.5 and 2.6. The study should:
  - be comprehensive in terms of the methodologies applied and use different methodologies to corroborate results
  - involve the collation, and creation where appropriate, of the following data:
    - rainfall data including historical and design data and radar
    - stream flow data
    - tide levels
    - inundation levels and extents
    - data on the operation of Wivenhoe and Somerset dams
    - river channel and floodplain characteristics including topography, bathymetry, development and survey data
  - involve determining the correlation between any of the data sets above
  - produce suitable hydrologic models run in a Monte Carlo framework, taking account of variability over the following factors:
    - spatial and temporal rainfall patterns
    - saturation of the catchment
    - initial water level in dams
    - effect of operating procedures
    - physical limitations on the operation of the dams
    - tidal conditions
    - closely occurring rainfall events
  - validate hydrologic models to ensure they reproduce:
    - observed hydrograph attenuation
    - probability distributions of observed values for total flood volume and peak flow
    - timing of major tributary flows
    - observed flood behaviour under no dams conditions and current conditions
  - produce a suitable hydraulic model or models that:
    - are able to determine flood heights, extents of inundation, velocities, rate of rise and duration of inundation for floods of different probabilities

- are able to deal with movement of sediment and changes in river beds during floods
  - are able to assess historical changes to river bathymetry
  - are able to be run in a short time to allow detailed calibration and assessment work
  - characterise the backwater effect at the confluence of the Brisbane and Bremer rivers and other confluences as appropriate
  - involve analysis of the joint probability of floods occurring in the Brisbane and Bremer rivers (and any other pair of rivers if considered appropriate)
  - be iterative, and obtain a short-term estimate of the characteristics of floods of different probabilities in all significant locations in the catchment (at least Brisbane City, Ipswich City and at Wivenhoe Dam) in order to determine the priorities for the rest of the study.
- 2.3 Ipswich City Council should determine whether the results, models and maps produced by the Brisbane River flood study are sufficient for its floodplain management. If they are not, Ipswich City Council should ensure appropriate work is done by way of data collection and creation and hydrologic and hydraulic modelling for use in its floodplain management.
- 2.4 A recent flood study should be available for use in floodplain management for every urban area in Queensland. Where no recent study exists, one should be initiated.
- 2.5 The Queensland Government, in consultation with councils, should determine which urban areas in Queensland do not have access to flood information from a current flood study. The Queensland Government should rank those areas in order of priority in accordance with their need for updated flood information by reference to factors including:
- a. population
  - b. sophistication of land use planning and emergency management measures already in place in those areas
  - c. currency of any flood risk information available to the council
  - d. approximate frequency of damaging floods in the area according to the historical record.
- 2.6 By reference to the order of priority determined in accordance with recommendation 2.5, the Queensland Government and councils should together ensure that the council responsible for each urban area in Queensland has access to current flood study information. This will include determining:
- a. a process or processes by which the flood studies will be completed, including the involvement of the Queensland Government and relevant councils
  - b. how, and from whom, the necessary technical and financial resources will be obtained
  - c. a reasonable timeframe by which all flood studies required will be completed.
- 2.7 As far as is practicable, councils should maintain up-to-date flood information.
- 2.8 When commissioning a flood study, the body conducting the study should:
- check whether others, such as surrounding councils which are not involved in the study, dam operators, the Department of Environment and Resource Management, and the Bureau of Meteorology, are doing work that may assist the flood study or whether any significant scientific developments are expected in the near future, and decide whether to delay the study
  - discuss the scope of work with the persons to perform the flood study as well as surrounding councils which are not involved in the study, dam operators, the Department of Environment and Resource Management, and the Bureau of Meteorology.
- 2.9 Elected representatives from councils should be informed of the results of each flood study relevant to the council's region, and consider the ramifications of the study for land planning and emergency management.
- 2.10 Elected representatives from all agencies involved in a flood study should be informed of recommendations made for future work, and determine, on a risk basis, whether that further work is to be completed.

- 2.11 The Queensland Government and Commonwealth Government should ensure the existence and maintenance of a repository of data of the type used in flood studies. The database should include the types of data which the expert panel specified as needed for a comprehensive flood study. Councils, Queensland and Commonwealth Government agencies and dam operators should be able to deposit and obtain access to data.
- 2.12 Councils in floodplain areas should, resources allowing, develop comprehensive floodplain management plans that accord as closely as practicable with best practice principles.
- 2.13 For urban areas or areas where development is expected to occur:
  - a. councils with the requisite resources should develop a flood map which shows 'zones of risk' (at least three) derived from information about the likelihood and behaviour of flooding
  - b. councils without the requisite resources to produce a flood behaviour map should develop a flood map which shows the extent of floods of a range of likelihoods (at least three).
- 2.14 For non-urban areas or areas where limited development is expected to occur councils should consider, on a risk basis, what level of information about flood risk is required for the area, and undertake the highest ranked of the following options which is appropriate to that need and within the capacities (financial and technical) of the council:
  - a. a map showing 'zones of risk' (at least three) derived from information about the likelihood and behaviour of flooding
  - b. a map showing the extent of floods of a range of likelihoods (at least three)
  - c. a flood map based on historic flood levels that have been subjected to a flood frequency analysis to estimate the annual exceedance probability of the selected historical flood
  - d. a historic flood map without flood frequency analysis
  - e. the Queensland Reconstruction Authority Interim Floodplain Assessment Overlay as a way to determine those areas for which further flood studies are required, or
  - f. the Queensland Reconstruction Authority Interim Floodplain Assessment Overlay (preferably refined using local flood information) as a trigger for development assessment.
- 2.15 Councils should ensure that areas for which there has been no assessment of the likelihood of flooding are indicated on a map and that, as part of the development assessment process for these, there is at least some enquiry into whether a site proposed for development could be subject to flooding.
- 2.16 Councils and the Queensland Government should display on their websites all flood mapping they have commissioned or adopted.
- 2.17 Flood maps, and property specific flooding information intended for use by the general public, should be readily interpretable and should, where necessary, be accompanied by a comprehensible explanatory note.
- 2.18 Councils that do not currently do so should consider offering an online database which allows the public to conduct a search on a parcel of land to find development approvals relevant to that parcel of land.
- 2.19 The Queensland Government should consider implementing a mechanism by which prospective purchasers of property are alerted to the issue of flood risk. To that end, the Queensland Government should consider consulting the Real Estate Institute of Queensland and the Law Society of Queensland as to the appropriateness of amending standard contract conditions so as to include a 'subject to flood search' condition, or other means of achieving the same objective.
- 2.20 The Queensland Government should endeavour to ensure that Queensland conditions are appropriately considered in the National Flood Risk Advisory Group's review of best practice principles.
- 2.21 In the event that the review does not adequately account for Queensland conditions, the Queensland Government should produce a document that provides appropriate guidelines for floodplain management in the Queensland context.
- 2.22 The Queensland Government should determine whether existing guidelines are sufficient for councils to understand best practice in the performance of flood studies and the production of flood maps. If a lack of current guidelines is identified, the government should create and circulate guidance material for councils.

## Chapter 4 State planning instruments

- 4.1 The Queensland Government should:
  - a. narrow the definition of ‘development commitment’ in State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* to ensure more development applications are assessed for compatibility with flood, and
  - b. investigate whether the compensation provisions of the *Sustainable Planning Act 2009* act as a deterrent to the inclusion of flood controls in a planning scheme and consider whether they ought be amended.
- 4.2 If, as part of a state interest review process, the Department of Local Government and Planning decides that no condition should be imposed requiring a council’s proposed planning scheme to incorporate the effect of the Department of Community Safety’s comments about State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, it should advise the Department of Community Safety of the reasons for its decision.
- 4.3 The Department of Community Safety should put in place administrative arrangements which ensure it can readily ascertain whether its comments are being reflected in council planning schemes. If the Department of Community Safety becomes aware that its comments are not being adequately addressed, it should take steps to follow this up with the Department of Local Government and Planning.
- 4.4 The Queensland Government should ensure that the circumstances in which the Department of Community Safety is to consult the Department of Environment and Resource Management about a planning scheme’s flood modelling and flood mapping are clear.
- 4.5 The Queensland Government should change Temporary State Planning Policy 2/11: *Planning for stronger more resilient floodplains* to remove the possibility of councils’ using the interim floodplain assessment overlay mapping and Model Code as part of a permanent amendment to their existing planning scheme or as part of a new planning scheme.
- 4.6 Councils should consider using the limited development (constrained land) zone in their planning schemes for areas that have a very high flood risk.
- 4.7 The Queensland Government should consider amending the *Sustainable Planning Act 2009* to require that consideration be given to the risk of flooding in the preparation or revision of a regional plan.

## Chapter 5 Local planning instruments

- 5.1 The Queensland Government should draft model flood planning controls, using a similar format and structure to that in the Queensland Planning Provisions, that councils can adapt for local conditions. The Queensland Government should require these controls to be reflected in new planning schemes. This may be achieved by including the controls in either:
  - a state planning policy dealing with flood, with an accompanying amendment to the *Sustainable Planning Act 2009*, or
  - the Queensland Planning Provisions.

The Queensland Government should consult councils to determine which of the two state planning instruments is the more appropriate to include the model flood planning controls.
- 5.2 The Queensland Government should include in the model flood planning controls a requirement that councils have a flood overlay map in their planning schemes. The map should identify the areas of the council region:
  - that are known not to be affected by flood
  - that are affected by flood and on which councils impose planning controls (there may be subsets in each area to which different planning controls attach)
  - for which there is no flood information available to council.

- 5.3 If the Queensland Government does not include a requirement for such an overlay map in the model flood planning controls, councils should include a flood overlay map in their planning schemes. The map should identify the areas of a council region:
- that are known not to be affected by flood
  - that are affected by flood and on which councils impose planning controls (there may be subsets in each area to which different planning controls attach)
  - for which there is no flood information available to council.
- 5.4 The Queensland Government should include in the model flood planning controls a model flood overlay code that consolidates assessment criteria relating to flood.
- 5.5 If the Queensland Government does not include such a code in the model flood planning controls, councils should include in their planning schemes a flood overlay code that consolidates assessment criteria relating to flood.
- 5.6 The Queensland Government should include in the model flood planning controls a model planning scheme policy that:
- for development proposed on land susceptible to flooding, outlines what additional information an applicant should provide to the assessment manager as part of the development application, or
  - for development proposed on land where the potential for flooding is unknown, requires an applicant to provide:
    - as part of the development application, information to enable an assessment of whether the subject land is susceptible to flooding, and
    - upon a determination the subject land is susceptible to flooding, more detailed information, to allow an assessment of the flood risk.
- 5.7 If the Queensland Government does not include such a policy in the model flood planning controls, councils should include in their planning schemes a planning scheme policy that:
- for development proposed on land susceptible to flooding, outlines what additional information an applicant should provide to the assessment manager as a part of the development application, or
  - for development proposed on land where potential for flooding is unknown requires an applicant to provide:
    - as part of the development application, information to enable an assessment of whether the subject land is susceptible to flooding, and
    - upon a determination the subject land is susceptible to flooding, more detailed information to allow an assessment of the flood risk.
- 5.8 The Queensland Government should consider amending the *Sustainable Planning Act 2009* to expressly provide either a power to remake or a power to extend a temporary local planning instrument containing interim flood regulation for a further limited period. The power to remake or extend should:
- a. permit the modification of the temporary local planning instrument to the extent required to ensure its provisions remain relevant, having regard to any requirement that may have been introduced or any information that may have become available while the original temporary local planning instrument was in force
  - b. be contingent on the Minister's being satisfied that the circumstances listed in section 105 of the *Sustainable Planning Act* continue to exist and that there are proper grounds for the failure to make a permanent scheme amendment while the original temporary local planning instrument was in force.
- 5.9 The Queensland Government should consider allowing councils to amend a planning scheme to update existing flood mapping information by way of the minor amendment process, provided that adequate public consultation has occurred.

## Chapter 6 Satellite planning systems

- 6.1 The Queensland Government should consider amending the *Urban Land Development Authority Act 2007*, the *South Bank Corporation Act 1989*, the *State Development and Public Works Organisation Act 1971* insofar as it governs state development areas, and other legislation which establishes alternative planning systems that operate independently of the *Sustainable Planning Act 2009*, to require that:
  - any planning scheme, interim or otherwise, appropriately reflects any state planning policy with respect to flood
  - flood risk be considered in the assessment of any development application.
- 6.2 The Coordinator-General should amend the guideline for preparing an ‘initial advice statement’ for a significant project under the *State Development and Public Works Organisation Act 1971* so that it specifically requires an applicant to consider and provide information about the project’s flood risk.

## Chapter 7 Development and flood considerations

- 7.1 The Queensland Government should consider extending the application of a state planning policy dealing with flood to the types of community infrastructure which are identified in the *Sustainable Planning Regulation 2009* and which the community needs to continue functioning, notwithstanding flood.
- 7.2 The Queensland Government should draft assessment criteria to be included in the model flood planning controls that require community infrastructure (including the types of community infrastructure which are identified in the *Sustainable Planning Regulation 2009* and which the community needs to continue functioning, notwithstanding flood) to be located and designed to function effectively during and immediately after a flood of a specified level of risk.
- 7.3 If the Queensland Government does not include such assessment criteria in model flood planning controls, councils should include assessment criteria in their planning schemes that require community infrastructure (including the types of community infrastructure which are identified in the *Sustainable Planning Regulation 2009* and which the community needs to continue functioning, notwithstanding flood) to be located and designed to function effectively during and immediately after a flood of a specified level of risk.
- 7.4 The Queensland Government should draft assessment criteria to be included in the model flood planning controls that require the impact of flood on commercial property to be minimised.
- 7.5 If the Queensland Government does not include such assessment criteria in the model flood planning controls, councils should include assessment criteria in their planning schemes that require the impact of flood on commercial property to be minimised.
- 7.6 The Queensland Government should ensure that the criteria under the *Environmental Protection Act 1994* that apply to the assessment of development applications for material change of use for environmentally relevant activities include consideration of the risk of flooding at the site on which the activity is proposed to occur.
- 7.7 The Department of Environment and Resource Management should amend its information sheet about applications for a material change of use for environmentally relevant activities so that applicants are prompted to include information (if any) about the risk of flooding at the site where the activity is proposed to occur.
- 7.8 The Department of Environment and Resource Management should amend the template assessment report used to assess applications for a material change of use for environmentally relevant activities so that it prompts departmental officers to give specific consideration, as part of the assessment process, to the risk of flooding at the site where the activity is proposed to occur.
- 7.9 The Department of Environment and Resource Management should ensure that, when applications for a material change of use for an environmentally relevant activity are approved by the department, the details of those activities, including their nature and location, are provided to the council within whose area the activity will be conducted.

- 7.10 Councils should ensure that, when applications for environmentally relevant activities are approved by a council, the details of those activities, including their nature and location, are provided to the Department of Environment and Resource Management.
- 7.11 The Queensland Government should draft assessment criteria to be included in the model flood planning controls that require that:
- the manufacture or storage of bulk hazardous materials (as defined in State Planning Policy 1/03) take place above a certain flood level, determined following an appropriate risk based assessment, or
  - structures on land susceptible to flooding and used for the manufacture or storage of bulk hazardous materials (as defined in State Planning Policy 1/03) be designed to prevent the intrusion of floodwaters.
- 7.12 If the Queensland Government does not include such assessment criteria in the model flood planning controls, councils should include assessment criteria in their planning schemes that require that:
- the manufacture or storage of bulk hazardous materials (as defined in State Planning Policy 1/03) take place above a certain flood level, determined following an appropriate risk based assessment, or
  - structures on land susceptible to flooding and used for the manufacture or storage of bulk hazardous materials (as defined in State Planning Policy 1/03) be designed to prevent the intrusion of floodwaters.
- 7.13 When approving applications for development which involve the manufacture or storage of hazardous materials, councils should not restrict the conditions imposed to ones which are solely reliant on human intervention to remove the materials in the event of flood.
- 7.14 The Queensland Government should review the code for development applications for prescribed tidal work in the Coastal Protection and Management Regulation 2003 to consider whether the design and construction standards should be made more stringent than the existing standards.
- 7.15 Councils (particularly Brisbane City Council) should consider including in their planning schemes more stringent standards for the design and construction of prescribed tidal work than those in the code for development applications for prescribed tidal work in the *Coastal Protection and Management Regulation 2003*.
- 7.16 The Queensland Government should consider drafting assessment criteria to be included in the model flood planning controls which require that works in a floodplain:
- do not reduce on-site flood storage capacity
  - counteract any changes the works will cause to flood behaviour of all floods up to and including the applicable defined flood event by measures taken within the subject site (for example, use of compensatory works, detention basins or other engineering mechanisms)
  - do not change the flood characteristics outside the subject site in ways that result in:
    - loss of flood storage
    - loss of/changes to flow paths
    - acceleration or retardation of flows, or
    - any reduction in flood warning times elsewhere on the floodplain.
- 7.17 If the Queensland Government does not include such assessment criteria in the model flood planning controls, councils should consider including assessment criteria in their planning schemes which require that works in a floodplain:
- do not reduce on-site flood storage capacity
  - counteract any changes the works will cause to flood behaviour of all floods up to and including the acceptable defined flood event by measures taken within the subject site (for example, use of compensatory works, detention basins or other engineering mechanisms), and
  - do not change the flood characteristics outside the subject site in ways that result in:
    - loss of flood storage
    - loss of/changes to flow paths
    - acceleration or retardation of flows, or
    - any reduction in flood warning times elsewhere on the floodplain.

- 7.18 The Queensland Government should consider amending the *Sustainable Planning Regulation 2009* so that operational work or plumbing or drainage work (including maintenance and repair work) carried out by or on behalf of a public sector entity authorised under a state law to carry out the work is not exempt development under the *Sustainable Planning Act 2009* if the development has the potential to reduce floodplain storage.
- 7.19 Levees should be regulated.
- 7.20 The Queensland Government should consult with councils to determine an effective method for the regulation of the construction of levees in Queensland. In particular, the Queensland Government should consider:
- requiring a development permit for the construction of a levee by designating levees as assessable development in the *Sustainable Planning Regulation 2009*, or
  - requiring, by way of a state planning policy or mandatory provision in the Queensland Planning Provisions, that councils nominate the construction of a levee as assessable development in their planning schemes.
- 7.21 The Queensland Government should consult with councils to formulate a definition of ‘levee’ to identify what should be regulated.
- 7.22 There should be a consistent process for the determination of applications to build levees. That process should include:
- consulting landholders who may be affected by the proposed levee
  - obtaining or commissioning appropriate hydrological and hydraulic studies to assess the impacts of the proposed levee.
- 7.23 There should be a common set of considerations in the decision whether to approve an application to build a levee, including:
- the impacts of the proposed levee on the catchment as a whole
  - the benefits of the proposed levee to the individual or entity applying to build the levee and to any nearby community as a whole
  - any adverse impacts on other landholders, including the risk of levee failure
  - the implications of the proposed levee for land planning and emergency management procedures
  - whether any structural, land planning or emergency management measures can be taken to mitigate the adverse impacts of the proposed levee.
- 7.24 The Queensland Government should draft assessment criteria to be included in the model flood planning controls that address:
- the prospect of isolation or hindered evacuation
  - the impact of isolation or hindered evacuation.
- 7.25 If the Queensland Government does not include such assessment criteria in the model flood planning controls, councils should consider including assessment criteria in their planning schemes that address:
- the prospect of isolation or hindered evacuation
  - the impact of isolation or hindered evacuation.

## Chapter 8 Development assessment in practice

- 8.1 Councils should, resources allowing, maintain flood maps and overland flow path maps for use in development assessment. For urban areas these maps should be based on hydraulic modelling; the model should be designed to allow it to be easily updated as new information (such as information about further development) becomes available.
- 8.2 Councils should make their flood and overland flow maps and models available to applicants for development approvals, and to consultants engaged by applicants.

- 8.3 The Queensland Government should draft a model planning scheme policy to be included in the model flood planning controls that sets out the information to be provided in development applications in relation to stormwater and flooding. The policy should specify:
- the type of models and maps to be provided
  - the substantive information required to be shown in the development application
  - how the assumptions and methodologies used in preparing the models and maps should be presented
  - the form in which the information on stormwater and flooding is to be presented in the application.
- 8.4 If the Queensland Government does not include such a policy in the model flood planning controls, councils should include a planning scheme policy in their planning schemes that sets out the information to be provided in development applications in relation to stormwater and flooding. The policy should specify:
- the type of models and maps to be provided
  - the substantive information required to be shown in the development application
  - how the assumptions and methodologies used in preparing the models and maps should be presented
  - the form in which the information on stormwater and flooding is to be presented in the application.
- 8.5 Councils should review their assessment processes to ensure that:
- the person with primary responsibility for the assessment of the development application considers what expert input is required
  - where a development application is subject to comment by a number of professionals, the responsibilities and accountability of each contributor are clear
  - where flood-related information is referred to an expert for advice, the expert is required to comment on the extent of compliance by reference to each relevant assessment criteria and identify and explain any inability to comment.
- 8.6 Councils should take care when imposing conditions to ensure that each condition has purpose; standardised conditions should not be included where they have no application to the development in question.
- 8.7 Councils should not rely on a condition requiring an evacuation plan as the sole basis for approving a development susceptible to flooding.
- 8.8 Councils should consider providing advice to development applicants during pre-lodgement meetings, and at the time of receiving a development application, about the way in which the development will be assessed for flood risk and what flood information council will be relying on to make this assessment.

## Chapter 9 Building controls

- 9.1 The proposed new part of the Queensland Development Code, Mandatory Part 3.5 ‘Construction of buildings in flood hazard areas’, should be amended so that the performance requirement relating to building design and construction (Performance Requirement P1) for building on a lot will only be triggered where the council has:
- designated part of its area as a natural hazard management area (flood) under section 13 of the Building Regulation 2006, and
  - either:
    - declared a height to be the expected flood level under section 13 of the Building Regulation 2006, or
    - adopted a highest recorded flood level for the lot, and
  - either:
    - declared a velocity to be the expected maximum velocity of flood water for the area in which the lot is located, or
    - designated the area in which the lot is located an inactive flow or backwater area.

- 9.2 The proposed new part of the Queensland Development Code, Mandatory Part 3.5 ‘Construction of buildings in flood hazard areas’, should be amended so that the performance requirements about utilities and sanitary drains (Performance Requirement P2 and P3) for building on a lot will only be triggered where the council has:
- designated part of its area as a natural hazard management area (flood) under section 13 of the Building Regulation 2006, and
  - either:
    - declared a height to be the expected flood level under section 13 of the *Building Regulation 2006*, or
    - adopted a highest recorded flood level for the lot.
- 9.3 The Queensland Government should consider amending the ‘Limitation’ section of the proposed new part of the Queensland Development Code, Mandatory Part 3.5 ‘Construction of buildings in flood hazard areas’, to allow for the possible application of ‘acceptable solution A1’ to a building located on a lot if:
- it is reasonable to expect the part of the lot on which the building work is proposed to be subjected to a maximum velocity of less than 1.5 metres per second, or
  - the part of the lot on which the building work is proposed is located in an inactive flow or backwater area.

## Chapter 10 Essential services

- 10.1 The Queensland Government should consider including in the criteria in the Queensland Plumbing and Wastewater Code a requirement that the risk of leakage from private on-site sewerage systems during floods be minimised.
- 10.2 Authorities responsible for the construction of sewerage infrastructure should, when embarking on new works, undertake risk and cost/benefit assessments to determine the level at which electrical infrastructure that may be vulnerable to inundation should be placed.
- 10.3 Authorities responsible for the management of sewerage infrastructure should conduct a review of their existing infrastructure to identify electrical infrastructure that may be vulnerable to inundation and perform risk and cost/benefit assessments to determine if it should be relocated to a higher level.
- 10.4 Queensland Urban Utilities should make the results of its trials on the use of caps for overflow relief gully grates available to other authorities responsible for sewerage infrastructure. Consideration should be given by those authorities as to how the results can be used to improve the flood resilience of their sewerage networks.
- 10.5 If the Queensland Development Code is amended to include provisions requiring homeowners to install sewage reflux valves, the Queensland Government should develop and make available to homeowners appropriate guidance material to assist them in meeting their responsibilities to maintain reflux valves.
- 10.6 Queensland Urban Utilities, and other distributor-retailers and councils, that have identified a practice of stormwater drains being connected to sewerage infrastructure, should conduct a program of education to raise public awareness that this practice is illegal and impedes the operation of the sewerage infrastructure.
- 10.7 Councils and distributor-retailers should agree to protocols for the exchange of information about suspected illegal connections, the steps being taken to investigate them or the basis for concluding that no investigation is required, and the results of any investigations or enforcement actions.
- 10.8 The Department of Environment and Resource Management should review the Queensland Urban Drainage Manual to determine whether it requires updating or improvement, in particular, to reflect the current law and to take into account insights gained from the 2010/2011 floods.
- 10.9 All councils should, resources allowing, map the overland flow paths of their urban areas.
- 10.10 Councils should consider amending their planning schemes to include provisions directed to consideration of the flood resilience of basements as a factor in determining the appropriateness of a material change of use.

- 10.11 In assessing and determining development applications for material change of use in areas susceptible to flood, councils should consider whether the new developments locate essential services infrastructure above basement level, or, alternatively, whether essential services infrastructure located at basement level can be constructed so that it can continue to function during a flood.
- 10.12 SunWater and the Central Highlands Regional Council should determine the issues of ownership and responsibility for maintenance of the LN1 drain system in Emerald.
- 10.13 The Bundaberg Regional Council should investigate the adequacy of the drain and take reasonable steps to ensure the Moore Park area is effectively served.
- 10.14 All councils should periodically conduct risk assessments to identify areas at risk of backflow flooding. In respect of such areas, councils should consider how such risks can be lessened, including in that process consideration of the installation of backflow prevention devices. Backflow devices should not, however, be installed unless and until a full risk based assessment has been undertaken.
- 10.15 Councils should conduct education campaigns directed to ensuring that all residents and property owners in areas identified as being at risk of backflow flooding are aware of the circumstances in which backflow flooding can occur, the hazard it presents and what should be done if it occurs.
- 10.16 The Queensland Government should draft assessment criteria to be included in the model flood planning controls that require critical infrastructure in assessable substation developments is built to remain operational during and immediately after a flood of a particular magnitude. That magnitude should be determined by an appropriate risk assessment.
- 10.17 If the Queensland Government does not include such assessment criteria in the model flood planning controls, councils should include assessment criteria in their planning schemes that require critical infrastructure in assessable substation developments is built to remain operational during and immediately after a flood of a particular magnitude. That magnitude should be determined by an appropriate risk assessment.
- 10.18 The Queensland Government should consider measures to ensure that requirements are included in the designation of land for community infrastructure under the *Sustainable Planning Act 2009* to ensure that critical infrastructure for operating works under the *Electricity Act* is built to remain operational during and immediately after a flood of a particular magnitude. That magnitude should be determined by an appropriate risk assessment.
- 10.19 Electricity distributors should consider installing connection points for generators to provide electricity supply to non-flooded areas that have had their supply cut during floods.
- 10.20 The Queensland Government should consider whether there should be a legislative requirement that customer dedicated assets be built at or above the applicable defined flood level and if so, the Queensland Government should consider which legislation should contain such a requirement.
- 10.21 The Queensland Government should consider implementing mandatory requirements to ensure that all conduits for the purpose of providing electrical supply below the applicable defined flood level are sealed to prevent floodwaters from entering them or flowing into them.
- 10.22 Carriers, councils and the Australian Communications and Media Authority should take into account the risk of flooding when considering the placement of telecommunications facilities.
- 10.23 Queensland Rail and QR National should continue to investigate opportunities for increasing the flood resilience of their networks, including raising the height of critical equipment.

## Chapter 11 Buy-backs and land swaps

- 11.1 Councils should consider implementing a property buy-back program in areas that are particularly vulnerable to regular flooding, as part of a broader floodplain management strategy, where possible obtaining funding from the Natural Disaster Resilience Program for this purpose.

## Chapter 12 Performance of private insurers

- 12.1 When a policy-holder makes a claim, the insurer should ascertain the policy-holder's preferred method of contact and ensure that it is used (with other modes of communication if necessary) to keep the policyholder informed about the progress of the claim. However, important decisions regarding the claim – for example, determinations about the outcome of the claim and settlement sums – should always be confirmed in writing.
- 12.2 Insurers should review their existing systems and processes and implement any improvements necessary to ensure that accurate and complete records of conversations with policy-holders are made.
- 12.3 Letters notifying policy-holders that their claims have been denied should, at a minimum, state the information upon which the insurer has relied in making the decision. These letters should also advise policy-holders that copies of the information will be made available upon request (in accordance with clause 3.4.3 of the General Insurance Code of Practice) and indicate how policy-holders can make a request.
- 12.4 The Insurance Council of Australia should consider an amendment to Part 3 of the code which requires insurers to notify policy-holders of the information on which they relied in assessing claims.
- 12.5 The Insurance Council of Australia should amend clause 3.4.3 of the General Insurance Code of Practice so that it requires insurers to inform policy-holders of their right to request a review of an insurer's decision to refuse to provide access to information on which it relied in assessing claims.

## Chapter 13 Mining

- 13.1 Mine operators should obtain all public seasonal forecasts issued by the Bureau of Meteorology relevant to the regions in which their operations are located.
- 13.2 Any mine operator of a site at high risk of flood should obtain the best forecast information available (seasonal and short term) for the region in which the mine is located.
- 13.3 The Department of Environment and Resource Management should prepare a list of relevant considerations to be taken into account in performing a risk assessment to decide which sites to inspect. Bureau of Meteorology forecasts should be one consideration.
- 13.4 The Department of Environment and Resource Management should conduct risk assessments in time for site inspections, and the implementation of solutions to problems identified at inspections, to take place before 1 November of each year.
- 13.5 The Queensland Government should work collaboratively with the Commonwealth Government and mine operators to ensure co-ordinated and effective monitoring of salts, metals and other contaminants in marine environments that may be affected by mine discharges.
- 13.6 The Queensland Government should determine, as far as possible, the impact of mine discharges during the 2010/2011 wet season on freshwater and marine water quality and fauna and flora.
- 13.7 The Department of Environment and Resource Management should assist mine operators in their applications for amended environmental authorities to ensure, as far as possible, that each environmental authority contains a tailored version of Table 4 of the model conditions. The Department of Environment and Resource Management should provide to mining companies its monitoring data and its suggested values for Table 4 on the basis of an assessment of the catchment which takes into account the cumulative effect of different operators' releases.
- 13.8 Unless the Department of Environment and Resource Management has decided not to permit discharges, it should assist each mine operator in its application for an environmental authority to ensure, as far as possible, that each authority includes provisions for discharges during times of heavy rainfall and flood.
- 13.9 The Queensland Government should legislate to clarify the purposes for which a transitional environmental program can be granted. In particular, if the government considers the transitional environmental program the appropriate regulatory mechanism to deal with the discharge of water from mines during flood, section 330 of the *Environmental Protection Act 1994* should be clarified to make it clear that it extends to that use.

- 13.10 The Queensland Government should refine the criteria which must be considered in assessment of applications for relaxation of environmental authority conditions, by transitional environmental program or otherwise, in response to flood.
- 13.11 The Queensland Government should consider amending the *Environmental Protection Act 1994* so that it allows for the relaxation of environmental authority conditions, by transitional environmental program or otherwise, as to discharge of water:
  - pre-emptively, in advance of rainfall or flooding events, or
  - for all mines in a catchment that is flooding.
- 13.12 The Queensland Government should prepare a procedural guide for officers deciding whether to grant a relaxation of environmental authority conditions, by transitional environmental program or otherwise, with guidance as to:
  - the meaning of each criterion
  - examples of the types of things that may be relevant to each criterion
  - the priority, if any, to be afforded to different criteria.
- 13.13 The Queensland Government should make public the procedural guide used by Department of Environment and Resource Management officers to decide whether to grant a transitional environmental program.
- 13.14 The Queensland Government should consider amending the *Environmental Protection Act 1994* to provide a definition of the term 'emergency' for the purposes of section 468 of that Act.
- 13.15 The Queensland Government should make public the procedural guide used by Department of Environment and Resource Management officers to decide whether to grant an emergency direction.
- 13.16 The Queensland Government should amend the *Environmental Protection Act 1994* so as to permit an emergency direction to be given orally where it is not practicable to provide the direction in writing, with provision for its subsequent confirmation in writing.
- 13.17 The Queensland Government should determine which of its agencies should take responsibility for the management of all existing and new abandoned mine sites in Queensland.
- 13.18 The Department of Employment, Economic Development and Innovation should assemble all information currently available to the abandoned mine land program into a single database. The Queensland Government should ensure, using whatever information is available, that the list of abandoned mines is as complete as possible. This should at least include a review of all information held by the Department of Environment and Resource Management and the Department of Employment, Economic Development and Innovation.
- 13.19 The Queensland Government should seek information about the size, features and condition of abandoned mines, including whether the mine or its surrounding environment were adversely affected by flood, from private landholders who have abandoned mines on their properties.

## Chapter 15 Emergency response and other interim report issues

- 15.1 Councils should support and encourage business owners to develop private flood evacuation plans by providing the following to business owners in areas known to be affected by flood:
  - information about the benefits of evacuation plans
  - contact details of relevant council and emergency service personnel for inclusion in evacuation plans.
- 15.2 Councils should consider making available to business owners locality specific information that would assist them to develop evacuation plans for commercial premises, for example, any evacuation sub-plan created under Emergency Management Queensland's disaster evacuation guidelines.

- 15.3 The fire service should ensure that station officers are familiar with the procedure for contacting management when requesting the calling in of additional staff; and, in particular, that they have available to them the names and current telephone numbers of the officers to be contacted in the first instance, with alternative contact details in the event that those officers prove unavailable.
- 15.4 The Queensland Fire and Rescue Service should require that each region records in writing the results of its risk assessment undertaken as part of its annual review of its special operations functional plan.
- 15.5 The *Disaster Management Act 2003* should be amended to give the chief executive of the department administering the Act (or his or her delegate) the authority to appoint an officer of Emergency Management Queensland to direct SES operations in extraordinary circumstances.
- 15.6 Emergency Management Queensland, in consultation with councils, should develop a directive that makes clear the authority of an officer of that agency to command a major SES operation. This could be expected to occur when a deployment of additional SES members is made to a region because the response needed is beyond the capacity of its local units. The directive should make clear the powers of the officer and his or her reporting responsibilities to disaster managers in these circumstances. Emergency Management Queensland must also ensure that any officer who assumes such a role has adequate training and skills in the conduct of disaster operations.
- 15.7 Emergency Management Queensland should ensure its staff, SES members and disaster managers are familiar with the directive when it is developed.
- 15.8 Emergency Management Queensland, in consultation with councils, should develop clear directives about:
  - the communication and reporting that should take place between the SES and disaster managers, including in relation to task allocation and completion, once disaster management groups have been activated
  - the communication and reporting that should take place between the SES and disaster managers, including in relation to task allocation and completion, once disaster management groups have been activated
  - the process for dealing with requests for assistance that exceed an SES unit's capacity to respond them
  - the process for seeking extra support for an SES unit that has been overwhelmed by a disaster (whether by way of Emergency Management Queensland or the disaster management arrangements or both)
  - the role of SES liaison officers in communications with disaster managers about SES disaster operations
  - the role of incident controllers, and their teams, relative to those SES (or Emergency Management Queensland) personnel charged with the command of SES operations.
- 15.9 Emergency Management Queensland should ensure its staff, SES members and disaster managers are familiar with the directives it develops in relation to these matters.
- 15.10 Emergency Management Queensland should develop and implement a new formula for the distribution of its recurrent SES subsidy, which takes into account relevant factors including the size of a local SES contingent and the population, area and natural hazard risk profile of the local government area concerned.
- 15.11 Emergency Management Queensland should pursue the execution of the 'Local Arrangements' with councils where a Memorandum of Agreement is in place. The contents of the arrangements should be reviewed and updated regularly.
- 15.12 Emergency Management Queensland should simplify the process by which SES members gain recognition for prior qualifications so that unnecessary duplication of training can be avoided.

## Chapter 16 Operation of Wivenhoe and Somerset dams

- 16.1 The Crime and Misconduct Commission should investigate whether the conduct of Mr Tibaldi, Mr Ayre and Mr Malone relating to:
- preparation of documents surrounding the January 2011 flood event, including the 17 January 2011 brief to the Minister, the 2 March 2011 flood event report, and statements provided to the Commission
  - oral testimony given to the Commission
- evidences offence/s against the Criminal Code, and/or official misconduct under the *Crime and Misconduct Act 2001* committed by any, or all, of them.
- 16.2 Seqwater should ensure that proper support and oversight mechanisms are put in place around both the substantive and procedural aspects of drafting flood event reports. Seqwater should consider engaging consultants with expertise in the production of reports following significant events to advise on these mechanisms. Measures to be considered should include:
- ensuring appropriate systems are in place to ensure the recollections of flood engineers and other parties are recorded immediately after the event, perhaps by engaging an external party to interview the flood engineers and other parties
  - ensuring that a methodology for writing the report is set out clearly in advance, in writing, and that the final report includes a statement of that methodology
  - putting in place systems to ensure that members of senior management have sufficient understanding of both the methodology and process by which the report is prepared to allow themselves to be satisfied that these are appropriate.
- 16.3 The Department of Environment and Resource Management should ensure that an independent and appropriately qualified person immediately starts the task of reviewing the March flood event report to ensure that the review is completed before the start of the 2012/2013 wet season.
- 16.4 Seqwater should ensure that any future peer review process:
- is co-ordinated by someone independent of those who wrote the report
  - entails the provision of all relevant information to the peer reviewers
  - permits sufficient time for the review
  - documents all contact between those whose actions are under review and the reviewers.
- 16.5 The Queensland Government should resolve the discrepancy in recorded peak river height for the January 2011 flood of the Brisbane River between the Brisbane City and Port Office gauges.

## Chapter 17 Other dam issues

- 17.1 The steering committees of the Wivenhoe Dam and Somerset Dam Optimisation Study and the North Pine Dam Optimisation Study should consider removing the water supply security investigation from each study.
- 17.2 The steering committee of the North Pine Dam Optimisation Study should consider whether it would be beneficial for the floodplain management investigation to be removed from the North Pine Dam Optimisation Study.
- 17.3 The Queensland Government should ensure that, when it considers options for the operational strategies to be employed at Wivenhoe and Somerset dams, and North Pine Dam, it is presented with a wide range of options which prioritise differing objectives. The Queensland Government should determine the operational strategies by considering the implications of each option over a range of flood events for at least:
- inundation of urban and rural areas
  - water supply security
  - dam safety
  - submerging of bridges

- bank slumping and erosion
  - riparian fauna and flora.
- 17.4 Seqwater should, in creating the new Wivenhoe and North Pine flood mitigation manuals, comprehensively consider:
- the amount of discretion that is able to be exercised by the flood engineers and the senior flood engineers, and the description of the circumstances in which such discretion may be exercised
  - the circumstances in which it might be appropriate to release water in advance of an impending flood on the basis of forecasts from the Bureau of Meteorology
  - if strategies of the form of strategy W2 and W3 in Revision 7 are included in the revised manual, or any strategy defined as a ‘transition strategy’, when and how those strategies should be implemented
  - if the concept of ‘urban inundation’ is relevant to the operation of the dam, how it should be defined, and if the definition involves diverse concepts, how those concepts can be related back to the strategies, so that flood engineers can reach a clear understanding of their objectives and primary considerations
  - if the concept of ‘natural peak flow’ is relevant, how it should be defined.
- 17.5 The conditions for the use of a particular strategy in all flood mitigation manuals should reflect objective standards.
- 17.6 The Queensland Government should ensure that all flood mitigation manuals include the requirement that those operating the dam during flood events hold current registrations as professional engineers.
- 17.7 Seqwater should consider engaging a technical writer to develop completely new manuals after the operational strategies for Wivenhoe, Somerset and North Pine dams are set by the Queensland Government.
- 17.8 Seqwater should ensure a legal review of the Wivenhoe manual and the North Pine manual is completed before the manual is submitted for approval.
- 17.9 The Queensland Government should consider whether North Pine Dam should be operated as a flood mitigation dam when it considers possible operating strategies and full supply levels as part of the longer term review of the Manual of Operational Procedures for Flood Mitigation at North Pine Dam.
- 17.10 The Queensland Government should amend the *Water Supply (Safety and Reliability) Act 2008* to designate the Minister as the person who must approve a flood mitigation manual.
- 17.11 The assessment of flood mitigation manuals should be completed by a person with appropriate expertise who has had no involvement in its development, at any stage, and who can be seen to be independent of all individuals who were so involved.
- 17.12 The Queensland Government should continue to assess and review the adequacy of work procedures DS 5.1 and 5.3, having regard to the need for flood mitigation manuals to reflect the will of the executive.
- 17.13 Prior to approving a flood mitigation manual, the Queensland Government should be satisfied that its terms are expressed in a manner that allows a determination of compliance with it to be made by reference to objective standards.
- 17.14 The Department of Environment and Resource Management should prepare formal work procedures for the review of flood event reports created under emergency action plans and flood mitigation manuals. These should include procedures for:
- making enquiries with the owners of referable dams that have catchments that have been subject to heavy rainfall (or where there is other reason to believe the emergency action plan has been triggered) as to whether the emergency action plans have been triggered
  - reminding owners of referable dams that have had emergency action plans triggered of their obligation to submit a flood event report
  - upon receipt of a flood event report, reviewing it, identifying any dam safety or other issues or areas where insufficient detail has been provided, raising those matters with the dam owner or other affected party and identifying appropriate remedial steps

- raising any issues identified in the report that are beyond the expertise of the Department of Environment and Resource Management, or are likely to be of particular interest to another body, with the appropriate body
  - keeping a record of the process and results of the review of the flood event report
  - fixing an appropriate timeline for the completion of each of the above steps: the time required may depend on specific circumstances, but must allow for any potential safety issues to be identified and remedied efficiently.
- 17.15 As part of the longer term review of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam the Queensland Government should consider whether the dam operators should be able to extend the drawdown of the lake beyond seven days in order to reduce downstream bank slumping.
- 17.16 CS Energy should supplement physical monitoring of Splityard Creek Dam with visual monitoring by installing surveillance cameras or similar devices.
- 17.17 CS Energy and Seqwater should agree upon and adhere to a formal communication protocol that requires CS Energy personnel to advise Seqwater, through the Flood Operations Centre, of water movements between Splityard Creek Dam and Wivenhoe Dam or Pryde Creek once a flood event is declared under the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam. The protocol should ensure that a direct line of communication is established between CS Energy personnel physically located at the power station and the Flood Operations Centre.
- 17.18 The protocol should make provision for the use of telephone and/or radio where communication by email is not possible. Where necessary, CS Energy and Seqwater should make additional radio equipment available to relevant personnel.
- 17.19 CS Energy should put in place contingency measures to ensure email and telephone communications at Wivenhoe Power Station are not entirely dependent on a network located off-site.
- 17.20 CS Energy should review its emergency action plan and business procedures to ensure they are wholly consistent and give appropriate consideration to flooding as a possible emergency event.
- 17.21 CS Energy should amend its business procedure to remove any ambiguity as to the establishment of communications with Seqwater and to acknowledge the formal communications protocol regarding releases.
- 17.22 The Queensland Government should consider whether to empower Seqwater, through the flood operations centre, to direct CS Energy to stop or delay releases from Splityard Creek Dam where a flood event is declared under the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam.
- 17.23 Seqwater should consider commissioning an investigation into the extent of cracking below the level of the upper gallery of Somerset Dam and the impact of any such cracking on the dam's stability and, in turn, its operation.
- 17.24 Seqwater should ensure that the Somerset Dam gallery is not susceptible to flooding during overtopping events.
- 17.25 The Department of Transport and Main Roads, in conjunction with Brisbane City Council and Somerset Regional Council, should investigate options for the upgrade of Brisbane River crossings between Wivenhoe Dam and Colleges Crossing and undertake a cost-benefit analysis of these to determine the outcome which best serves the public interest.
- 17.26 As part of the longer term review of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam, the Queensland Government should consider the impact of possible upgrades of bridges downstream of Wivenhoe Dam on different operating strategies for the dam.
- 17.27 Wide Bay Water should, in addition to its usual wet season preparations and maintenance, undertake the following activities in advance of each wet season:

- conduct training for personnel on dam operation, including contingency plans for the situation in which one or more of the gates is inoperable
  - hold meetings of key personnel of Wide Bay Water involved in the operation of the dam during floods, which:
    - in addition to any other matters, inform staff about the current status of the gates, dam operation strategies and contingency plans for the situation in which one or more of the gates is inoperable
    - are recorded in minutes which document the information provided and are made available to all operational staff.
- 17.28 The Department of Environment and Resource Management should require Wide Bay Water, in advance of every wet season, to provide details of its expectation as to the operability of the crest gates if a flood occurs, until such time as all gates have been demonstrated to work as designed.
- 17.29 Toowoomba Regional Council should engage external consultants to carry out failure impact assessments on the detention basins along East Creek.
- 17.30 Toowoomba Regional Council and the Department of Environment and Resource Management should continue to co-operate to assess the referable dam status of existing detention basins and any future detention basins constructed in the West Creek and East Creek catchment areas.
- 17.31 The Queensland Government should legislate to oblige each owner of a referable dam to have an emergency action plan approved by the appropriate Queensland Government agency. Such plans should be reviewed periodically.
- 17.32 The Queensland Government should, in consultation with the Department of Environment and Resource Management and Emergency Management Queensland, determine which agency is appropriate to review and approve emergency action plans for referable dams.
- 17.33 Prior to each wet season, the Department of Environment and Resource Management should audit the compliance of each owner of a referable dam with the obligation to have an emergency action plan approved by the Queensland Government.
- 17.34 The Department of Environment and Resource Management should prioritise dam safety audits according to risk. The risk assessment should be informed by criteria including:
- structure and materials used in construction
  - age of the dam
  - time since last inspection
  - occurrence of a flood event since last audit and the size of that flood event
  - population at risk if the dam were to fail
  - experience and capability of dam owner
  - dam owner compliance history
  - time since last audit.
- 17.35 The Department of Environment and Resource Management and Emergency Management Queensland should ensure that each has copies of current emergency action plans for all dams in Queensland.
- 17.36 The Department of Environment and Resource Management should conduct periodic dam safety information and education sessions with emergency management personnel including those from Emergency Management Queensland, local and district disaster management groups and local councils. Priority should be given to sessions if the Bureau of Meteorology forecasts a wet season with a greater than 50 per cent chance of above median rainfall.

# Preface

The Commission was set up fourteen months ago to enquire into seven matters arising out of the 2010/2011 floods, identified in the terms of reference as: preparation and planning for the floods by governments, agencies and the community; the adequacy of the response to the floods; management of essential services; the adequacy of forecasts and early warning systems; insurers' performance of their responsibilities; the operation of dams; and land use planning to minimise flood impacts. It was a broad and daunting range of subject matter. Those questions had to be examined over a very large geographical area, because most of the state was affected; inquiries had to be made and hearings held in a variety of locations.

The Commission came under criticism towards the end of its term when it had to re-convene to examine whether the account of operational strategies to which the flood engineers responsible for Wivenhoe Dam had sworn in hearings was in fact correct. Not all of the criticism was fair, or acknowledged the pressures under which the Commission was operating, in endeavouring to cover all of its terms of reference in a limited time. It would have been quite impracticable for the Commission to take all the evidence given on oath before it and check it for inconsistency against the mountain of documents received. Time simply did not allow that. And the Commission's approach across the terms of reference has not been one of seeking to attribute blame; its brief was not to seek out wrong-doers but, as the Order in Council establishing it specifies, to make recommendations for the improvement of preparation and planning for future floods and emergency response in natural disasters, as well as for any legislative change needed. But the need to examine these particular allegations was made all the more acute by the fact that a commission of this kind is so dependent, given its time constraints, on truthful evidence.

As to how the floods were managed, there is no doubt that they took a state more accustomed to drought by surprise. Generally, though, Queenslanders can be relieved that governments at all levels were able to provide a prompt, if not perfect, response, which compares favourably with the apparent paralysis of government agencies and breakdown in order apparent on the Gulf coast after Hurricane Katrina struck New Orleans.<sup>1</sup> In Queensland there was an already existing, coherent emergency management structure, although it had not yet been tested by disaster of these proportions. Although some councils struggled, there was no breakdown in order, and people came to the assistance of others.

There is certainly a good deal of room for improvement in planning for emergency response, as the many recommendations in this report and the interim report demonstrate. But this note of caution must be sounded: the disastrous floods which struck south-east Queensland in the week of 10 January 2011 were unprecedented, in many places completely unexpected, and struck at so many points at once that no government could be expected to have the capacity to respond seamlessly and immediately everywhere, and in all ways needed. A great deal can be done to improve readiness to deal with disaster generally, but it is impossible that any government could be permanently ready to come at once to the assistance of everyone needing help in a disaster of that scale and suddenness, unless it were to maintain a standing force of rescue personnel beyond the present capacity of society to fund.

Even a large dam such as Wivenhoe has a limited flood mitigation capacity when the volume of water entering it is significantly larger than its storage capacity. Its flood mitigation effect for Brisbane was further limited by the fact that floodwaters from other parts of the Brisbane River catchment entered the river downstream of the dam, through the Bremer River and the Lockyer Creek. The flooding in Brisbane and Ipswich could, as Mr Babister's study has shown, have been reduced to some degree had the dam had its capacity reduced to 75 per cent prior to the December rains; but to appreciate what the magnitude of the rain would be and that it would fall in the dam area would have required a more than human capacity of prediction. What is concerning, though, is the apparent inertia of government when the possibility was raised.

The Commission has found non-compliance with the manual under which the dam was to be operated. What should not be overlooked is that the manual itself was ambiguous, unclear and difficult to use, and was not based on the best, most current research and information. The Commission has made a number of recommendations to ensure its thorough review, including of the operating strategies contained in it, based on comprehensive scientific investigations and modelling.

So far as insurance is concerned, the Commission's terms of reference did not extend to what has emerged as the major complaint: the fact that many people thought they were insured for flood, but have found that the wording of their policies actually excludes their claims. It was sensible not to ask the Commission to enquire into the

problem of definition, because it has already been the subject of two other inquiries. But it meant that the field of what was to be addressed was limited to insurers' performance where they were responsible for meeting claims. Despite the Commission's efforts to encourage members of the public to provide their accounts, evidence has been scant, perhaps for reasons which are suggested in the relevant chapter. The Commission has not been prepared to make sweeping findings on limited evidence. Where ways of managing claims better have emerged from the evidence, recommendations have been made.

This report has dealt at considerable length with the land planning systems of the State and their application by councils. In land use planning, attention to flood risk has been ad hoc. The recommendations made are designed to insert into the land planning system uniform controls which will ensure that the risk of flood is consistently recognised and planning assessments made with regard to it. Queensland also lacks a coherent approach to floodplain management; a number of recommendations have been made relating to the need for current and comprehensive flood studies and flood mapping, particularly in urban areas.

One of the heartening aspects of the Commission's work has been the many people who took the time and trouble, whether they were directly affected or not, to write submissions with considered and sincere ideas. Some will be unhappy that their views were not adopted; but I am genuinely grateful to all who contributed their efforts.

I want to thank counsel assisting and the staff of the Commission for their remarkable efforts, energy and esprit de corps over a testing year. Staff members in their twenties abandoned their social lives to work absurdly long hours, oblivious to weekends and public holidays; older Commission officers strained the affections of their families doing the same. Nothing could have been achieved without the hard work and steadiness of purpose of the four counsel assisting. And my thanks go also to the Deputy Commissioners for their good humour and patience through sittings close and far, under all sorts of conditions. Mr O'Sullivan, particularly, made himself available for community meetings around the state, in the towns he knows well from his long career.

It is hoped that this report and the interim report will serve as a detailed record for the future, of what happened in the floods and where things went wrong. The areas to which this report is directed are the longer term. Years of drought did not promote rigour in flood planning, whether in relation to disaster response, dam management or land use. Complacency about flood prevailed, at least in parts of the state, over many years. And there is a risk that the recommendations made here will be enthusiastically taken up in the short term, but, absent another flood disaster in the next few years, priorities will drift and the lessons will be forgotten.

C.E. Holmes  
Commissioner

## (Endnote)

- 1 A Failure of Initiative: The Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina.

# 1

## 1 Introduction

Prolonged and extensive rainfall over large areas of Queensland, coupled with already saturated catchments, led to flooding of historic proportions in Queensland in December 2010, stretching into January 2011.<sup>1</sup>

Thirty-three people died in the 2010/2011 floods; three remain missing. More than 78 per cent of the state (an area bigger than France and Germany combined) was declared a disaster zone; over 2.5 million people were affected.<sup>2</sup> Some 29 000 homes and businesses suffered some form of inundation.<sup>3</sup> The Queensland Reconstruction Authority has estimated that the cost of flooding events will be in excess of \$5 billion.<sup>4</sup>

The scale of the disaster led to the establishment, on 17 January 2011, of the Commission of Inquiry into the Queensland floods of 2010/2011.

### 1.1 Report to government

The Queensland Government set the matters that the Commission must consider as part of its inquiries (the ‘terms of reference’<sup>5</sup>), and the timeframes in which the Commission must deliver its findings and recommendations to government.

In accordance with the order establishing it, the Commission provided the Queensland Government with an interim report on 1 August 2011. The order originally required the Commission to provide a final report to the Queensland Government by 17 January 2012. The date for the final report (this report) was first extended to 24 February 2012 because of the Commission’s extensive public hearing schedule and the volume of evidence to be considered; in late January that date was further extended to 16 March 2012 to allow the Commission to take further evidence in relation to the dam operation strategies applied at Wivenhoe Dam during the January 2011 flood event.

The Commission’s interim report focused on those matters that the Commission had identified as needing to be addressed before the 2011/2012 wet season. In particular, it dealt with preparation and



*First day of Inquiry hearings, 11 April 2011 (photo courtesy The Courier-Mail)*

planning for floods and steps needed to ensure an emergency response that would prevent the loss of life and property. It also recommended that should the Bureau of Meteorology predict with confidence equal to or greater than 2010's prediction another wet season of similar proportions, the full supply level of Wivenhoe Dam should be lowered to 75 per cent in the 2011/2012 wet season (a step which was in fact taken). In all cases, the Commission sought to identify recommendations that could realistically be put into effect in the short term, but it also made recommendations about work of such importance that it should be commenced, even if it could not be completed, before the next wet season.

Given the very short time available to it before the interim report was required to be provided to Government (six months) the Commission endeavoured to make that report as comprehensive as possible about the operation of dams, and emergency warnings, preparation, planning and response to floods, including some aspects of managing the supply of essential services during the 2010/2011 floods.

Some of these issues required further examination and are addressed in this final report. Because the issues of insurance and land planning were not matters which lent themselves to useful recommendations for the next wet season, the Commission deferred its consideration of those aspects of its terms of reference to this final report.

## 1.2 The Commission of Inquiry

The Commission was established under the *Commissions of Inquiry Act 1950* as an independent body with wide-ranging powers of investigation.

The Honourable Justice Catherine Holmes was appointed as Commissioner to lead the inquiry. Mr James (Jim) O'Sullivan AC and Mr Phillip Cummins were appointed as Deputy Commissioners to assist her.

Two barristers, Mr Peter Callaghan SC and Ms Elizabeth Wilson SC were first appointed as counsel assisting the Commission. Later, Ms Kerri Mellifont SC and Ms Nicole Kefford were also appointed as counsel assisting the Commission. Mr Mark Hinson SC provided advice on aspects of land planning legislation.

Staff of the Commission were drawn from fields of expertise relevant to the Commission's work including the legal, policy, research and policing professions. Experts in certain fields were also engaged to provide advice on particular matters, including hydrology and town planning matters. A list of experts engaged is in *Appendix 5*.

## 1.3 The Commission's work

The Commission's findings and recommendations in this report and its interim report were the result of an examination of an enormous amount of information. This information was obtained through a variety of means, including written submissions, community meetings, material sought from organisations and individuals with particular knowledge, and public hearings. The Commission sought to ensure it was informed in a balanced way, receiving the views of the public and those of organisations which played a part in the preparation and response to the floods, across a range of perspectives from urban and regional areas.

More than 700 written submissions were received. They addressed the entire range of matters into which the Commission was to inquire.

At the outset of its investigations, the Commission held community consultation sessions in Grantham and Murphys Creek in the Lockyer Valley. No formal evidence was taken at these meetings; it was a useful way for the Commission to hear directly from members of the Lockyer Valley community what they regarded as the questions needing to be considered by the Commission.

The Commissioner and deputies visited the Lockyer Valley twice in January 2011, to see first hand the immediate effects of the devastating flash flooding that occurred there on 10 January 2011. The Commissioner and deputies also visited the Wivenhoe and Somerset dams to see them in operation.

Community meetings were held in 16 locations in central, southern and western Queensland. Led by Deputy Commissioner O'Sullivan, those meetings provided information about how community members could participate in the inquiry process. Through the community meetings, the Commission identified individuals and organisations in regional areas from whom it sought further information. Meetings were held before the interim report, and again after its delivery, when time permitted trips to those communities which could not be visited in the first round. In total, the Deputy Commissioner and Commission staff, including the Commission's police investigators, travelled



2011 flood height marked on gum tree, Balonne River at St George (photo courtesy Gerard Hinchliffe)

as witnesses in the Commission's public hearings.

Public hearings were held around the state. The Commission sat for 68 days in total, and 6133 pages of transcripts of evidence were produced. Thirty-one days of hearings took place before the Commission's interim report was delivered. In its second round of hearings, the Commission sat again in Brisbane, Ipswich and Emerald, this time focusing on land planning and insurance related issues. It also held hearings for the first time in Bundaberg, Maryborough and Gympie, where it examined, in addition to those issues, the emergency preparation for and response to the 2010/2011 floods. A third round of hearings was held over a ten day period in early February 2012 to examine allegations of misconduct on the part of flood operations engineers in the application and reporting of dam operation strategies for Wivenhoe Dam.

Details of the public hearings held over the entire period of the Commission are set out below:

- Brisbane (49 days)
- Toowoomba (5 days)
- Dalby (1 day)
- Goondiwindi (1 day)
- St George (1 day)
- Ipswich (3 days)

some 4154 kilometres throughout Queensland in the course of holding community meetings.

Through the duration of the Commission, community meetings were held in:

- Jericho
- Alpha
- Chinchilla
- Condamine
- Surat
- Tara
- Rolleston
- Theodore
- Mundubbera
- Gayndah
- Gin Gin
- Taroom
- Charleville
- Roma
- Cunnamulla
- Warwick.

The Commission's police investigators obtained information to inform its research by making contact with communities throughout Queensland which were directly affected by the 2010/2011 floods and travelling to regional areas to obtain statements from local people affected by flooding.

The Commission also used its powers under the *Commissions of Inquiry Act 1950* to obtain statements and documents from members of the public, experts, public servants and members of non-government organisations. Some of those individuals were also called

- Rockhampton (1 day)
- Emerald (3 days)
- Bundaberg (2 days)
- Maryborough (1 day)
- Gympie (1 day).

The hearings were held in a range of venues, from town halls to regional court houses. The total number of witnesses who gave evidence in the Commission's public hearings was 345: 176 people gave evidence in the first round of hearings held before the Commission's interim report, 142 people gave evidence in the second round, and 27 witnesses were called in the third round. (Some of those who gave evidence in the third round had also been called as witnesses in the first round of hearings).

The Commissioner presided at each of these public hearings, assisted by the two deputy Commissioners, with the exception of the last part of the public hearings, in which the conduct of Seqwater and its employees in the reporting of dam operation strategies was in issue. At the Commissioner's request, Deputy Commissioner Cummins stood aside on becoming aware that a company for which he had contracted to work after the Commission's close had been engaged by Seqwater to be part of a review committee examining technical work completed for the long term review of the Wivenhoe and North Pine dam manuals. While he remained a Deputy Commissioner, to avoid any possible perception of a conflict of interest, he did not take any further part in the Commission's work.

Hearings were open to the public and conducted within a legal framework: witnesses gave evidence and were cross examined, exhibits were tendered and transcripts prepared. Lifeline counsellors engaged by the Queensland Government were available to support witnesses before, during and after their appearances before the Commission.

There was no requirement for those involved to have legal representation, although some witnesses chose to seek permission from the Commission to be legally represented when they appeared at the hearings.

The Commission received a number of applications from individuals and entities seeking leave to appear as parties in the course of the inquiry. Those whose interests were likely to be affected in an individual, direct and immediate way by the Commission's findings or recommendations were given leave to appear, enabling them to challenge evidence by cross-examination. *Appendix 2* sets out the parties who were granted leave to appear as a party to the proceedings before the Commission.

Those who unsuccessfully sought leave to appear on the basis of a more general interest in the matters the subject of the inquiry were given other opportunities to put forward their views and information, by way of submission, formal statement or being called to give evidence.

In the course of its work the Commission has given effect to the principle of natural justice and has given notice to those whose conduct might be the subject of adverse findings in this and the interim report.

At all times the Commission ensured that its work was as open and accessible as possible to the general public. The Commission's website ([www.floodcommission.qld.gov.au](http://www.floodcommission.qld.gov.au)) provided information about the progress of the inquiry as well as email, postal and telephone contact details so that anyone, regardless of geographical location, could provide information or submissions to the Commission. The website also provided live streaming of the public hearings. Daily transcripts from the public hearings were placed on the website within 24 hours (and in most cases the same day), so that the public could be kept informed of the Commission's progress. The website proved a very popular source of information for people following the inquiry: for example, in the six months from September 2011 to February 2012, it received over 66 000 visits and nearly 280 000 page views.

Submissions made to the Commission and exhibits tendered as part of the public hearings were also published on the website, redacted of personal information that would breach an individual's privacy, or represent a risk to public safety. Closing submissions made by parties and counsel assisting the Commission on the matters explored in the third round of hearings will be placed on the website on publication of this report, redacted of any submissions adverse to a party's interests about which the Commission did not make a finding. The Commission's view is that it would be unfair to publish allegations damaging to reputation which were not in the event substantiated.

The Commission's interim report and this final report are also available on the Commission's website.

The Commission has conducted its investigations, community meetings, public hearings and delivered its reports well within the budget allocated by the Queensland Government.

## 1.4 Structure of this report

The report begins with an examination of floodplain management (chapter 2), which is, in many respects, at the heart of the Commission's inquiry. It covers the range of responses to flood risk that the Commission has investigated from its inception to this final report: emergency warnings, preparation, planning and response, dams, levees, and land use planning. This report proposes a fundamental shift in approach; the focus on just one flood, often the so-called '1 in 100 year' flood, must now be abandoned. Floods come in all sizes; a proper approach to flood risk will consider them all.

The second part of the report (chapters 3-11) details the results of the Commission's examination of how local and regional planning systems can best minimise the impact of floods.

This part of the report commences, in chapter 3, with a summary of the land planning framework and how it works, covering the *Sustainable Planning Act 2009* (the legislation which in most cases governs land planning in Queensland), the instruments made under it, and how development is assessed. Bearing in mind that land planning is a complex area of the law, with a peculiar language of its own, the Commission has sought, to the extent possible, to use language intelligible to those not familiar with the intricacies of planning schemes.

Various aspects of state and local planning instruments are considered in chapters 4 and 5 respectively. Chapter 6, on 'satellite' legislation, explains how some pieces of planning legislation which are independent of the *Sustainable Planning Act 2009* operate.

Some particular challenges which flood-susceptible land presents in planning are considered in chapter 7, including the problems of storing hazardous materials on a floodplain and isolation of properties by flooding of low-lying access routes. This chapter also addresses the issue of controls for the development of levees.

How the development assessment process works in practice where flooding is a consideration is detailed, with some particular case examples, in chapter 8.

Chapter 9 considers the role of building controls in minimising damage caused by flooding through the regulation of design and construction, and the implications of possible changes to the Queensland Development Code to regulate building in flood hazard areas.

Chapter 10 provides an overview of the damage caused by the 2010/2011 floods to sewerage, stormwater, electricity, telecommunications, and roads and rail infrastructure. It considers how damage to essential services infrastructure can be minimised in future floods, with a particular emphasis on planning and design measures.

Larger-scale measures to mitigate the impact of flooding are examined in chapter 11 *Buybacks and land swaps*, including the initiative to rebuild Grantham in the wake of the flash flooding disaster of 10 January 2011.

A significant term of reference not dealt with by the Commission in the interim report is the performance of private insurers in meeting their claims responsibilities. This is addressed in chapter 12.

The results of the Commission's investigations into the Queensland Government's response to flooding at active and abandoned mine sites are set out in chapter 13.

The Commission, in its interim report, made a number of recommendations designed to avoid a repetition of the number of flood-related deaths that occurred in the 2010/2011 floods. Chapter 14 of this final report discusses the circumstances of the flood related deaths, and sets out each finding or recommendation made by the Commission to address the systemic issues raised by those deaths.

Chapter 15 concerns a variety of matters raised, but not finally dealt with, in the Commission's interim report: emergency communications; review of disaster management plans; the Queensland Fire and Rescue Service's response to the events of 10 January 2011 and its risk assessment process; the structure and funding of the SES and local SES attempts at providing a warning to Grantham residents on 10 January; and whether the quarry at Grantham had any role in the Grantham flooding.

Chapter 16 examines the application and reporting of dam operating strategies for Wivenhoe Dam. In particular, this chapter examines allegations as to the versions given by Seqwater and its employees of the strategies under which the dam was operated between 7 January and 11 January 2011; conclusions are reached about what in fact occurred and recommendations are made accordingly.

Chapter 17 examines several different aspects of dam operations, including the functioning of some particular dams, the longer term review of the manual, bank slumping, cracks in Somerset Dam, bridges and crossings near dams, and some relevant dam functions of DERM.

The recommendations from this report are set out following the Commissioner's preface. As was the case in the interim report, particular recommendations are also set out in the chapter to which they relate, preceded by a discussion of the facts and material relied on in making them. The recommendations made in the Commission's interim report are set out in *Appendix 3*.

## 1.5 General observations

All topics in the Commission's interim and final reports are related, in one way or another, to the concept of flood risk. That is a term capable of more than one meaning; although usually it embodies both likelihood of flooding and the consequences of flood when it comes. Sometimes, though, it relates only to likelihood. How it is used in this report depends on context. Where the Commission uses expressions such as 'susceptible to flooding', 'vulnerable to flooding' or 'at risk of flooding' it does not use them in any technical sense; they should be regarded as having their ordinary meaning.

This report does not attempt to catalogue every action taken in preparing for the 2010/2011 floods; it also does not attempt to exhaustively examine every development application or insurance claim. While the Commission did examine particular developments and particular insurance claims, and has set out the results of some of those investigations in this report, it does so by way of illustration of the issues being examined, as part of the Commission's attempt to find a better way of preparing for and responding to floods in the future.

At all times, the Commission has been cognisant of the requirement in its terms of reference to make recommendations that are 'appropriate, feasible and cost effective' to improve the response to any future floods or other natural disasters. Where the Commission has identified a recommendation that has significant cost implications, the report details this in the relevant part, and frames the recommendation appropriately. However, in the time available to it, the Commission has not been in a position to exhaustively seek evidence on the cost of various alternatives. Instead, it has focussed on making recommendations about what might usefully be achieved.

The recommendations made by the Commission are focussed on flood-related matters, given the significance of the particular kind of natural disaster experienced in Queensland. However all levels of government, in considering their response to the recommendations, should consider how they might also be applied in other natural disasters.

## (Endnotes)

- 1 A detailed description of the extent of flooding across Queensland is set out in the Commission's interim report, chapter 1 *Summary of weather and flood events*.
- 2 Queensland Government, Operation Queenslander: the State Community, Economic and Environmental Recovery and Reconstruction Plan, 2011 [p3].
- 3 Queensland Government, Operation Queenslander: the State Community, Economic and Environmental Recovery and Reconstruction Plan, 2011 [p4].
- 4 Queensland Government, Operation Queenslander: the State Community, Economic and Environmental Recovery and Reconstruction Plan, 2011 [p4].
- 5 The full terms of reference for the Commission is at *Appendix 1*.

# 2

## 2 Floodplain management

A floodplain is an area of land adjacent to a creek, river, estuary, lake, dam or artificial channel, which is subject to inundation by floodwater.<sup>1</sup> Most cities and towns in Queensland are located on floodplains.<sup>2</sup> There are ample benefits associated with making use of fertile floodplain lands, but they come with an obvious drawback: by definition, floodplain land is subject to flooding.

No recommendations made by this Commission, even if implemented by government, can control the forces of nature. At some time in the future, parts of Queensland will experience floods of a magnitude as great as, or greater than, those of the 2010/2011 wet season. Existing science cannot predict when they will happen, or how severe they will be.

Contemporary society does not countenance a fatalistic approach to such inevitabilities, even if their occurrence is unpredictable. There is an expectation that government will act to protect its citizens from disaster, and that all available science should be applied so that the nature and extent of the risk is known and appropriate action taken to ameliorate it.

With that in mind, government agencies need to engage in a process of floodplain management involving a combination of land planning and building controls, emergency management procedures, and structural mitigation measures such as levees and dams. This chapter addresses the preparatory steps government should take to enable the best possible decisions to be made about floodplain management measures. The implementation of particular floodplain management measures is considered in more detail elsewhere in this report and the Commission's interim report.<sup>3</sup>

The most useful scientific exercise currently available to underpin government's response to flood risk is a flood study. A flood study is the scientific investigation of flooding in a particular area, usually the catchment of a river system. It may involve hydrologic and hydraulic investigations, and a statistical analysis of the frequency with which floods have occurred.

Any such process will be only as effective as the science that enables it, and the reliability of results will necessarily depend upon the quality of data. There is no single way of performing a flood study. It can be a simple exercise, or one that is as complex and detailed as resources will allow. The Commission did not attempt to codify the science and practice of flood studies. Rather, it convened a panel of experts and was informed by their consensus as to the status of some existing flood studies, the procedures that would ideally be involved in future studies, and the need to reform the way in which essential data is managed.

The experts' consensus is a good blueprint, but it must be accepted that it is, for the most part, only governments who can afford to undertake major flood studies. As much as any government process, the management of a flood study will be subject to a range of influences. In this context, it was instructive for the Commission to examine the history of flood studies in Brisbane and Ipswich over the last 30 years. That examination reinforced the proposition that a flood study is a scientific exercise, and if the utility of its results is to be maintained

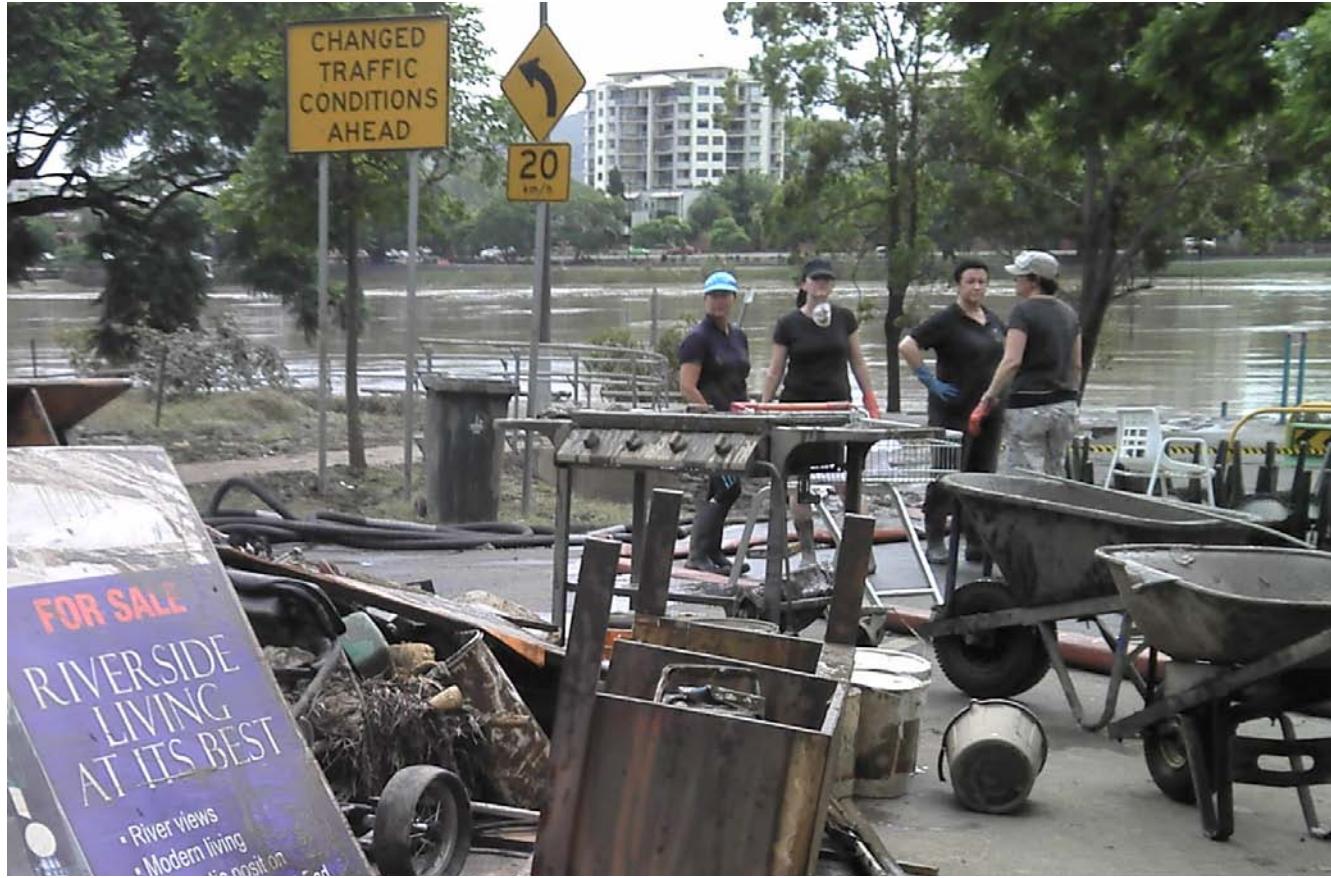
there is an ever present need for governments to stay abreast of scientific developments, and the possibilities they create for the refinement and expansion of existing knowledge.

Once completed, a flood study will be useful only if it can be understood by an audience that extends well beyond the scientific community. To that end, the results can be visually represented in the form of a flood map. A map that reflects the results of a comprehensive flood study is the most valuable form of flood map, and can usefully inform important public and commercial decisions. It can demonstrate not just the potential extent of a flood, but also the risk of its occurrence and the manner in which it might behave. There are, however, other types of flood maps that can also be useful to governments and individuals, depending on the information required and the resources available to provide it. The Commission has endorsed a hierarchy of flood maps that might be used by governments in Queensland, according to their circumstances: see *2.7.3 Assessment of mapping options*.

At most, however, a flood map is a theoretical two-dimensional representation of what is likely to be a complex and dynamic situation involving countless variables. It cannot be assumed that human judgment about such matters will always be assisted by scientific understanding, or governed by common sense and logic.

For example, the Q100 figure, as represented on a flood map depicting it, is intended to convey the proposition that, in any given year, there is a 1 per cent chance that the area depicted will be inundated – to some extent – by floodwater. As the Commission discovered, many members of the public did not understand the term ‘Q100’ in that way. The very notion that a map depicting a Q100 line was an effective means of communicating the results of a flood study was challenged.<sup>4</sup>

This example is just one illustration of why a government’s responsibility does not end with the procurement of a flood map. The complications involved in preparing for and responding to flood are such that it is desirable for governments to implement comprehensive floodplain management plans in accordance with principles which have already been developed for that purpose. By so doing, they might begin to meet the expectation that government protect its constituents from floods which are yet to be experienced, but which will inevitably occur.



Flood damaged property, West End (photo courtesy Paul Rees)

## 2.1 Principles of floodplain management

Historically, governments have managed the risks associated with occupying the floodplain in a number of ways, from ad hoc decision-making based on past experience through to comprehensive planning and emergency response strategies. Approaches of the former kind are obviously unsatisfactory. Not only do they fail to ensure that a range of potential flood events is considered, they do not address other factors involved in mitigating the impact of flooding and responding to it.

In an attempt to develop a nationally consistent approach to floodplain management, the Standing Committee on Agriculture and Resource Management<sup>5</sup> sought to develop a series of best practice guidelines. These guidelines are set out in its report number 73, *Floodplain Management in Australia: best practice principles and guidelines* (2000).<sup>6</sup> The National Flood Risk Advisory Group is currently developing a new floodplain management manual that will supersede *Floodplain Management in Australia*. The Commission has been advised that a draft of the new manual is likely to be finalised by mid-2012. In the meantime, *Floodplain Management in Australia* is widely considered to set out the best practice principles for floodplain management.<sup>7</sup>

According to *Floodplain Management in Australia*, best practice requires the identification and implementation of an appropriate mix of four different kinds of floodplain management measures:

- land use planning controls (for example, zoning requirements to ensure compatibility between land use and flood risk)
- building controls (for example, minimum flood levels and flood-proofing)
- structural measures (for example, flood mitigation works such as the construction of levees)
- flood emergency measures (for example, flood warning, evacuation and recovery plans).

Determining precisely which measures are appropriate and how best to distribute resources among them can be a complicated process. With this in mind, *Floodplain Management in Australia* outlines a series of steps it considers should be undertaken. This process begins in earnest with the conduct of a flood study.<sup>8</sup>

Once a flood study has been completed, the relevant government agency (typically a council) will be in a position to conduct enquiries into the appropriate mix of flood mitigation measures. Where possible, this should be done by way of a formal floodplain management study and guided by appropriate flood mapping. The conclusions drawn from those enquiries can then be implemented in accordance with a floodplain management plan, the development of which is considered in more detail in section 2.6.1 *Preparing a floodplain management plan*.

## 2.2 Flood studies

A flood study allows the likelihood of flooding at particular locations as well as the characteristics of each flood, such as extent of inundation, flow, depth and velocity, to be determined. Flood studies form the foundation upon which floodplain management measures are built; it is not possible to adequately manage the risk of flooding if that risk is not properly understood. There is no single way of doing flood studies: they may be comprehensive or relatively simple.

Flood studies typically have two main components:

- a hydrologic study aimed at determining rainfall and associated stream flows in a range of scenarios
- a hydraulic analysis that estimates the behaviour of flood flow (that is, flow rate, velocity, depth and extent of inundation) as it passes through the floodplain.

Some matters of terminology should be dealt with at the outset. The likelihood of flooding occurring at a particular point is often described in terms of annual exceedance probability (likelihood that a particular flood flow or height will be exceeded in any one year) or average recurrence interval (average period in years between floods of a particular size or greater).<sup>9</sup> A flood with an annual exceedance probability of 1 per cent has an average recurrence interval of 100.<sup>10</sup> The flood line which represents the extent of such a flood is commonly known as the Q100. In this report, the Commission will use the term ‘flood with an annual exceedance probability of one per cent’ or its shortened form, ‘1% AEP flood’, except where another term may be needed to maintain consistency with the evidence.

The term ‘flood hazard’ is sometimes used to refer to the behaviour or characteristics of floodwaters (that is, velocity, depth, rate of rise, and length of inundation). However, flood hazard is defined in *Floodplain Management in*

Australia as ‘potential loss of life, injury and economic loss caused by future flood events’.<sup>11</sup> The level of flood hazard in that sense will vary with a number of factors:

- flood behaviour (depth, velocity, rate of rise, duration)
- topography (for example, whether there are evacuation routes, or whether land is surrounded by floodwater)
- the nature of the population at risk and the types of land use in the flooded area
- emergency management issues (such as the adequacy of flood forecasting, flood warning and evacuation plans).<sup>12</sup>

A flood study is a scientific investigation; it involves no matters of policy. It can determine the characteristics of floods with different likelihood of occurring, but cannot determine ‘hazard’; the latter involves qualitative considerations such as the nature of land use and the efficacy of evacuation plans. Models created during a flood study can be used to create flood maps – see section 2.7 *Flood mapping for land planning controls* below.

## 2.3 A flood study of the Brisbane River catchment

### 2.3.1 The expert panel

The Commission heard evidence from a panel of experts about flood studies for the Brisbane and Bremer rivers. Those rivers were of particular interest to the Commission because of the large urban centres – Brisbane and Ipswich – that flooded in January 2011. The Brisbane River panel included eight experts, who were either hydrologists or hydraulic engineers: three engaged by the Commission (Dr Rory Nathan, Mr Mark Babister and Dr Michael Leonard), three engaged by Brisbane City Council (Professor Colin Apelt, Mr Erwin Weinmann and Mr Drew Bewsher) and one engaged by each of Ipswich City Council (Mr Neil Collins) and the Insurance Council of Australia (Mr Sharmil Markar). The Bremer River panel comprised the experts engaged by the Commission, Ipswich City Council and the Insurance Council of Australia.



*Expert panel of hydrologists and engineers, Inquiry hearings, 26 October 2011 (photo courtesy The Courier-Mail)*

The Commission initially engaged Mr Babister to prepare reports giving his best estimate of the Q100 at certain points along the Brisbane and Bremer rivers.<sup>13</sup> The other experts on the panels responded to Mr Babister’s report with reports of their own.<sup>14</sup> Before giving evidence in public hearings of the Commission, the experts participated in a conference with an independent facilitator, Mr Peter Davis SC, and produced a joint expert statement. In that statement, all experts, including Mr Babister, agreed that his estimate was not an appropriate flood level figure corresponding to the Q100 because he had not been able to complete a comprehensive flood study.<sup>15</sup> (Given the short timeframes under which the Commission has worked, Mr Babister was given only four weeks to produce a report;<sup>16</sup> it represented his best efforts in the time available to him to calculate Q100 without the benefit of a comprehensive flood study.<sup>17</sup>) The reports prepared by each expert were critiques of Mr Babister’s methodology and results. The joint expert statement diverged significantly from that topic. It focussed on the sort of comprehensive flood study which would be necessary to obtain a sound estimate of the level that would be reached by floods of different probabilities, such as the Q100.<sup>18</sup> The joint expert statement<sup>19</sup> sets out a blueprint for a best practice flood study for the Brisbane River catchment.

## 2.3.2 A comprehensive study of the Brisbane River catchment

The joint statement of the expert panel recommended that a flood study analyse flood behaviour throughout the entire Brisbane River catchment.<sup>20</sup> That analysis would lead to a determination of the likelihood and characteristics of flood in Brisbane and Ipswich.<sup>21</sup> They suggested that such a study should be conducted over a range of possible floods from the flood with a 50 per cent annual exceedance probability through to the probable maximum flood.<sup>22</sup>

The experts considered that it would not be appropriate for them to prescribe the methodology for conducting the flood study, but did recommend that the study should be comprehensive in use of data sources and range of methodologies.<sup>23</sup> Corroboration of results could be obtained by comparing estimates of flow, height, velocity or depth using different methodologies.<sup>24</sup>

The proposed data, hydrologic investigations and hydraulic investigations to be used in the study are set out in the joint expert statement. The joint statement gives no opinion on the exact order in which different pieces of work should be done, but during public hearings the experts supported an iterative approach to the flood study.<sup>25</sup> That would involve an initial data collection and hydrologic modelling to arrive at estimates of floods of different likelihoods. These estimates would not be final figures, but would be used to determine which factors introduced the most uncertainty. The work would then focus on reducing the uncertainty created by those factors, for example by refining data sets or creating modelled data, thus producing the best returns from the least effort.<sup>26</sup> The process of data collection, hydrologic and hydraulic modelling set out below is likely to need to be undertaken more than once.

Dr Nathan gave a rough estimate of the time required to complete the entire study as three years.<sup>27</sup> That period incorporates time spent developing the framework for the completion of the study with all agencies that are to be involved, including councils and dam operators.<sup>28</sup> He estimated the cost of the study in professional fees as in the ‘low numbers of millions’.<sup>29</sup> He estimated that the first iteration, being the characterisation of the flood risk, would take between 12 and 18 months.<sup>30</sup>

### 1. Collection of data

Significant work is required on data.<sup>31</sup> The experts recommended the collation of existing data along with any review or analysis of it, and the collection of further data on historical events. In addition, the study should involve a fresh analysis and review of data relied upon in previous studies.<sup>32</sup> The creation of a central repository of flood study data may assist in this task: see section 2.5.5 *Central repository of flood study data*.

The experts concluded that the following data must be used in the flood study:<sup>33</sup>

- rainfall data including:
  - historical rainfall data (including sub-daily and daily-point rainfall)
  - radar data sets
  - rainfall data, often described as design, synthetic or probabilistic, obtained through the use of rainfall models. Such data sets are often available from the Bureau of Meteorology and include information about average depth over catchment, temporal and spatial patterns
- stream flow, including historical peak, continuous and anecdotal stream flow data, observed flow data from physical gauging<sup>34</sup> and rating curves<sup>35</sup> used at different times in history
- tide levels, including historical and modelled tide levels, astronomical tides and tidal anomalies
- inundation levels and extents during historical floods
- data about how Wivenhoe Dam and Somerset Dam are operated now and have been operated in the past, including discharges and levels in historical and modelled events<sup>36</sup>
- modelled, continuous inflow and outflow data for Somerset and Wivenhoe dams to allow an investigation of the probability of the dam being at certain levels at the start of a flood<sup>37</sup>
- historical land use conditions
- river channel and floodplain characteristics for hydraulic modelling to be performed in current and historical conditions, including:
  - topographic data obtained through LIDAR (light detection and ranging, technology that is used to measure geospatial information) and bathymetry (mapping of river beds)

- structures and other development affecting flood flows
- vegetation on the floodplain
- survey data
- characteristics of the movement of sediment in the Brisbane and Bremer rivers and major tributaries.

Given the iterative nature of the flood study, it would not be necessary for the collection, collation and review of data to be comprehensive before any further investigations were undertaken. The extent to which this initial data collection and collation should be completed before commencement of the study is a matter for the judgment of those carrying out the study.

## 2. Preparation of hydrologic models

Hydrologic models convert rain falling over land into flow in a stream.<sup>38</sup> Different models are needed for different catchments. For the Brisbane River catchment, hydrologic models relating at least to Somerset and Wivenhoe dams, the Lockyer Creek, the Bremer River and the Brisbane River downstream of Wivenhoe Dam will be required.

The expert panel recommended that the hydrologic models be run in what is known as a Monte Carlo framework.<sup>39</sup>

## 3. Running hydrologic models in Monte Carlo framework

The benefit of the Monte Carlo framework is that it allows the natural variability of factors which affect flood to be taken into account.<sup>40</sup> It is obvious that there is no single set of conditions that will cause a flood. It is the combined effect of when, where and the extent to which rain falls, dam levels and saturation of the catchment which causes a flood, and there may be many different values ascribed to each one of those features.

In the past, some hydrologists have estimated the Q100 flood (or a flood of any exceedance probability) by assuming that a rainfall event of the same probability will cause such a flood and then modelling the effect of one such rainfall event. For example, a rainfall event with an annual exceedance probability of one per cent might be simulated to determine the peak flow which would occur at different points in a river in a 1% AEP flood. Fixed values have been assigned to all other relevant factors: one saturation factor, one lake level, one spatial and temporal distribution of the rainfall, and so on. Some studies have analysed more than one rainfall event: for example studies done for the Brisbane City Council in 2003 addressed seven rainfall events.<sup>41</sup>

The Monte Carlo framework allows the modelling to be done using thousands of different values<sup>42</sup> for each of the factors that produce floods. Looking at all the different values of the different factors, the model can approximate something like the thousands of possible outcomes. The hydrology expert panel recommended the following factors be varied in different model runs:

- temporal (the period in which rain falls) and spatial (the area over which it falls) patterns of rainfall
- saturation of the catchment
- initial water level in dams
- variability of operating procedures of dams
- physical limitations on operation of the dams
- tidal conditions
- previous and following rainfall events.<sup>43</sup>

Some of the factors will not be independent of each other, but will be related in some way. For example, the degree of saturation in the catchment of the Brisbane River above Wivenhoe and the initial water level in the dams are both dependent on the amount of rain that has fallen in the catchment in the previous weeks, months and years. Common sense dictates that when a large amount of rain has fallen, it is more likely that the dams will be full and the catchment will be saturated. The relationships between factors must be reflected by ascribing mutually consistent values to them. This correlation between data sets must be determined before the Monte Carlo analysis can be performed.<sup>44</sup>

The results of all of those model runs are considered together so that a probability distribution of the peak flow or volume of floods that could occur from a rainfall event of a particular probability can be developed.<sup>45</sup> A probability distribution is a representation of the likelihood of different outcomes occurring. For example, it may be that the modelling shows that 4 per cent of the time, a 1% AEP rainfall event will cause a flood with peak flow greater than

7000 m<sup>3</sup>/s, or that 15 per cent of the time, a 1% AEP rainfall event will cause a flood with peak flow greater than 9000 m<sup>3</sup>/s. The probability distribution will show how likely it is that certain values of flow will be met or exceeded during a rainfall event of a particular probability.

#### 4. Validation of hydrologic models

The expert panel recommended that the hydrologic models be validated by comparing the results they produce against observed data from historical floods. Models developed in a Monte Carlo framework, taking into account natural variability, should reproduce observed flood behaviour and natural variability of outcomes.<sup>46</sup> In particular, at key locations, the models should be able to reproduce:

- hydrograph attenuation (that is, the extent to which a flood is attenuated as it travels downstream by water's entering floodplains and natural detention basins or absorbing into soil)
- probability distribution of the total flood volume produced by rainfall
- probability distribution of the peak flow produced by rainfall
- probability distribution of timing of flows from major tributaries
- natural flood behaviour observed in no dam conditions and current conditions.<sup>47</sup>

Dr Nathan gave evidence that this reproduction of natural variability might be more important for some factors at different places in the catchment. His evidence was that the reproduction of volume and peak flow was important above Wivenhoe and Somerset dams, whereas the reproduction of peak flow was the most important aspect of validation below the dams.<sup>48</sup>

The expert panel also recommended validating the hydrologic models by comparing peak flows and flood volumes obtained through modelling with values obtained through mathematical analysis of the historical flood record.<sup>49</sup> That latter technique, called flood frequency analysis, produces estimations of the probabilities of different flood heights purely from the historical record. Ideally, such an analysis would occur using data over as long a period as possible; in practice, a flood record of 150 years at the Brisbane Port Office gauge is considered a fairly substantial period of record.<sup>50</sup> Flood frequency analysis uses probability theory to obtain a flood frequency curve for a particular point on a river. The flood frequency curve can be used to determine a value (usually peak flow or height of the flood) for floods of different probabilities (say 10 per cent and 5 per cent, through to a small probability, for example 0.0001 per cent). The results can be compared to the results obtained from the Monte Carlo analysis.

The expert panel recommended that consideration should be given to pooling regional information in the flood frequency analysis.<sup>51</sup> That technique allows observed data from comparable areas to be used as though it occurred in one place, thereby increasing the amount of data available to analyse.<sup>52</sup> This method was used by a firm of consulting engineers and hydrologists, Sinclair Knight Merz, in 2003 to compare and combine data from different gauges in the Brisbane River,<sup>53</sup> but could also be employed to incorporate the use of data from rivers on the Sunshine and Gold coasts.

If the models are not validated, those performing the flood study will need to collect more data and refine the hydrologic models until they are defensible.

#### 5. Hydraulic modelling

A hydraulic model converts flow in a stream into flood heights, thus allowing assessment of the extent of inundation.<sup>54</sup> The expert panel recommended the use of a hydraulic model to determine flood levels, flows and extents over the full floodplain surrounding the Brisbane River and its major tributaries downstream of Wivenhoe Dam.<sup>55</sup>

The hydraulic model will also identify areas influenced by backwater at the confluence of two streams.<sup>56</sup> Backwater effects occur during flood when an excess of water in the larger waterway prevents water from flowing out of a tributary, and the tributary 'backs up', making flood levels upstream of the confluence higher. This is particularly important at the confluence of the Bremer and Brisbane rivers, where significant backwater effects have been observed.<sup>57</sup> The experts emphasised the need to model that backwater carefully and precisely.<sup>58</sup>

The experts considered that there should be one hydraulic model for the whole of the lower Brisbane River area.<sup>59</sup> They recommended use of a standard 'linked one-dimensional two-dimensional model'.<sup>60</sup> That type of model has some parts which are one-dimensional and assume velocity is constant at different points on the cross section of a

river. Other parts are two-dimensional and allow for changes in velocity at different depths and positions from the banks.<sup>61</sup> In this way, the model reflects the fact that some parts of a river system are two-dimensional and others, such as some weirs, are one-dimensional.<sup>62</sup>

It may be necessary to develop a separate, more detailed model of the interaction at the Bremer-Brisbane confluence.<sup>63</sup>

When creating any model, there is a balance to be struck between its complexity and its practicality. One important indicator of its practicality is the length of time it takes to run.<sup>64</sup> The experts recommended that attention be given to that balance, and considered that the model should:

- be able to assess historical changes to the river bathymetry
- run quickly enough to allow detailed calibration work and assessment of changes (the expectation being that hundreds of simulations will be required for this purpose).<sup>65</sup>

The hydrologists and engineers undertaking the study should also consider the ability of the model to deal with the movement of sediment and changes in river bed cross sections during flood events as a means of evaluating the effect of changing river conditions on flood levels.<sup>66</sup>

The results of the hydraulic modelling can be represented as a probability distribution for flood height, depth or velocity at different points along the Brisbane River for a range of floods of varying likelihood (for example Q100, 0.5 per cent, 0.001 per cent).

The iterative nature of the entire flood study means there will be some interplay between the hydrologic and hydraulic modelling. In particular, the experts considered that the rating curves<sup>67</sup> derived for the hydraulic modelling at different places down the river should be considered in the hydrologic modelling.<sup>68</sup>

## 6. Joint probability considerations

The expert panel identified two areas in which a joint probability analysis was required: the relationships between floods occurring in the Bremer and Brisbane rivers, and between flooding in the lower Brisbane River and elevated ocean levels.

A joint probability problem arises for the Bremer-Brisbane relationship because Ipswich can be affected by flooding in the Bremer River, flooding in the Brisbane River or both.<sup>69</sup> The same rainfall event may cause flooding in both rivers, which means the likelihoods of flooding in each river are linked. A joint probability analysis will determine the likely flooding in one river given the flooding that is occurring in the other. That can be represented in the form of a relationship (for example, a curve, such as a rating curve linking flows in the Brisbane with flows in the Bremer) or in terms of probabilities (for example, that for a given flow in the Brisbane, there is a 90 per cent chance that a flow above a certain level will be occurring in the Bremer).

No methodology for investigating the joint probability question was prescribed by the hydrology expert panel.<sup>70</sup> Those completing the study should seek expert advice as to which approach should be used.

Elevated ocean levels can affect flood heights in Brisbane because it is so close to the mouth of the river.<sup>71</sup> One meteorological condition, such as a cyclone, may cause both flooding in the river and elevated ocean levels.<sup>72</sup> The flood study must, the experts said, consider the interaction between ocean levels and flooding in the Brisbane River catchment, which will affect both the hydrologic and hydraulic modelling.<sup>73</sup>

## 7. Climate change

The experts agreed that the impacts of climate change should be assessed during the study.<sup>74</sup>

Climate change, and the uncertainties surrounding it, can be taken into account in a Monte Carlo analysis,<sup>75</sup> although it has been observed that the uncertainties surrounding climate change are much greater than other uncertainties in flood studies. Dr Leonard's opinion was that a Monte Carlo analysis should be completed first without taking into account climate change; later, steps could be taken to incorporate climate change into the analysis.<sup>76</sup> Guidance may also be found in the joint Queensland Government-Local Government Association of Queensland Inland Flood Study, completed in 2010, which considered the impacts of climate change.<sup>77</sup>

### 2.3.3 Responsibility for completing the study

The Commission recommends that the Queensland Government and councils should work together to ensure flood studies are done for all urban areas that do not have current flood information: see recommendations made in section 2.5.3 *Ensuring all urban areas have flood studies*, below. Those recommendations apply to the Brisbane River catchment as to all catchments in Queensland. A particular consideration of the state of the study in Brisbane is required, because a study which might involve a significant portion of the work now recommended has already been initiated by the Queensland Government, through Seqwater. That study is called the Wivenhoe Dam and Somerset Dam Optimisation Study.<sup>78</sup> The study's primary aim is to inform the review of the flood mitigation manual applicable at Wivenhoe and Somerset dams. The Commission's view is that the flood study of the catchment might be more efficiently performed outside the confines of the study commenced. That position is further explained in section 17.1.1 *The structure for the completion of the scientific investigations*.

That said, it is a matter for the parties involved to determine the structure within which both studies are completed. The Commission considers that the steering committee of the Optimisation Study should determine whether it is more effective for the Brisbane River flood study to be completed inside or outside of it.

Whatever is decided, the Commission considers it the responsibility of the councils, Brisbane City Council, Ipswich City Council and Somerset Regional Council, and the Queensland Government, in accordance with section 2.5, below, to ensure that a flood study with the characteristics recommended is completed. Those agencies should assess the work done (if any) within the Optimisation Study to determine whether further work is necessary for the flood study. If further work is required, that work should be completed on a catchment wide basis in a way determined by those agencies in accordance with the scheme set up for the completion of flood studies under section 2.5.3 *Ensuring all urban areas have flood studies*.

## Recommendations

- 2.1 The steering committee of the Wivenhoe Dam and Somerset Dam Optimisation Study should consider whether it would be more effective for the floodplain management investigation to be removed from the Wivenhoe Dam and Somerset Dam Optimisation Study.
- 2.2 Brisbane City Council, Ipswich City Council and Somerset Regional Council and the Queensland Government should ensure that, as soon as practicable, a flood study of the Brisbane River catchment is completed in accordance with the process determined by them under recommendation 2.5 and 2.6. The study should:
  - be comprehensive in terms of the methodologies applied and use different methodologies to corroborate results
  - involve the collation, and creation where appropriate, of the following data:
    - rainfall data including historical and design data and radar
    - stream flow data
    - tide levels
    - inundation levels and extents
    - data on the operation of Wivenhoe and Somerset dams
    - river channel and floodplain characteristics including topography, bathymetry, development and survey data
  - involve determining the correlation between any of the data sets above
  - produce suitable hydrologic models run in a Monte Carlo framework, taking account of variability over the following factors:
    - spatial and temporal rainfall patterns
    - saturation of the catchment
    - initial water level in dams
    - effect of operating procedures
    - physical limitations on the operation of the dams

- tidal conditions
- closely occurring rainfall events
- validate hydrologic models to ensure they reproduce:
  - observed hydrograph attenuation
  - probability distributions of observed values for total flood volume and peak flow
  - timing of major tributary flows
  - observed flood behaviour under no dams conditions and current conditions
- produce a suitable hydraulic model or models that:
  - are able to determine flood heights, extents of inundation, velocities, rate of rise and duration of inundation for floods of different probabilities
  - are able to deal with movement of sediment and changes in river beds during floods
  - are able to assess historical changes to river bathymetry
  - are able to be run in a short time to allow detailed calibration and assessment work
  - characterise the backwater effect at the confluence of the Brisbane and Bremer rivers and other confluences as appropriate
- involve analysis of the joint probability of floods occurring in the Brisbane and Bremer rivers (and any other pair of rivers if considered appropriate)
- be iterative, and obtain a short-term estimate of the characteristics of floods of different probabilities in all significant locations in the catchment (at least Brisbane City, Ipswich City and at Wivenhoe Dam) in order to determine the priorities for the rest of the study.

### 2.3.4 Further investigations required for Ipswich

Once it has received the results of the study to be completed for the entire Brisbane catchment, Ipswich City Council may require more refined data and mapping to assist it in its floodplain management. The further work to be done on the Bremer River would naturally follow the Brisbane River study. However, because of the iterative nature of the Brisbane work, it may be possible to start work on the Bremer River study before the finalisation of the Brisbane River study.<sup>79</sup>

Ipswich City Council may require more work to be done in the way of detailed data collection, hydrologic and hydraulic modelling for the Bremer River and its tributaries than is undertaken in the Brisbane River flood study. The expert panel recommended the following specific steps for Bremer River hydrologic and hydraulic modelling:

- use of Brisbane River historical flood data as well as data from floods in the Bremer River<sup>80</sup>
- validation of the hydrologic model against the probability distribution of flood levels obtained from the historical record at Ipswich.<sup>81</sup> This will be a check on whether the joint probability problem described above has been solved.<sup>82</sup>

Dr Nathan indicated that the extra work required for the Bremer River would take a matter of months, not years.<sup>83</sup> Dr Leonard gave an estimate of nine to 12 months.<sup>84</sup> The cost of the Bremer River work would be significantly less than the Brisbane work.<sup>85</sup>

### *Recommendation*

- 2.3 Ipswich City Council should determine whether the results, models and maps produced by the Brisbane River flood study are sufficient for its floodplain management. If they are not, Ipswich City Council should ensure appropriate work is done by way of data collection and creation and hydrologic and hydraulic modelling for use in its floodplain management.

### 2.3.5 Effect of the need for a comprehensive flood study on current planning

The expert panel found that it could not determine whether the most recent Q100 estimates obtained by both Brisbane and Ipswich city councils were appropriate flood level figures,<sup>86</sup> because neither was based on a comprehensive flood study.<sup>87</sup>

Neither Brisbane nor Ipswich City Council is presently using its most recent estimate of Q100 in its planning scheme or temporary local planning instrument. Brisbane City Council uses a ‘defined flood level’ in its planning scheme of 3.7 metres at the Port Office gauge, 40 centimetres higher than the most recent estimate of the Q100, which was set in 2003 at 3.3 metres.<sup>88</sup> Ipswich City Council’s most recent estimate of Q100 is 15.28 metres at the David Trumpy Bridge gauge, obtained in a 2006 flood study. That study was completed after the finalisation of the current Ipswich planning scheme, which sets the flood height corresponding to Q100 at 16.8 metres. That figure was arrived at by an earlier flood study.

That does not render the correctness or otherwise of the councils’ most recent estimates of Q100 irrelevant. While Brisbane has moved away from the use of the term Q100, or tying its floor level used for planning controls directly to an estimate of the Q100, it remains a measure by which the conservatism of the defined flood level is judged. If a flood study were to return results with a Q100 higher than Brisbane City Council’s defined flood level, the council is likely, prudently, to reconsider its adherence to that line. Equally, new estimates of the Ipswich Q100 might affect planning controls in the Ipswich planning scheme.

The flood levels currently used by both councils should not be discarded because of the hydrology expert panel’s finding. Rather, they should remain in place, in the absence of some exceptional reason, while the comprehensive flood study is performed and appropriate flood levels and extents are determined. Brisbane City Council has implemented temporary planning controls that reference the greater of its defined flood level or the 2011 flood line. Ipswich City Council’s temporary local planning instrument provides for temporary planning controls that reference equal to the greatest of the defined flood level from its 2006 scheme, and the 1974 and 2011 historical flood lines. That approach is prudent and should be continued until a comprehensive flood study is completed.<sup>89</sup> The use of freeboard<sup>90</sup> in the Brisbane and Ipswich planning schemes over many years has also been a sensible measure in the face of uncertainty surrounding Q100 levels.

## 2.4 Brisbane and Ipswich council procedures

The previous section dealt with what is now required by way of a flood study for the Brisbane River catchment. This section deals with the means by which two of the councils within that catchment, Brisbane City Council and Ipswich City Council, have approached the task of obtaining and using a flood study in the past.

### 2.4.1 The Brisbane Q100

From 1976 to March 2011, Brisbane City Council had, as the basis for planning controls related to flood, the same flood level: 3.7 metres at the Port Office gauge.<sup>91</sup> In that time, the council received from expert engineers more than one estimate of the Q100. Estimates ranged between 3.16 metres<sup>92</sup> and 5.34 metres<sup>93</sup> at the city gauge.

The 3.7 metre level was adopted by the council in 1976 on the basis that it represented the peak height that would have been reached by the 1974 flood had it been mitigated by Wivenhoe Dam.<sup>94</sup> The council’s submission states that it modelled and reviewed flood levels between 1996 and 2003;<sup>95</sup> that in 2003 an independent expert review panel found the best estimate of Q100 was 3.3 metres at the city gauge; and that the council subsequently decided to maintain the defined flood level used for Brisbane’s planning scheme at 3.7 metres.<sup>96</sup> As an explanation of the process by which estimates of the Q100 flood height were obtained, this submission is, while accurate, simplified. It is easier to distil relevant lessons from the expanded account which follows.

#### The Sinclair Knight Merz study

The council commissioned Sinclair Knight Merz, consultant engineers, to perform a comprehensive flood study in 1996.<sup>97</sup> The final report was delivered to the council in June 1998.<sup>98</sup> It gave a best estimate for Q100 at 5.34 metres at the city gauge,<sup>99</sup> which was 1.64 metres above the level referred to in the council’s planning controls (at 3.7 metres).

## Internal review

The manager of Water Resources,<sup>100</sup> the division of the council responsible for flood management policy, received the report. He had a number of concerns related to its methodology,<sup>101</sup> and, after some discussion with council officers from Water Resources and City Design (a division of the council which provides technical services to policy divisions) decided to engage an expert in hydrology from Melbourne to review it.<sup>102</sup> The terms of reference for the review were settled by the manager of Water Resources.<sup>103</sup>

His concerns were confirmed by the expert's report, received in December 1998. The expert took issue with Sinclair Knight Merz's methodology as to the assumption that Wivenhoe and Somerset dams would be at full supply level at the start of a flood, the use of aerial reduction factors and the assumption that no water would be lost to the ground or evaporation.<sup>104</sup> Further, he was concerned by the difference in results between the flood estimated by the design rainfall technique and a flood frequency analysis.<sup>105</sup> As a result of those concerns, the expert concluded that Sinclair Knight Merz's estimate of the Q100 was probably an overestimate.<sup>106</sup> His report otherwise confirmed Sinclair Knight Merz's approach and methodology as appropriate.<sup>107</sup> The expert made recommendations about the work to be done in order to deal with the issues he identified.<sup>108</sup>

The manager of Water Resources decided to act on those recommendations,<sup>109</sup> and enlisted City Design to do the necessary work.<sup>110</sup> City Design worked toward satisfying the expert's recommendations and produced a report in June 1999 which gave a best estimate of Q100 as 5.0 metres at the Port Office gauge.<sup>111</sup> The manager of Water Resources, deciding that the report did not adequately address the expert's concerns,<sup>112</sup> commissioned City Design to perform more work.<sup>113</sup> The unit produced a second report in December 1999 which gave a best estimate of Q100 as 4.7 metres at the Port Office gauge,<sup>114</sup> one metre above the planning control level used by the council. The manager was still not satisfied with the methodology used and considered the December report still did not meet the expert's recommendations.<sup>115</sup> No decisions were taken in respect of the Q100 or related planning controls in response to the June or December report: Water Resources considered further work was required.<sup>116</sup>

## Waiting for data

Officers of Water Resources then decided that the council should approach the study in concert with other agencies.<sup>117</sup> They opened channels of communication with the Department of Natural Resources and Mines, the Bureau of Meteorology and the South East Queensland Water Corporation.<sup>118</sup> A technical workshop was held involving these agencies in October 2000. The purpose of the workshop was to determine the best practice methodology that should be adopted for the finalisation of the Brisbane River flood study.<sup>119</sup>

At the workshop, a hydrologist from the department drew the attention of the council officers present to a set of studies then being conducted, in which the department was a participant. They were designed to underpin the application of new procedures in the recent revision of Australian Rainfall and Runoff to regions of Queensland. One of those regions was the Wivenhoe Dam catchment. The studies included modelling of likely releases from the dam if affected by the new design rainfalls.<sup>120</sup> The hydrologist from the department advised the council officers that he expected the results of the study would include an estimate of the flow of the Q100 flood that was closer to the council's current estimate (from pre-1998 studies) than earlier departmental studies.<sup>121</sup> It was anticipated that the work would be finalised by December 2000.<sup>122</sup> The manager of Water Resources decided to put the council's flood study on hold and wait for the department's data to be provided.<sup>123</sup>

The department's data was not provided in December 2000. In fact it was not provided for nearly three years, finally being made available to the council in June 2003.<sup>124</sup> The data was the product of a range of studies conducted by a large number of partners, which took much longer than expected to be concluded. For current purposes it cannot be said that any detriment was suffered because of the period of time taken for the data to become available, but the delay illustrates how flood studies can be frustrated by circumstances outside of the control of the council.<sup>125</sup>

## Resolution

*The Courier-Mail* ran a number of articles in June 2003 about the manner in which the council had dealt with flood study information.<sup>126</sup> The June 1999 City Design report had been released to *The Courier-Mail* without the council's approval and was the object of public scrutiny.<sup>127</sup>

In July 2003, the council decided to continue the flood study with the new data received from the Department of Natural Resources and Mines.<sup>128</sup> There was urgency in the council's approach – it wanted the issue resolved

quickly.<sup>129</sup> This was due partly to media attention and public interest<sup>130</sup> and partly to the length of time that had passed since the study started in 1996.<sup>131</sup> The Lord Mayor decided that the results obtained needed to stand up to examination; an independent review panel was viewed as the way to achieve this outcome.<sup>132</sup> The manager of Water Resources commissioned the independent review panel, which was chaired by the same expert who peer reviewed the 1998 report. The manager of Water Resources also commissioned Sinclair Knight Merz to do the modelling work for the independent review panel to review.<sup>133</sup>

The independent review panel's terms of reference included the sentence '[e]ven if the Q100 changes from 6,800 m<sup>3</sup>/s, it is likely that the Development Control Level will remain the same as is currently used in the Brisbane City Plan'.<sup>134</sup> A senior engineer in the Water Resources Branch who wrote the terms of reference said he intended to indicate that if the independent review panel found that the Q100 was lower than previously thought, planning control levels would not be correspondingly lowered.<sup>135</sup>

The independent review panel had five weeks to deliver its report.<sup>136</sup> It did no substantive modelling, but reviewed results provided to it by Sinclair Knight Merz.<sup>137</sup> The consultants from Sinclair Knight Merz were given between one and two months to produce draft reports to be reviewed by the panel.<sup>138</sup> They were not to produce new models, but to use those created in the 1996 to 1998 study.<sup>139</sup> The manager of Water Resources gave evidence that he 'would have' asked them how long it would take to feed the new data and information into the models.<sup>140</sup> No consideration was given as to whether the 1998 models remained appropriate. The independent review panel was involved in setting the scope of the work to be conducted by Sinclair Knight Merz.<sup>141</sup>

The prospect of performing a Monte Carlo analysis to deal with uncertainty was raised during the study. At a project meeting attended by the independent review panel and representatives of Sinclair Knight Merz and Brisbane City Council on 14 August 2003, it was estimated that such an analysis would at least require six weeks of work to convert the hydrologic models. This amount of time was considered to be 'too long'.<sup>142</sup> Draft reports provided to the panel were dated 8 and 28 August 2003. In the draft reports, and in the final report in December 2003, Sinclair Knight Merz outlined the sources of uncertainty and recommended that a Monte Carlo analysis be performed in the future.<sup>143</sup>

## Presenting results to full council

The independent review panel delivered its report to the council on 3 September 2003, seven days after the second draft report was received. The panel determined that the best estimate of the Q100 was 3.3 metres at the city gauge, corresponding to a flow of 6000 m<sup>3</sup>/s. The panel gave a range of uncertainty around those estimates, putting the possible values between 2.8 and 3.8 metres and 5000 and 7000 m<sup>3</sup>/s.<sup>144</sup>

The independent review panel report recognised the inevitable uncertainty that attaches to estimates of the flow or height of a flood of a particular probability.<sup>145</sup> This remaining uncertainty arose in a number of areas including: the accuracy of rating curves; the relationships between, on the one hand, the occurrence of flood-producing storms and saturation of the catchment, and, on the other, storm occurrence and dam levels;<sup>146</sup> and the choice of particular spatial and temporal patterns for the storms used to model the Q100 flow. As to the last point, the panel said that a different estimate of the Q100 might be obtained by the use of different storms. That, the panel said, could be resolved by a full Monte Carlo analysis.<sup>147</sup>

Having made those observations in the body of the report, the panel gave its conclusions in the following terms:

The panel notes that the current 'best estimates' of Q100 and of the corresponding flood level at the Port Office, provide a sufficient basis for a decision on whether the currently accepted flood levels are broadly acceptable. However, for general flood risk assessments and risk-based flood management decision, more refined flood frequency estimates will ultimately be required.<sup>148</sup>

The report contained five suggested areas of future work. The panel 'strongly recommend[ed]' that a Monte Carlo analysis be performed 'as Council moves towards a risk-based approach to flood management'.<sup>149</sup>

Water Resources prepared a memorandum to civic cabinet, recommending that the independent review panel's best estimate of Q100 of 6000 m<sup>3</sup>/s and 3.3 metres at the city gauge be accepted, but that the planning control level be maintained at 3.7 metres.<sup>150</sup> The memorandum reasoned that the current level of 3.7 metres was within the range suggested by the independent review panel for Q100.<sup>151</sup> It noted that there was uncertainty arising from the methods used to estimate flows and heights and climate variability.<sup>152</sup> There was no reference in the memorandum to the foreshadowed requirement for more refined estimates of the Q100 if the council were to make risk-based

flood management decisions.<sup>153</sup> Nor was there reference to the recommendation for Monte Carlo analysis. That is unfortunate. Council officers and elected members should be cognisant of the uncertainties involved in any flood estimate, and make decisions with that in mind.<sup>154</sup>

The draft resolution had the effect of accepting the independent review panel's best estimate of Q100 flow as 6000 m<sup>3</sup>/s and determining that the planning control level of 3.7 metres was still 'the most appropriate level'.<sup>155</sup> The draft resolution was recommended to full council by civic cabinet and then adopted by the council on 2 December 2003.<sup>156</sup> The council decided to adopt the 'defined flood level' terminology for this planning control level, moving away from the use of the term Q100.<sup>157</sup>

## Reports received after the decision was made

The reports provided by Sinclair Knight Merz to the independent review panel were drafts. The final report of the 2003 investigations was delivered in December 2003. It determined the best estimate of Q100 to be 3.51 metres at the city gauge and 6500 m<sup>3</sup>/s. The range of uncertainty was 2.76 metres to 4.41 metres and 5000 to 7000 m<sup>3</sup>/s.<sup>158</sup> After further calibration of the hydraulic model, Sinclair Knight Merz provided another estimate of Q100 in February 2004, of 3.16 metres.<sup>159</sup>

There is no evidence that these figures were ever provided to the relevant council committee, the chief executive or the full council. The present manager of the Water Resources Branch, who had reviewed the files, said that no decisions were made as to giving briefings to councillors about the December 2003 report because 'decisions had been made in reliance on the Panel (2003)'.<sup>160</sup> The former manager said he would only have put information in front of council if they had to make a decision on it; for example, if the report had suggested the council needed to revisit the Q100.<sup>161</sup>

The Commission considers that elected representatives should be informed of the results of all flood studies completed for a council. See, further, section 2.5.4 *Commissioning, assessment and use of flood studies*.

## Recommendations for future work

The 2003 reports of Sinclair Knight Merz and the independent review panel made recommendations for work that should be completed. One recommendation that has gained prominence, given the recommendations of the Commission's expert panel, is the recommendation to perform a Monte Carlo analysis.

Water Resources officers decided not to proceed with the Monte Carlo analysis. There were two reasons given to the Commission for the decision. First, the council's planning control level was at the top of the range for the Q100 produced by the independent review panel.<sup>162</sup> Second, Water Resources, after consultation with City Design, decided the Monte Carlo methodology was not sufficiently developed to be used immediately.<sup>163</sup> Some members of the independent review panel had advised council officers in 2003 that the recommendation went beyond best practice.<sup>164</sup>

The expert panel members who gave evidence before the Commission expressed varying views as to whether the Monte Carlo method was an appropriate method to incorporate into a flood study in 2003, and if not, at what time it was appropriate.<sup>165</sup> Most agreed with Dr Nathan's observation that hydrologists are better placed to conduct a Monte Carlo analysis in 2011 than they were ten years ago.<sup>166</sup> Reference was made to the improvements in computing power between 2003 and 2011,<sup>167</sup> increased understanding of radar,<sup>168</sup> and the benefit of data gained from the 2011 flood.<sup>169</sup> Others said it was feasible in 2003, but on a lesser scale than that possible with current technology.<sup>170</sup>

The question as to when use of the Monte Carlo method might become appropriate was left unasked by the council,<sup>171</sup> which had no formal procedure in place to track the progress of such methodology.<sup>172</sup> The council has not, since 2003, implemented the recommendation to perform a Monte Carlo analysis, although it has completed other flood risk management investigations.<sup>173</sup>

In any case, the implementation of the technique is now supported by the whole of the Commission's expert panel and recommended by the Commission. See recommendation 2.2 above.

## 2.4.2 The Ipswich Q100

The Commission asked Ipswich City Council about flood studies completed since 2000. Due to changes in personnel at the council, it was unable to provide detailed information about how decisions were made regarding each flood study,<sup>174</sup> but it confirmed the accuracy of a chronology provided by Mr Mark Babister in his Flood Frequency Report on the Bremer River.<sup>175</sup>

### Inextricably intertwined with Brisbane

As stated above in section 2.3.4 *Further investigations for Ipswich*, the Bremer River flooding issues are a subset of the issues to be addressed in flood studies of the Brisbane River. The work done on the Bremer River has often, sensibly, followed work done by the Brisbane council for the Brisbane River catchment.

Ipswich City Council adopted planning schemes in 2004 and 2006. Both planning schemes include a similar flood overlay, which depicts the council's 'Q20 development line' (a flood line based on a long standing regulation line) and the Q100 flood line.<sup>176</sup>

A major study of the Bremer River was performed by Sinclair Knight Merz in 2000.<sup>177</sup> Sinclair Knight Merz used models produced during its study for Brisbane City Council between 1996 and 1998 to obtain estimates of the Q100 by modelling the passage of a 1% AEP rainfall event through the Bremer River.<sup>178</sup> The flood levels thus obtained were compared to flood levels arrived at by performing a flood frequency analysis on the historical record. The two methods produced levels for the Q100 of 18.65 metres and 18.6 metres respectively at the David Trumpy Bridge, the main gauge in Ipswich.<sup>179</sup>

Those estimates, and other work completed in 2002 by Halliburton KBR for rural areas,<sup>180</sup> were used to create the flood overlay for the 2004 planning scheme.<sup>181</sup> In 2003, whilst in the process of adopting the planning scheme, Ipswich City Council found that Brisbane City Council had changed its estimate of the Q100 flow at the Brisbane city gauge in response to the independent review panel report.<sup>182</sup>

The council decided to amend its overlay so that it was consistent with the independent review panel's conclusion that 6000 m<sup>3</sup>/s was the best estimate of the Q100 level at the Port Office gauge in Brisbane.<sup>183</sup> The council had no modelling of the extent to which an event in Ipswich would produce that flow. It used, instead, mapping produced by Sinclair Knight Merz in 2000 based on a 6800 m<sup>3</sup>/s peak flow at the Brisbane city gauge.<sup>184</sup> That map was a modified version of the Q50 map produced by Sinclair Knight Merz, but Ipswich City Council began using it as a Q100 map because of the similarity of the peak flow used to create it to Brisbane City Council's latest estimate of Q100 flow.<sup>185</sup> The flood overlay used in the 2006 scheme reflected only minor amendments from the 2004 scheme.<sup>186</sup>

### The 2006 studies

Brisbane City Council's new Q100 flow was not the only new piece of information available to the Ipswich City Council at the end of 2003. The council was also provided the dam operation and rainfall data assembled by the Queensland Government, and so long awaited by Brisbane City Council.<sup>187</sup> Funding was obtained for a review and update of the 2000 Ipswich River flood study, a task performed by Sargent Consulting in 2006. That study had the following goals:

- to develop a refined version of the council's hydrologic model to account for the new information received
- to use stochastic (Monte Carlo) simulation to account for variability in spatial and temporal rainfall distributions, saturation and dam levels
- to develop a refined version of the hydraulic model
- to ensure consistency of flood levels and mapping at the border of the Ipswich City Council region and neighbouring councils' regions, including that of Brisbane City Council
- to produce flood mapping and flood overlays for the Ipswich planning scheme.<sup>188</sup>

The Monte Carlo analysis performed by Sargent was not of the scale recommended by the Commission's expert panel. The complexity of the hydrologic model limited the number of times it could be run: manual entry of data was required on each occasion.<sup>189</sup> As the existing model had been expensive to develop and was used by both the Brisbane and Ipswich city councils, it was determined that building a new model was not appropriate.<sup>190</sup> The flow

results obtained for the 1% AEP flood event were 20 to 30 per cent less than those obtained in the 2000 Sinclair Knight Merz study.<sup>191</sup> The Sargent estimate of the 1% AEP flood level at the David Trumpy Bridge was 15.28 metres.<sup>192</sup> The new 1% AEP flood flows and heights were not embraced by the other agencies involved in the study – Brisbane City Council, the Bureau of Meteorology, Seqwater, the Queensland Government, SunWater and Esk Shire Council.<sup>193</sup> Those agencies were concerned that the flows and heights were lower than those identified in previous studies and observed in the catchment.<sup>194</sup> Further, the results were based on the assumption that significant storage would be available in the dams at the start of the flood; other agencies did not agree this was appropriate.<sup>195</sup>

The results of this study have not been considered for inclusion in a planning scheme, as the current Ipswich planning scheme was finalised before the results were received.

## Joint probability

The joint probability problem at Ipswich concerns the relationship between floods occurring in the Bremer River and the Brisbane River at the same time. As has been stated, Ipswich City Council's flood estimates should sensibly be attuned to work done on the Brisbane River. The recent history indicates just how dependent the council has been on results from Brisbane River studies.

Generally, modelling commissioned by Brisbane and Ipswich city councils has made assumptions about the magnitude of the flood that is likely to occur in the Brisbane River when a flood is occurring in the Bremer River.<sup>196</sup> For example, some have assumed a 5% AEP flood in the Brisbane and a 1% AEP flood in the Bremer to estimate flood heights in Ipswich.<sup>197</sup>

The Commission's expert panel recommended that a joint probability analysis should be done in a comprehensive Bremer River flood study.<sup>198</sup> Just as saturation and dam levels are likely to be related, so are floods occurring in the Bremer and the Brisbane rivers. Their headwaters are close; one storm system could be responsible, as it was in 2011, for producing floods in each. To adopt a process of assumption about the type of flood that occurs in each is too simplistic an approach; it is not a realistic reflection of what actually occurs. The correlation between the two variables must be investigated.

The result of that investigation will be a set of probability distributions of the flow that is likely to occur in one river, given a particular flow in the other.

The need for a joint probability analysis to be done was identified some time ago. Following the 2003 Brisbane River studies, Ipswich City Council commissioned a review by Sinclair Knight Merz of Ipswich flood modelling and overlays. The Sinclair Knight Merz memorandum, received by the council in January 2004,<sup>199</sup> stated that the coincident flows for the Brisbane and Bremer rivers were significant, but unable to be determined on the material available. A joint probability approach was suggested.<sup>200</sup> The memorandum recommended further work be performed, in particular to deal with the joint occurrence of floods issue. It was suggested that such work might be done in conjunction with Brisbane City Council.<sup>201</sup>

The Sargent study in 2006, in the use of a simplified Monte Carlo framework, investigated the effects of different spatial variations of rainfall across the entire Brisbane River catchment. Part of that study involved different patterns of rainfall over the upper Brisbane River, lower Brisbane River and Bremer River catchments. Variability between storms over the Bremer and Brisbane rivers was part of the analysis, but the variability was not compared to the historical variability between floods in the two rivers.<sup>202</sup> It did not constitute a rigorous analysis of the joint probability. The Commission recommends that such an analysis now be implemented: see recommendation 2.2 above.

## The future

The next statutory review of the Ipswich planning scheme is due to commence after 2012.<sup>203</sup> The results of the comprehensive flood study now recommended by the Commission's expert panel are at least three years away. Ipswich City Council should maintain its temporary flood lines in the interim: see section *5.2 Temporary local planning instruments*. The council should be actively involved in the progress of the work to be done for the Brisbane River. See section *2.3.3 Responsibility for completing the study*, above.

## 2.5 The performance of flood studies in Queensland

### 2.5.1 Catchment wide flood studies

Having considered both the future and the past of the Brisbane and Ipswich City Council Q100 lines, the Commission's focus turned to general principles that might be applicable to flood studies around Queensland. Parts of the expert panels' joint expert statements are applicable for all catchments. The internal processes of the Brisbane and Ipswich city councils are a useful starting point from which to make some general points about conducting flood studies.

Not all parts of Queensland need a comprehensive flood study. Flood studies are expensive and time consuming; they will be justified only when their results can be used to inform land planning and emergency management decisions that affect a large number of people. The Commission considers that all urban areas should have access to the results of a recent flood study.

It is not best practice to conduct a flood study for an urban area alone or even for a local government area. The performance of individual flood studies for cities and towns can lead to different or imperfect information being used and inconsistencies in predicted flood levels at local government boundaries. A flood study should be completed over a whole catchment to encompass the hydrology and hydraulics of all relevant waterways. This approach is supported by Floodplain Management in Australia,<sup>204</sup> the expert panel and more recently by the Queensland Reconstruction Authority, and a number of submissions to the Commission.<sup>205</sup>

Those two concepts – the expense of a flood study and the fact that it would ideally be conducted for a whole catchment – lead to some difficulty in determining the areas for which flood studies should be initiated. Some urban areas have current flood studies; others have studies that require updating or expansion. Still others have never had a flood study completed. Some of those flood studies are a small part of a catchment wide study, while others have been done on the waterways immediately surrounding the urban area. Some levels of government or communities within a particular catchment might wish a catchment wide study to be initiated now, while others might be happy with the currency of their information.

Requiring the performance of all flood studies over full catchments may involve duplication and unnecessary use of resources. The entire catchment approach is ideal, but not always practicable.

#### *Recommendation*

- 2.4 A recent flood study should be available for use in floodplain management for every urban area in Queensland. Where no recent study exists, one should be initiated.

### 2.5.2 Who should be responsible for the performance of flood studies?

A question which was hotly debated in submissions before the Commission was which level of government should be charged with conducting flood studies.<sup>206</sup> The question entails twin issues: who is best placed to obtain a flood study from experts and who should fund it.

Councils have, historically, borne the burden of producing flood studies for parts of catchments within their local government areas. They are the principal entities involved in land use planning, development assessment and disaster management; they are the primary users of flood maps and are best placed to assess their flood mapping requirements.<sup>207</sup> The completion of flood maps may require detailed information about local river conditions and previous flooding events.<sup>208</sup> Councils are often the principal custodians of such information, and are best placed to retrieve any knowledge their residents might have about previous flood levels.

Some councils have received substantial assistance from both state and federal governments. The Queensland Government has, in 2011, through the Queensland Reconstruction Authority, collected data about floods which occurred and provided interim floodplain maps to those councils with no mapping. Department of Environment

and Resource Management (DERM) officers review flood maps that are proposed to be used as a flood overlay in a planning scheme to determine whether the department has further information, which it makes available,<sup>209</sup> and they provide advice and direction to councils on request.<sup>210</sup> (DERM does not review the modelling behind a flood map or consider its appropriateness for use in land planning; see section 4.1.7 *The role of DERM*.)

The Commonwealth Government, through Geoscience Australia, is responsible for providing topographic data, including digital elevation model data and contours.<sup>211</sup> The availability of that information substantially reduces the cost of completing a flood study and producing a flood map.<sup>212</sup> It also supports projects for the production of national guidelines.<sup>213</sup> Both the Commonwealth and the Queensland governments contribute equally to flood study projects that have obtained a grant under the Natural Disaster Resilience Program.<sup>214</sup> That program commenced in 2008 and has allocated approximately half of its \$44 million in funds; a portion of those funds have been for flood study projects.<sup>215</sup>

It is clear, however, that the current arrangements have not been effective in ensuring the completion of adequate flood studies across the state.

The Queensland Government submitted that flood studies, and associated mapping, should remain the responsibility of councils.<sup>216</sup> It says that the lack of flood studies and maps reflects a failure by some councils to prioritise their completion. It does not deny that some councils are incapable of performing flood studies on their own, but it points to the provision of technical advice by the Queensland Government to councils through DERM and the Queensland Reconstruction Authority.<sup>217</sup>

Many councils, and their representative body, the Local Government Association of Queensland, on the other hand, assert that the Queensland Government should play a far greater role than it has in the past.<sup>218</sup> That role, they say, should entail co-ordinating the conduct of flood studies and the development of flood mapping, as well as providing funding and technical assistance.<sup>219</sup> They indicate that local governments do not have sufficient resources to undertake flood studies themselves.<sup>220</sup> Another argument for state responsibility for, or at least co-ordination of, flood studies is their catchment wide nature: catchments often extend well beyond local government boundaries.

There are reasonable arguments on both sides of the debate, although one suspects that they are underpinned by a uniform disinclination to accept the funding burden. The Commission is not in a position to determine how the three tiers of government – federal, state and local – should allocate their resources. What is clear is that catchment wide flood studies are needed in many areas, and the three levels of government should co-operate to ensure they are produced.

### 2.5.3 Ensuring all urban areas have flood studies

The Commission does not intend to prescribe in detail how the Queensland Government and the councils work together to ensure flood studies are completed for those urban areas that require it. There are some basic steps that are required for that process.

First, the urban areas that do not have current flood risk information will need to be identified. Those areas should be ranked in order of priority depending on their need for the information. This will depend on a number of factors, including population, date of last flood, date of last flood study and frequency of floods in the historical record.

Having determined the priorities, flood studies should be conducted, whether catchment wide or on a narrower basis if appropriate, in those areas that require them within a reasonable time. Decisions will also need to be made about how those flood studies will be carried out, how each level of government will be involved and from whom technical and financial resources will be sought to complete the flood studies. One avenue might be to request assistance from the Commonwealth Government.

## Recommendations

- 2.5 The Queensland Government, in consultation with councils, should determine which urban areas in Queensland do not have access to flood information from a current flood study. The Queensland Government should rank those areas in order of priority in accordance with their need for updated flood information by reference to factors including:
- population
  - sophistication of land use planning and emergency management measures already in place in those areas
  - currency of any flood risk information available to the council
  - approximate frequency of damaging floods in the area according to the historical record.
- 2.6 By reference to the order of priority determined in accordance with recommendation 2.5, the Queensland Government and councils should together ensure that the council responsible for each urban area in Queensland has access to current flood study information. This will include determining:
- a process or processes by which the flood studies will be completed, including the involvement of the Queensland Government and relevant councils
  - how, and from whom, the necessary technical and financial resources will be obtained
  - a reasonable timeframe by which all flood studies required will be completed.

### 2.5.4 Commissioning, assessment and use of flood studies

#### A continuing obligation

Flood studies are often performed reactively, undertaken after a large flood or in response to the availability of a new method or data set.<sup>221</sup> The obligation to maintain up-to-date information is a continuing one: all councils should ensure they have access to up-to-date flood information and act on it for land planning and disaster management preparation. How the results of flood studies are used in land planning and emergency management are discussed in more detail in sections 2.6, 2.7 and 2.8 below.

#### The decision to commission a flood study

Flood studies should, ideally, be commissioned for whole catchments. As set out above, though, it might be that a particular urban area needs a flood study immediately whereas others within the catchment have current information. In that sense, a flood study for an area smaller than an entire catchment might be appropriate in the short term. In the long term, it would make sense for councils responsible for different areas within a catchment to organise their new flood studies to be done together on a catchment wide basis.

Before the start of any flood study, it would be prudent to enquire as to work being done by others in developing scientific techniques that may be relevant to the study. Enquiries should be made of the Bureau of Meteorology, DERM, dam operators, surrounding councils and research centres.

The work to be done in a flood study will logically follow any work done by Commonwealth or state agencies such as the Bureau or DERM.<sup>222</sup> A flood study completed on the best available data or in accordance with the most recent scientific techniques will be more accurate. On the other hand, there are continuing advances in the ways information is gathered, data is analysed and modelling is run. It may be that a flood study will be out of date only a few years after completion. The body conducting the flood study must decide what data or scientific development is worth waiting for, and when to go ahead with what is currently available. The balance is between accuracy of the final result and obtaining updated results quickly.

If the decision is made to wait, timelines should be set for the completion of work that is to be done by each agency. If unexpected delays are encountered during the waiting period, this should be brought to the attention of the chief executives or elected representatives of all councils involved in the study.

## Initiating the study

Flood studies can be conducted internally within state or local governments or by external consultants. The people chosen should have the relevant expertise and access to the data, models and local information necessary to complete it.<sup>223</sup> If possible, where data analysed or created by other agencies is to be used, it should be checked by those performing the flood study.<sup>224</sup> The central repository recommended in section 2.5.5 *Central repository of flood study data*, should assist in this process.

The decision as to the scope of the flood study will determine many aspects of the results, in particular the level of certainty which attaches to them. If resources were unlimited, there would undoubtedly be a recent and comprehensive flood study for all catchments. As they are not, there must be a balance between the resources to be expended and the level of certainty of the results.<sup>225</sup> For a catchment wide flood study, decisions will need to be made within each council involved as to how much can be spent from their budgets. Any contribution by state or federal governments must also be taken into account. Councils should be heavily involved in the determination of the scope of the work of the study, as they will use the results upon completion. Therefore, all relevant councils should consider the options for the scope of the flood study and their implications for resources and certainty.

Once a scope of work has been determined, detailed instructions will need to be drafted. This should be done by persons with technical expertise in hydrology and hydraulics. It should not involve any statement of the likely planning or emergency management decisions which may flow from decisions of those performing the flood study.<sup>226</sup> The science should be kept separate from the policy.

## Assessment and use of results by councils

Regardless of who completes or funds the flood studies, it will be councils who use the information in them to make decisions about land planning and emergency management to reduce the flood risk to their communities. Once a flood study is completed, it is councils who must take responsibility for its assessment and use.

At the end of the flood study, results should be presented to all councils affected. Some councils will have internal officers skilled in hydrology to review flood study reports.<sup>227</sup> In all cases, council officers should engage in frank discussion with hydrologists or engineers completing a flood study, to ensure that any limitations and any uncertainty attaching to its results are clearly understood. Experts must take some responsibility, too, for ensuring the uncertainties attaching to their results are clearly stated. It was conceded in evidence before the Commission that hydrologists and engineers have not always done a good job of communicating uncertainty and the implications of that uncertainty for future decisions.<sup>228</sup>

If a council is not satisfied with the methodology by which a flood study is completed, an independent review may be appropriate; although care must be taken not to become mired in an extensive trail of expert reviews and opinions. Uncertainty and limitations are inevitable;<sup>229</sup> they can be factored into the risk management processes that should be used by councils before acting on the results.

The use to which flood studies are put depends heavily on local circumstances; the Commission can make no recommendation that has universal application. At the conclusion of each flood study relevant to the council's region, it should be presented to the full council. Consideration should be given to the impacts of the result on current land planning and emergency management arrangements. Council officers can usefully provide information and advice to assist in those decisions.<sup>230</sup>

## Recommendations for further work

Where a flood study report makes recommendations for further work, it should be elected representatives who determine, after receiving risk based advice, whether the further work suggested should be completed.<sup>231</sup> For a catchment wide flood study, it may be the elected representatives from all agencies involved in the flood study who make the decision together. Officers of state and local governments do, of course, add value by their recommendations as to whether further work should be completed, but should not be deciding the matter. This is the only way to achieve the balance between the public interest in obtaining highly accurate flood levels and the cost of the resources required to obtain them.

It would be useful for larger councils and the Queensland Government, who may receive many expert reports with varying recommendations, to create and maintain a database of those recommendations to track their implementation. If particular recommendations are not able to be immediately implemented because of the state of

the science, or other investigations that are continuing, steps should be taken to ensure they are acted upon when practicable.

## *Recommendations*

- 2.7 As far as is practicable, councils should maintain up-to-date flood information.
- 2.8 When commissioning a flood study, the body conducting the study should:
  - check whether others, such as surrounding councils which are not involved in the study, dam operators, the Department of Environment and Resource Management, and the Bureau of Meteorology, are doing work that may assist the flood study or whether any significant scientific developments are expected in the near future, and decide whether to delay the study
  - discuss the scope of work with the persons to perform the flood study as well as surrounding councils which are not involved in the study, dam operators, the Department of Environment and Resource Management, and the Bureau of Meteorology.
- 2.9 Elected representatives from councils should be informed of the results of each flood study relevant to the council's region, and consider the ramifications of the study for land planning and emergency management.
- 2.10 Elected representatives from all agencies involved in a flood study should be informed of recommendations made for future work, and determine, on a risk basis, whether that further work is to be completed.

### **2.5.5 Central repository of flood study data**

The panel of experts described in section 2.3.1 was frustrated in their consideration of the Brisbane River and Bremer River Q100 levels by the lack of a central repository for data needed for flood studies. Mr Babister gave evidence that there were numerous examples of data that was not available to others conducting studies or to him in his examination of this topic. One example was data created by the Queensland Government in 2003, showing the attenuation provided by the dams for modelled rainfall events.<sup>232</sup> Dr Nathan gave the example of LIDAR data (high resolution data on the topography of the earth) which allows hydrologists to define the potential of a flood plain to absorb rainfall, carrying capacity of rivers and the extent of inundation which would be caused by a flood of a certain height.<sup>233</sup>

The expert panel recommended that a central repository of flood-related data be created, maintained and updated.<sup>234</sup> That recommendation was made in the context of determining what would be required to obtain a robust estimate of the Q100. The Commission has only considered the appropriate characteristics of the repository through the prism of what is required for flood studies used in land planning. The repository could be useful for other agencies or address other data deficiencies. For example, it could be used to provide information to insurers, or to provide flood maps to the public (see section 2.9 below regarding the provision of information to the public). Whether the repository is used to fulfil those purposes is a question for those responsible for the repository.

#### **Responsibility for the repository of data**

Different suggestions were made as to which agency should be responsible for such a repository. DERM<sup>235</sup> and the Bureau of Meteorology<sup>236</sup> were nominated, as, more generally, were Queensland<sup>237</sup> and Commonwealth governments.<sup>238</sup> Dr Nathan suggested that councils would be best placed to maintain the repository for their catchments.<sup>239</sup>

Geoscience Australia, a Commonwealth agency, maintains a database of flood studies around Australia. It has a web portal which allows access to flood studies around Australia.<sup>240</sup> The Natural Disaster Insurance Review report recommended that an agency be created to co-ordinate a national repository of flood risk information.<sup>241</sup>

These initiatives might negate the need for a separate repository of data for Queensland. The Commonwealth and Queensland governments should determine, jointly, whether the repository should be established within those initiatives or as a separate entity. In any case, they must ensure that the data needed for flood studies is available to all who might need it.

## Contents of the repository of data

At a minimum, the repository should hold the data listed as necessary for the completion of a comprehensive flood study.<sup>242</sup> Some data will simply need to be collated. Other data does not yet exist, and will be created as flood studies are performed for catchments around Queensland. As those flood studies are performed, the data used or created from models and the analysis of it should immediately be given to the repository.

The data should be accompanied by the results of any review or analysis of that data.<sup>243</sup> The methodology used to obtain the data should also be specified. That information will assist those using the data to determine how much reliance should be placed on it.<sup>244</sup>

The repository's records must make it possible to ascertain what the data held was at any particular point in time so that those subsequently considering work done in reliance on it can understand the basis on which the work was done.<sup>245</sup>

Where a flood study is to be performed by independent consultants, the obligation for ensuring that all data used or created is available to the central repository should fall on the council or other body commissioning the study. All levels of government should contribute to the body of knowledge about floods in Queensland.

## Access

The experts considered that the data should be available for access by all agencies involved in the creation and use of flood studies,<sup>246</sup> that would include, at least, the Bureau of Meteorology, dam operators and all levels of government.

A range of issues will need to be considered in the decision as to who should have access to the database: questions of intellectual property, impacts on land values, insurance prices and liability for incorrect information.<sup>247</sup> To deal with these issues, the agency with responsibility for the repository may need to create contractual arrangements for the deposit of, and access to, the data.<sup>248</sup>

The complexity of such issues should not be allowed to prevent the development of the repository. A repository would ensure the availability of data to those undertaking flood studies and increase the accuracy of those flood studies. At the same time, it should have the effect of reducing costs,<sup>249</sup> an important consideration; on the evidence before the Commission, cost is a major obstacle in the way of councils wishing to undertake flood studies. See section 2.5 *The performance of flood studies in Queensland*.

## Recommendation

- 2.11 The Queensland Government and Commonwealth Government should ensure the existence and maintenance of a repository of data of the type used in flood studies. The database should include the types of data which the expert panel specified as needed for a comprehensive flood study. Councils, Queensland and Commonwealth Government agencies and dam operators should be able to deposit and obtain access to data.

## 2.6 Using flood studies in floodplain management

Performing flood studies and producing flood maps is of little use unless the information gained is used by government and provided to others.

Firstly, all levels of government must use effectively the information they have gained. Councils require such information to impose appropriate planning controls, set minimum floor levels for development of different types and institute effective emergency management procedures. That may be done under the auspices of a floodplain management plan. The Queensland Government similarly needs such information, in its case to attend to state-wide concerns, such as the construction of dams, flood mitigation or the placement of public infrastructure. Those decisions should be made as part of a floodplain management approach consistent with the best practice principles outlined in *Floodplain Management in Australia*.

Secondly, the information should be provided to the public and others with a legitimate need for it. *Floodplain Management in Australia* states that communities in areas susceptible to flood should be made aware of the flood risk to which they are subject.<sup>250</sup> The focus is on their need to understand emergency management procedures, such as evacuation, in which they may be involved during a flood.<sup>251</sup> The Commission considers that individuals might also benefit from the provision of information for land planning purposes. Government can do only so much; individuals' decisions within the scope of land planning, such as decisions about where and how to build, have an impact on the resilience of the community to flood: see section 2.9 *Distribution of flood information*, below.

### 2.6.1 Preparing a floodplain management plan

*Floodplain Management in Australia* describes a floodplain management plan as the cornerstone of effective floodplain management. Such a plan should outline the mix of land planning and building controls, emergency management plans and structural flood mitigation measures to be employed in a catchment. Decisions as to the distribution of resources across these types of measures are complex; they require economic, social and environmental costs and benefits to be weighed against each other.<sup>252</sup> *Floodplain Management in Australia* recommends that this decision-making process be informed by the results of a floodplain management study. Such a study involves the identification of people and property at risk of flooding, an assessment of the acceptability of different levels of flood risk and a consideration of the relative merits of possible management measures.<sup>253</sup>

*Floodplain Management in Australia* recommends that a floodplain management plan should be reviewed at regular intervals of not more than 10 years and after severe flood events.<sup>254</sup> There may be significant expenses associated with the establishment and review of floodplain management plans. In the case of larger, fast-growing regions or those particularly susceptible to flooding, however, the benefits are likely to outweigh the costs. Those benefits include reduced risk to human life and public health, improved decision-making in relation to appropriate land use, integration of land use planning, emergency management and structural floodplain management measures, and increased community understanding of flood risks.<sup>255</sup>

### 2.6.2 Responsibility for floodplain management

The Commission considers that councils should be responsible for the development of floodplain management plans. Councils are responsible for the imposition of development conditions and have detailed knowledge of local river conditions and past flood events. They are best positioned to engage in the investigations necessary to determine the appropriate mix of floodplain management measures.

This is not, however, to say that other government agencies should not play a role in floodplain management. *Floodplain Management in Australia* states that the role of state and territory governments is to co-ordinate the implementation of floodplain management plans in accordance with appropriate standards,<sup>256</sup> which may involve providing advice to councils in the areas of planning, hydrology and emergency management. It also notes that the Commonwealth Government has previously been involved in floodplain management by way of, for example, financial assistance for the development and implementation of floodplain management plans, flood forecasting by the Bureau of Meteorology and financial relief to ameliorate the effects of flooding.

Councils' concerns about their financial and technical ability to produce flood maps are equally applicable to the creation of floodplain management plans. However, the need for floodplain management plans to integrate a range of measures (such as planning scheme controls and emergency management planning) that are most appropriately

administered at a local level requires that councils be primarily responsible for the creation and implementation of such plans. Many councils may require assistance from higher levels of government to develop floodplain management plans. All three levels of government should work together to ensure that all councils are able to adequately manage the flood risk posed in their local areas.

### 2.6.3 Councils' floodplain management activities

It appears that many councils had not implemented a comprehensive management plan that accords with best practice principles as at the 2010/2011 wet season. The best practice principles are just that: they are not mandatory. And it must be said that there is a vast disparity in size and resources between Queensland's largest and smallest councils. Accordingly, the Commission recognises that it is not possible for all councils to develop floodplain management plans that adhere with best practice principles in all possible respects.

By no means, however, should this be taken as a suggestion that the best practice principles ought to be discarded. As discussed above, adherence to the process and principles set out in *Floodplain Management in Australia* by developing a single, overarching, floodplain management plan, is likely to result in a more efficient distribution of resources among various floodplain management measures.

It was not possible for the Commission to engage in a comprehensive review of the floodplain management measures adopted by each council within the state. Nevertheless, the Commission's investigations revealed that councils have implemented a range of useful floodplain management measures.

Brisbane City Council, as Queensland's (and Australia's) largest local government has substantial resources and staff with expertise in the technical disciplines necessary to conduct effective floodplain management.<sup>257</sup> As is to be expected, the council has invested a great deal of resources on flood-related planning and mitigation.<sup>258</sup> The measures it has implemented provide a useful illustration of the kinds of floodplain management mechanisms that councils can adopt.

In 2005, for example, Brisbane City Council established the Lord Mayor's Taskforce on Suburban Flooding.<sup>259</sup> The taskforce was required to consider a range of flood-related issues, with a particular focus on creek and local flooding. In the years following the release of the taskforce's report, the council has implemented a range of floodplain management measures including:

- investigations of flood risk, including undertaking flood studies for a number of creeks, and modelling the probable maximum flood of the Brisbane River<sup>260</sup>
- the voluntary home purchase scheme<sup>261</sup>
- drainage works programs<sup>262</sup>
- emergency management measures including the establishment of a local disaster management group, a local disaster co-ordination centre, a disaster management plan<sup>263</sup> and the development of the 'Bender' flood model and the Brisbane River Flood Forecasting System allowing predictions to be made as to the peak level of flood waters at various locations
- initiatives aimed at informing the community of flood risk, including community awareness and education programs, the provision of free flood maps and FloodWise property reports,<sup>264</sup> and early warning alert services regarding the possible impact of creek flooding and severe storms.<sup>265</sup>

Brisbane City Council is not the only council taking active steps towards the implementation of an appropriate range of floodplain management measures. The Rockhampton Regional Council, for example, arranged for a detailed flood study to be conducted after the 2010/2011 wet season.<sup>266</sup> This flood study included hydrologic and hydraulic modelling of the impact of 2, 5, 10, 20, 50, 100 average recurrence interval flood events and the probable maximum flood, as well as a brief consideration of emergency management planning, community awareness, and planning controls. The study commissioned by Rockhampton Regional Council should not be mistaken for a comprehensive floodplain management plan, but it is likely to provide a useful foundation from which the council will be able to develop one.

## Recommendation

2.12 Councils in floodplain areas should, resources allowing, develop comprehensive floodplain management plans that accord as closely as practicable with best practice principles.

## 2.7 Flood mapping for land planning controls

There is a variety of land use planning measures councils can employ to manage floodplains. They include devising appropriate assessment criteria, and determining minimum floor levels for different types of development. Many of them are dealt with in more detail in chapters 3 to 11 of this report. The Commission's focus in this chapter is the production of mapping, a key tool to translate knowledge of flood risk into effective land planning controls.

### 2.7.1 The absence of flood maps in Queensland

Flood maps are based on the results of flood studies and, by showing information about the extent, likelihood and characteristics of flooding, as well as its consequences, can form the basis of decisions about the best way to use land in the floodplain.<sup>267</sup>

There is currently a lack of flood mapping in Queensland planning schemes. A recent report commissioned by the Queensland Reconstruction Authority in conjunction with the Department of Local Government and Planning reviewed 127 of Queensland's 137 planning schemes<sup>268</sup> and established that 80 out of the 127 planning schemes reviewed (63 per cent) contained no flood-related mapping.<sup>269</sup> Of the remaining 47 planning schemes with maps, only 23.6 per cent were completed in accordance with the guideline to State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*.<sup>270</sup> It must be recognised that the review assessed the existence of flood mapping in the context of Queensland planning schemes and is therefore not conclusive as to the proportion of councils who have created flood maps for other purposes. However, even taking its restricted scope into account, the review's conclusions lead the Commission to find that there is, in Queensland, a wholly inadequate level of flood mapping.

There are two principal reasons for the inadequate level of flood mapping within Queensland:

- There is no requirement that councils undertake flood mapping by the operation of State Planning Policy 1/03, the *Sustainable Planning Act 2009*, or any other piece of legislation.
- In almost every case, creating a comprehensive flood map involves undertaking a detailed flood study: an expensive, time consuming and technically complex process, beyond the reach of many councils.

### 2.7.2 The effectiveness of flood maps in land planning

Flood maps are used in the preparation of planning schemes, and the assessment of development applications. As to the first process, councils need enough information to understand the risk of flooding and to put in place the appropriate planning controls to minimise or eradicate the effects of flooding on people and property.<sup>271</sup> Decisions about what controls to put in place, and where they should operate, should be informed by a clear understanding of the risk of flooding, obtained by reference to information about the chance of flooding, and its potential consequences for people and property. The second process – the assessment of development applications – usually requires council assessment officers to have regard to a planning scheme's flood overlay map. Such maps depict the land constrained by flooding and to which the council has attached planning controls.

The cost of creating the flood map will almost always be an issue. But employing significant resources is not always necessary. If development pressures are small and the potential for damage from flooding is minimal, the costs incurred creating a detailed flood map using a flood study may not be justified.<sup>272</sup> However, for towns and cities with substantial populations, and for areas where development is expected to occur, there is a clear need to understand where and when flooding will occur, so that its effects can be mitigated.<sup>273</sup>

The costs of flood mapping are not only borne by governments. Developers may incur costs too: councils can require additional flood investigations about the likelihood and behaviour of flooding at a proposed site. Preparing

this material can be costly, a fact which should be considered when councils engage in the process of determining the most appropriate map for their purposes.<sup>274</sup>

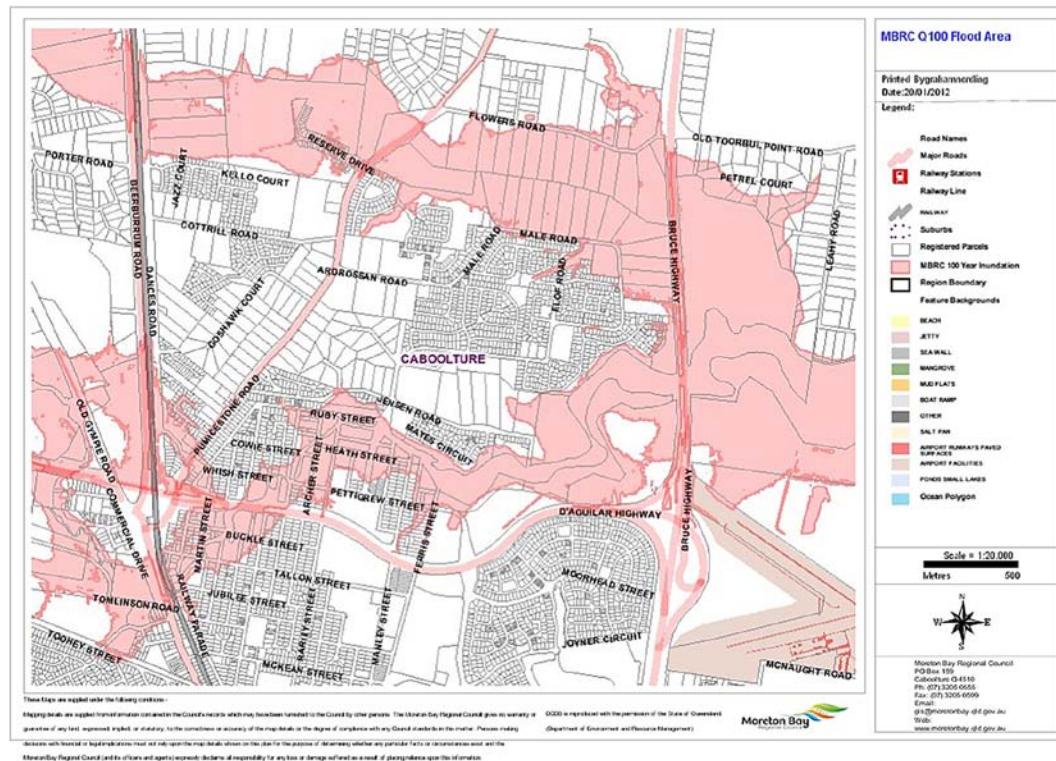
Having regard to the requirements of the land planning system, the Commission has assessed each type of map against the following criteria:<sup>275</sup>

1. whether the map allows a proper assessment of flood risk
2. whether the map can be used effectively as an overlay in a planning scheme
3. whether the map is efficient in terms of the costs incurred by the government (local or state, or both) in generating the map.

## 2.7.3 Assessment of mapping options

### Q100

Queensland's State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* requires planning schemes to nominate a flood event, referred to as a defined flood event, which determines the land subject to flood-related planning controls.<sup>276</sup> Where councils have decided to do so, most have nominated a single flood event with a 1% AEP (Q100) to govern planning decisions in their area. This is no surprise: the 1% AEP flood has traditionally been considered the acceptable level of risk for most forms of development in Australia.<sup>277</sup>



Moreton Bay Regional Council Q100 flood areas at Caboolture

Source: Statement of Chris Warren, Moreton Bay Regional Council, 12 September 2011

This focus on the Q100 and one defined flood event should not continue. Q100 represents only one possible flood. Reliance on a single defined flood event contains this limitation: there are only two areas by reference to which planning controls relevant to flood can be set – the area inside, and the area outside the line depicting the extent of the flood. Restricting development within the extent of the 1% AEP flood will manage a portion of the risk,<sup>278</sup> but it does not deal with the risk of floods that are less frequent, but more severe, or those that will occur more often, but with less damaging consequences.<sup>279</sup> Instead, the various areas to which planning controls apply should be selected having regard to the likelihood, behaviour and consequences of the full range of possible floods, up to and including the probable maximum flood.<sup>280</sup>

The case of Ipswich is instructive. Flood levels in the Bremer River can vary dramatically. Several members of the expert panel sought to emphasise that in Ipswich the consequences of a flood greater than a 1% AEP could be devastating, and far graver than would be experienced by Brisbane should a flood of the same probability occur. In cases such as Ipswich's, it is vitally important to have an understanding of floods greater than a 1% AEP flood and to put in place the appropriate controls.

It would appear that, having received the Commission's draft findings to this effect, the Queensland Government has acknowledged the need for this shift in approach to planning; as is apparent from the Queensland Reconstruction Authority's draft guidelines released for public consultation in January 2012, *Planning for stronger, more resilient floodplains: Part 2 - Measures to support floodplain management in future planning schemes*.

Once a council has a current flood study with a hydraulic model it can produce a map showing flood likelihood and behaviour without incurring significant costs.

## Likelihood and behaviour mapping

A flood behaviour map shows information as to likelihood of flooding in particular locations, and the characteristics of the flood, such as velocity, rate of rise and depth. Likelihood is often indicated by lines showing the extent of floods of different likelihoods. The characteristics of a flood can be shown in zones.

A map showing both likelihood and behaviour is best practice. It is supported by Floodplain Management in Australia,<sup>281</sup> State Planning Policy 1/03<sup>282</sup> and expert land planners engaged by the Commission.<sup>283</sup> It allows the risk of flooding to be understood across the full spectrum of floods, thus enabling the appropriate flood-related planning controls to be used in development assessment.<sup>284</sup> Those controls can differ between different 'zones of risk', taking into account the likelihood of flooding alone, the behaviour of flooding alone, or the combination of likelihood and behaviour.<sup>285</sup>

Given the wide range of information depicted, it is unsurprising that a flood behaviour map is the most expensive map to produce. Most hydraulic models created during a flood study can produce maps which show likelihood or behaviour. Simpler models may not be able to produce behaviour data accurately; if a council intends to obtain a flood behaviour map, the base model should be chosen with that in mind.<sup>286</sup> The behaviour maps produced by such a model will each be for a flood of a particular probability. The council will then have a sheaf of maps, each relevant to a flood of a particular likelihood. Using all those maps might be useful in an emergency management context, as it is not always clear at the start of a flood how large it will be.

However, for use in a planning scheme, councils will have to choose how to aggregate the information obtained from the model. Detailed information about the likelihood of flooding, and its characteristics, or the use of many maps, may prove too complicated for a planning scheme.<sup>287</sup> The Commission heard from two expert town planners on this point; each suggested that limiting the information depicted on the map to two or three 'hazard' categories – 'low', and 'high', with 'medium' as the additional option – would suffice for



*Central Highlands Regional Council Emerald 2008 flood map*

*Source: Attachment to statutory declaration of Luke Lankowski, Central Highlands Regional Council, 1 September 2011*

land planning purposes.<sup>288</sup> A council will have to make qualitative judgments on a risk basis as to the zones it wants to show on its map, having regard to the particular planning controls that might attach to each.<sup>289</sup> Floodplain Management in Australia offers some guidance about the type of flood behaviour which could define these hazard categories. For example, ‘high hazard’ is characterised by flood depths of up to 1.0 metre and velocities of up to 1.5 metres per second.<sup>290</sup> How that information is combined with information about likelihood is a decision for councils. The Queensland Reconstruction Authority, in its draft guideline, *Planning for stronger, more resilient floodplains: Part 2 - Measures to support floodplain management in future planning schemes*, released in January 2012 also supports the approach of three ‘hazard’ categories and provides some guidance about how a council may classify land for planning purposes.

To date, this approach to flood mapping has rarely been undertaken in Queensland,<sup>291</sup> although the Commission is aware of flood mapping conducted for the Rockhampton Regional Council which has produced separate maps showing flood velocity, flood depth and flood ‘hazard’ – the latter being a combination of velocity and depth.<sup>292</sup>

The Commission notes that the Victorian planning system requires planning schemes to nominate certain flood-related zones – urban floodway zone, floodway overlay, land subject to inundation overlay and special building overlay. These zones are differentiated in terms of the flood behaviour in those areas. Different planning controls apply within each zone. For example, land that conveys floodwaters in areas where the flood risk is high because of existing or contemplated development, are designated as being in the ‘urban floodway zone’. Within this zone, most land uses are prohibited.<sup>293</sup> Such maps may be appropriate for use in Queensland.

## Likelihood maps

A flood likelihood map is a map showing the extent of floods of several different probabilities, for example, a 0.5% AEP flood (Q200), a 1% AEP flood (Q100) and a 5% AEP flood (Q20). Each flood extent is represented by a line on the map.<sup>294</sup> While such a map does not show information about the behaviour of flooding, it at least shows the frequency with which parts of the floodplain are subject to inundation. That allows planning controls to be attached to more than one zone, for example: development in areas shown to flood with greater frequency should be subject to stricter planning controls. By allowing multiple zones of planning control to be established, it is closer to best practice than the approach – currently supported by State Planning Policy 1/03 – of mapping a single defined flood event.<sup>295</sup>

Maps of floods of several different annual exceedance probabilities offer a judicious substitute for flood behaviour mapping<sup>296</sup> and, because they often demand less sophisticated flood modelling for its creation, may be more easily attained. It should require little further work or expense to produce once a flood study that produces a hydraulic model has been completed; the model itself can produce a map capable of being inserted into a planning scheme.<sup>297</sup>

## Historical flood maps

A historical flood map shows the extent of a particular flood that has occurred in the past. It may simply be an aerial photograph of that flood. For instance, the 2010/2011 floods were captured by high definition photographs obtained by DERM in the days and weeks after flood peaks.<sup>298</sup> Maps were then created by cartographers who determined the maximum extent of the flood from water and debris marks and by reference to information from local residents. Historical flood maps can also be derived from recorded data – such as stream gauge heights and peak recorded flood levels – and photographs and personal accounts of historic floods.<sup>299</sup> Recorded data from an historical event, such as gauge heights, could also be run through a hydraulic model to determine its extent.

Maps of historical floods can be used as defined flood events in planning schemes. These maps are attended by the same problems as a map of a certain defined flood event – such as a 1% AEP flood – in that they restrict planning controls to differentiation between only two zones (outside and within the extent of the historical flood).

Caution must be exercised when using historical maps to make decisions about land planning. How likely it is that a flood will occur is an important factor in determining what flood-related land planning controls should be put in place.<sup>300</sup> Historical flood maps cannot convey information about likelihood, unless they incorporate further information such as that produced by a flood frequency analysis. State Planning Policy 1/03 attempts to deal with this problem: it recommends that a council perform a flood frequency analysis and estimate the extent of inundation that would be experienced should a flood similar to the historical flood event reoccur by assessing changes to the floodplain.<sup>301</sup> The Commission supports councils’ taking such steps before using historical flood events to regulate development in their regions.

The cost of preparing a map of an historical event will likely be lower than a flood map of behaviour and likelihood, or even just likelihood. Councils may choose to use the Queensland Reconstruction Authority's maps of the 2010/2011 flood. Additional costs are likely to be incurred conducting further analysis to determine the historical flood's likelihood of recurrence.

## Queensland Reconstruction Authority maps

The Queensland Reconstruction Authority has created a set of maps titled 'Interim Floodplain Assessment Overlays' that are intended to have a role in Queensland's planning schemes. These maps are part of a broader project undertaken by the Queensland Reconstruction Authority which also includes the creation of the Temporary State Planning Policy 2/11: *Planning for stronger, more resilient floodplains* and is supported by a guideline. The operation of the Temporary State Planning Policy is discussed in more detail in section 4.2 *Temporary state planning policy*.

These maps were created using satellite imagery of individual sub-basins and imposing the locations of towns and gauging stations onto the image. Ordered drainage data,<sup>302</sup> contour data<sup>303</sup> and the 2010/2011 flood line were also layered onto the satellite image, as was the 'floodplain data set', which comprises Pre-clear Vegetation Mapping of Landzone 3 (Alluvium), Landzone 1 (Estuarine) and SALI (Soil Flooding Limitation Mapping) data.<sup>304</sup>

Through the use of these data sets, the maps depict areas of soil and vegetation characteristics compatible with the land having been previously inundated by floodwaters, at some unknown point in history,<sup>305</sup> adjusted to take into account current contour information<sup>306</sup> and the 2010/2011 flood line.<sup>307</sup> The hard copy maps identify the locations of gauging stations, the expectation being that the user can then make inquiries as to the range of flood levels recorded at any particular gauge.<sup>308</sup>

### *Assessment of flood risk*

The interim floodplain maps do not depict an annual exceedance probability, nor do they provide any information about the risk or probability of flooding occurring in the future, or the frequency with which flooding has occurred in the past.<sup>309</sup> The maps' failure to show at least the likelihood of flooding means that they are, like historical flood maps without further analysis, of limited use in determining appropriate land planning controls.

The maps are expected to be refined by councils,<sup>310</sup> by reference to existing flood studies, records, photographs and local knowledge.<sup>311</sup> The authority has noted that, in some cases, where the process of local validation has occurred there is a correlation between the interim floodplain line and the results of flood studies.<sup>312</sup> However, as one council engineer observed, any correlation 'defies logic';<sup>313</sup> it is not a reason to support the use of the maps in a land planning context.

### *Use of the maps in planning schemes*

According to the Queensland Reconstruction Authority, applicants, or councils, can obtain details of the highest recorded flood levels for the gauging stations identified on the map, and use this information to determine appropriate minimum floor levels.<sup>314</sup> Again, however, this process gives no indication of the likelihood of flooding, and it remains necessary to establish how the highest historical flood level translates to a potential flood level for the proposed development site.<sup>315</sup>

The maps may, the authority suggested, 'trigger' further consideration of flood risk on a site specific basis; for development proposed within the interim floodplain area, the applicant would be expected to demonstrate the absence of flood risk.<sup>316</sup> The Commission considers that the use of the floodplain data set – soil and vegetation characteristics to identify areas congruent with previous flooding – limits the maps being used in this way. By incorporating the floodplain data set, even refined by reference to contour lines and the 2010/2011 flood line, the interim floodplain maps risk capturing too large an area. For several councils, the interim floodplain maps cover large tracts of their region which had not previously been considered liable to inundation.<sup>317</sup> If a requirement were imposed on all applications within the extent of the interim floodplain map to provide more detailed, site-specific information, it could impose an onerous burden on a disproportionately large number of applicants.

The interim floodplain maps are a level above having no flood data at all. By showing topographical information, the 2010/2011 flood line, and areas which may have been inundated in the past, the maps depict – in the words of the authority – 'an area of interest for potential flooding'.<sup>318</sup> Councils may choose to use the maps to determine areas within their region which require more detailed flood studies and mapping. The guideline produced by the Queensland Reconstruction Authority contemplates use of the maps in this fashion, asserting that the interim

floodplain maps ‘provide a framework for communities to decide priorities for more detailed flood studies’.<sup>319</sup> The Commission agrees.

#### *Cost*

The Queensland Reconstruction Authority’s interim floodplain maps are freely available for use by councils. Councils choosing to adopt the maps into their planning scheme will incur little expense. There may, however, be some costs involved in validating the maps, although the authority has offered to assist councils with fewer resources to do this. The Commission acknowledges the extensive work that has gone into the interim floodplain maps. Working with DERM, the Queensland Reconstruction Authority has, over a matter of months, created maps covering most of Queensland.<sup>320</sup> Even were resources available, it would have been impossible, in the timeframes imposed on the Authority, to collate the data required to map flood risk across the entire state.<sup>321</sup>

### **Creating a flood map from topography information**

It is important that the land planning system can accommodate circumstances where the risk of flooding is unknown.<sup>322</sup> One outcome of the large scale flooding that occurred across Queensland in December 2010 and January 2011 is that locations in Queensland for which very limited flood data existed now have data – such as rainfall and streamflow – from a large historical event.

However there will remain areas in Queensland where the likelihood of flood remains unknown. It is important that those areas are identified, so that it is clear that the absence of information about flooding does not indicate the absence of flood risk; rather, that it has not been evaluated. The Gladstone planning scheme, for example, uses the designation of ‘Unknown Extent of Flooding (Lack of Information)’ in the flood and storm surge mapping for its 1 per cent annual exceedance probability overlay.

The Commission considers that there are two principal options for councils in this situation:

1. Councils identify, on a map, areas of ‘unknown flood extent’. For development proposed in these areas, certain basic information of relevance to flooding considerations should accompany every development application;<sup>323</sup> for example, information about the elevation of a proposed development and its location relative to watercourses.<sup>324</sup> Upon assessment of this basic information a council may consider further information is necessary; if so, it can be sought at a second stage of the development process.<sup>325</sup>
2. Councils create maps showing areas with topographical features that indicate some chance (albeit crudely determined) of flooding. Only those proposing to develop in that area would be required to provide additional, site based information about flooding. This assessment requires access to information about a council region’s topography, for example, a contour map. What this kind of map would show might be referred to as a ‘flood investigation area’.<sup>326</sup>

Both options rely heavily on identifying topographical characteristics synonymous with flooding: this is a rudimentary approach to assessing flood risk, and should be used only as a last resort.<sup>327</sup> Where councils choose to produce their own map, they may incur some costs in obtaining the necessary topographical information.

### **The best flood maps**

It is not feasible, nor is it necessary, for sophisticated flood mapping to be completed on a state-wide basis.<sup>328</sup> There are locations where flood mapping is imperative, such as those with a large population and high levels of development (Ipswich, for example). For locations such as rural areas that are subject to low or no development, the expense of detailed flood mapping may well outweigh the potential benefits.

The Commission has ranked the flood maps in order of appropriateness for use in land planning:

1. Flood maps which depict both the likelihood of flooding and the characteristics of flooding.
2. Flood maps which depict a number of different levels of flood likelihood, for example probable maximum flood, 1 per cent (Q100) and 5 per cent (Q20) and 0.2 per cent (Q500).
3. Q100 maps – flood maps which depict the 1 per cent annual exceedance probability alone.
4. Historical flood maps.
5. Queensland Reconstruction Authority interim floodplain maps.
6. Mapping using topography.

## Recommendations

- 2.13 For urban areas or areas where development is expected to occur:
- councils with the requisite resources should develop a flood map which shows 'zones of risk' (at least three) derived from information about the likelihood and behaviour of flooding
  - councils without the requisite resources to produce a flood behaviour map should develop a flood map which shows the extent of floods of a range of likelihoods (at least three).
- 2.14 For non-urban areas or areas where limited development is expected to occur councils should consider, on a risk basis, what level of information about flood risk is required for the area, and undertake the highest ranked of the following options which is appropriate to that need and within the capacities (financial and technical) of the council:
- a map showing 'zones of risk' (at least three) derived from information about the likelihood and behaviour of flooding
  - a map showing the extent of floods of a range of likelihoods (at least three)
  - a flood map based on historic flood levels that have been subjected to a flood frequency analysis to estimate the annual exceedance probability of the selected historical flood
  - a historic flood map without flood frequency analysis
  - the Queensland Reconstruction Authority Interim Floodplain Assessment Overlay as a way to determine those areas for which further flood studies are required, or
  - the Queensland Reconstruction Authority Interim Floodplain Assessment Overlay (preferably refined using local flood information) as a trigger for development assessment.
- 2.15 Councils should ensure that areas for which there has been no assessment of the likelihood of flooding are indicated on a map and that, as part of the development assessment process for these, there is at least some enquiry into whether a site proposed for development could be subject to flooding.

## 2.8 Use of flood information in emergency management

The Commission's interim report made detailed findings and recommendations about emergency management measures.<sup>329</sup> Further comment is provided in this chapter because of the integral role that flood modelling and flood mapping play in preparing for and responding to a disaster. Emergency management measures are the only measures available to address the 'residual risk' of flooding.<sup>330</sup> The residual risk is that faced by the community even after all structural measures have been built (dams, levees and so on), planning controls put in place and building standards imposed to guard against flood.<sup>331</sup>

The primary aim of emergency management, prior to and during a flood, is to reduce the damage caused by an actual flood.<sup>332</sup> During a flood, this is best achieved by accurately predicting the flooding that will occur, warning the community and, where necessary and possible, evacuating people and property.<sup>333</sup> When planning for a future flood event, it is necessary to have an understanding of the full range of flood events so as to plan for any eventuality.<sup>334</sup>

Clearly, emergency management decision-making would benefit from access to detailed flood maps which show floods over a range of likelihoods – up to and including the probable maximum flood – as well as the behaviour of the flooding.<sup>335</sup> These requirements can only be delivered by a flood behaviour map, such as that described in section 2.7.3 *Assessment of mapping options*.

While flood maps are an undeniably useful tool for emergency management, during a flood, decision-making is best informed by the use of a real-time flood model.<sup>336</sup> Real-time flood models use current rainfall and river height data to predict the likely extent of flooding.

During the 2010/2011 floods, the Bureau of Meteorology used a hydrologic forecasting model which collected real-time rainfall and river level data, and combined that data with forecast rainfall data to make predictions about likely

flood levels.<sup>337</sup> The Bureau communicated its flood level predictions to Queensland's state disaster coordination centre, emergency services agencies, local governments and dam operators<sup>338</sup> as well as to the public via the Bureau's website and other forms of media, such as the radio. The Bureau's predictions, in many cases, substantially informed the emergency measures taken by the government and the community in response to the flooding.<sup>339</sup>

As noted in the Commission's interim report, Brisbane City Council also has such a model – the 'Bender'<sup>340</sup> – which it uses during a flood to provide property specific information to the public (through its call centre) and to determine the majority of response and recovery activities.<sup>341</sup> Ipswich City Council expects to make available to the public a 'real time' flood mapping product which the council intends will assist residents to respond to flood disasters as they happen.<sup>342</sup>

That is not to say that less sophisticated flood modelling and mapping serve no purpose in planning for or responding to a flood event. The Commission's interim report described how, during the 2010/2011 floods, emergency management personnel relied on information about water heights provided by rural landowners living near watercourses to inform their response.<sup>343</sup> Similarly, emergency responses can be informed by reference to historic floods, which provide a sense of the possible effects of a predicted flood.

## 2.9 Distribution of flood information

The distribution of flooding information to the community helps people to protect themselves, and their property, from flooding. During a flood emergency, individuals require property specific flood information to understand their own risk of flooding; and, if they are at risk, whether and when to evacuate. Individuals also use flood information to make decisions about whether to undertake a certain development or purchase a property or business.

Information provided to the public may take the form of general flood information, such as a map showing the likely extent of flooding for a whole city, or it may be property specific information which sets out flood heights for a particular property.

### 2.9.1 Providing flood information and mapping to the public

Mapping for use by the public should provide information that is useful to them in their decisions about land planning and response to an emergency. That should include information about the likelihood of flooding at a particular place, its depth, and the level of hazard to persons and property posed by it.

The usefulness of a particular map to the public mirrors its usefulness in a planning scheme; those that show little in the way of likelihood of flooding or deal with only one flood event are of less use than those that deal with the likelihood and behaviour of a full range of floods. A point of difference is the need for the public to know depth of flooding. Planning scheme maps may show the extent of flooding, but are unlikely to contain information about depth. However, flood levels are important to members of the public because they directly relate to the amount of damage caused to property; it would be helpful for maps showing depth to be publicly available.

Maps should not be provided without explanation; a map that provides behaviour and likelihood information is unlikely to be easily understood without guidance. An appropriate measure is to include with the map an explanatory note.<sup>344</sup> Any explanatory note should, to be understandable, avoid confusing terminology such as Q100.<sup>345</sup> The Commission heard evidence that some people whose property was above the Q100 level thought they were 'safe' from flooding;<sup>346</sup> others thought that floods would occur only once every 100 years. The Commission considers the best approach is to describe likelihood of flood in terms of annual exceedance probability as a percentage. That, at least, makes clear that *every year* there is a chance of flood occurring at the property. In its interim report, the Commission made findings and recommendations about how to convey property specific information to the community so that it can be understood.<sup>347</sup>

Brisbane City Council's approach to the provision of flood information is a useful example. It makes available, free of charge, FloodWise property reports that provide information about January 2011 flood levels,<sup>348</sup> estimated flood levels, source of flooding, minimum and maximum ground levels, minimum habitable floor level for building and development, and whether a property is located within a waterway corridor.<sup>349</sup> In a similar vein, Ipswich City Council makes available property specific flood reports which identify minimum and maximum ground heights and the 1974 and 2011 flood event levels by reference to the eave height of the property.<sup>350</sup>

All flood mapping commissioned or adopted by government should be made available to the public. If commissioned flood maps are not, in the event, adopted by government, an explanatory note should suffice to prevent public confusion.

The most useful, and cost effective, means of publishing such information is on government websites (local and state government). The Commission recognises that not all councils will have a website capable of providing all flood mapping to the public. Some councils may choose to charge a small fee for the provision of property specific flooding information, to cover administrative costs. While this is a matter for determination by individual councils, any decision about charging a fee must be weighed against the importance of ensuring all members of the community have access to information about flooding. Insurance companies may require ‘higher resolution’ or digital versions of the flood maps produced by local, state or federal authorities (and vice versa).<sup>351</sup> It is a matter for the entities involved to decide what commercial arrangements are put in place to manage the sharing of this information.

There are, of course, numerous legal and commercial issues which might arise through the release of flood mapping products, including issues surrounding liability, licensing, intellectual property, property values and the pricing of insurance.<sup>352</sup> These matters present challenges for the development of any information sharing model. However, the paramount consideration should be protection from the effects of flooding, which can be achieved, at least in part, through the provision of flood mapping.

## *Recommendations*

- 2.16 Councils and the Queensland Government should display on their websites all flood mapping they have commissioned or adopted.
- 2.17 Flood maps, and property specific flooding information intended for use by the general public, should be readily interpretable and should, where necessary, be accompanied by a comprehensible explanatory note.

### **2.9.2 Flood information for dealing with property**

It emerged from evidence before the Commission that purchasers of property, in making the decision to purchase, did not turn their minds to the property’s vulnerability to flood.<sup>353</sup>

To be properly informed, individuals dealing with property should be aware of the flood risk at the property and any flood-related constraints on development. Awareness of flood risk is dealt with substantially above. The conditions of a development approval attach to the land the subject of the application and bind any subsequent owner or occupier of the land.<sup>354</sup> Accordingly, it is important that subsequent owners and occupiers are aware of the conditions of all previous development approvals. That information could be communicated in a number of ways: through planning and development certificates, rates notices, real estate contracts or online.

#### **Planning and development certificates**

The *Sustainable Planning Act 2009* makes provision for the public to obtain from a council a limited, standard or full ‘planning and development certificate’ (for a prescribed fee).<sup>355</sup> Each of the standard and full certificates identifies any development conditions that attach to the land.<sup>356</sup> The limited certificate does not. These types of certificates are sometimes requested by prospective buyers of land as a part of the conveyancing process. However, in Queensland, there is no requirement to obtain such a certificate during the conveyancing process.<sup>357</sup>

In New South Wales, when land is sold the seller must attach a ‘Section 149 Planning Certificate’ to the contract for sale.<sup>358</sup> A Section 149 Planning Certificate is issued in accordance with the *Environmental Planning and Assessment Act 1979* and contains information on how a property may be used and restrictions on development (including flooding information). If a Section 149 Planning Certificate is not attached to the contract for sale, the buyer may have the right to rescind the contract and seek compensation from the seller.<sup>359</sup>

The Queensland Government Planner said that this approach would have utility in Queensland.<sup>360</sup> The Local Government Association, however, argued that the disclosure requirements for contracts for sale of land in Queensland were already onerous. Adopting the requirement for a planning certificate would be likely to impose an unfair cost burden on the vendors of property.<sup>361</sup> In the absence of evidence as to those cost implications, the Commission notes the arguments, but makes no recommendation.

### Rates notices

The Queensland Government Planner also suggested that the existence of development conditions that relate to flood-affected land could be communicated by placing a notification on a rates notice. Ipswich City Council's view, however, was that this method of alerting subsequent landowners of the conditions was unlikely to be completely successful. The difficulties identified included that:

- the recipients of the notice might not be the occupants of the land
- it would be difficult for councils to identify which conditions should be included
- collating all decision notices to attach to each rates notice would be administratively difficult and time and resource intensive.<sup>362</sup>

The Commission is also of the view that the difficulties associated with including the information on a rates notice militate against any recommendation that rates notices include such information.

### Land contracts

The Commission sees merit in a mechanism to bring prospective purchasers' attention to the issue of flood risk and flood-related development constraints prior to signing a contract. That might be achieved by including in standard contracts of sale a condition which makes the contract subject to the purchaser's obtaining a satisfactory flood search. That style of condition currently exists for building and pest inspections in the standard Real Estate Institute of Queensland contract for residential properties. Just as not all purchasers retain the building and pest inspection conditions in the contract, so too could purchasers choose to delete the flood report condition. But at least the issue would have been brought to their attention and a decision made.

### Online information

Another way a member of the public can obtain information about conditions binding the use of land, and in most cases overlays affecting the use of land, is through a database known as 'PD Online'. PD Online databases allow the user to carry out a search on a particular property to identify development approvals relevant to the land. However, not all councils offer the PD Online service; and for those that do, the information is limited to approvals issued after a certain date, given that it is not feasible for councils to upload all historic development approvals. It would be of considerable public benefit for all councils to offer PD Online databases.

## Recommendations

- 2.18 Councils that do not currently do so should consider offering an online database which allows the public to conduct a search on a parcel of land to find development approvals relevant to that parcel of land.
- 2.19 The Queensland Government should consider implementing a mechanism by which prospective purchasers of property are alerted to the issue of flood risk. To that end, the Queensland Government should consider consulting the Real Estate Institute of Queensland and the Law Society of Queensland as to the appropriateness of amending standard contract conditions so as to include a 'subject to flood search' condition, or other means of achieving the same objective.

## 2.10 Guidelines for the preparation of flood studies and flood management plans

The Commission considers that all levels of government would benefit from access to guidelines for the performance of flood studies, the production of flood maps<sup>363</sup> and the development of floodplain management plans. Several relevant guidelines already exist. For example:

- Floodplain Management in Australia provides a detailed overview of best practice floodplain management.
- Australian Rainfall and Runoff sets out a series of guidelines for the performance of flood studies and the calculation of flood risk.
- The guideline produced by the Queensland Reconstruction Authority *Planning for stronger, more resilient floodplains: Part 1 - Interim measures to support floodplain management in existing planning schemes* aims to assist councils to incorporate floodplain management principles into their existing planning schemes.
- The draft guideline produced by the Queensland Reconstruction Authority *Planning for stronger, more resilient floodplains: Part 2 - Measures to support floodplain management in future planning schemes* aims to assist councils to integrate floodplain management principles and processes into future planning schemes.

Some of those guidelines are in a state of flux. The second part of the Queensland Reconstruction Authority guideline is a draft. The most recent version of Australian Rainfall and Runoff was published in 1987 and is significantly out of date. A review of this document has begun but has been delayed by a failure to secure adequate funding.<sup>364</sup> Evidence before the Commission suggested that that the new version of Australian Rainfall and Runoff will support the use of Monte Carlo analysis.<sup>365</sup> The completion of this review is likely to assist significantly in the conduct of flood studies. It is clearly desirable that funding be made available for the completion of the work.

The National Flood Risk Advisory Group is currently developing a new floodplain management guideline that will supersede Floodplain Management in Australia. This document is expected to be finalised in June 2012.<sup>366</sup> The Queensland Government should use its membership of the group to ensure that the principles set out in the new floodplain management guideline are appropriate for Queensland conditions. If the new guideline is not sufficiently adapted to the Queensland context, the Queensland Government should take responsibility for the preparation of guidelines appropriate for use in this state.

As a final note, the results of the National Flood Risk Advisory Group's review will also be relevant to the terms of Queensland's State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*. State Planning Policy 1/03 is supported by a guideline which suggests the use of a floodplain management approach in line with the best practice principles set out in Floodplain Management in Australia, and provides a summary of those principles as they relate to land planning.<sup>367</sup> Depending on the terms of the new best practice floodplain management guidelines, it may be necessary to amend State Planning Policy 1/03 and the attached guideline. This further underscores the need for the Queensland Government to be involved in the National Flood Risk Advisory Group's review of best practice floodplain management.

## Recommendations

- 2.20 The Queensland Government should endeavour to ensure that Queensland conditions are appropriately considered in the National Flood Risk Advisory Group's review of best practice principles.
- 2.21 In the event that the review does not adequately account for Queensland conditions, the Queensland Government should produce a document that provides appropriate guidelines for floodplain management in the Queensland context.
- 2.22 The Queensland Government should determine whether existing guidelines are sufficient for councils to understand best practice in the performance of flood studies and the production of flood maps. If a lack of current guidelines is identified, the government should create and circulate guidance material for councils.

## (Endnotes)

- 1 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p26].
- 2 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: Best practice principles and guidelines, SCARM Report 73, 2000 [p xiv].
- 3 See chapters 3 and 5 of the interim report in relation to disaster management and emergency response, and chapter 2 of the interim report in relation to dam operation (note that a consideration of where and when to build levees and dams has not been part of the Commission's investigation). Chapters 3-9 of this report deal with matters of land planning and building controls.
- 4 The efficacy of such a process was questioned in other reports prepared in response to the 2010/2011 floods: see, for example, Brisbane City Council, Joint Flood Taskforce Report, May 2011.
- 5 The Standing Committee on Agriculture and Resource Management is a permanent standing committee established to assist the Agriculture and Resource Management Council of Australia and New Zealand (a ministerial council) with the development of policies, guidelines and programs in relation to agriculture and land and water resource issues.
- 6 It should be noted that Emergency Management Australia has published a condensed manual based on the SCARM Report 73. See Emergency Management Australia, Manual 19: Managing the Floodplain, 1999.
- 7 Emergency Management Australia, Manual 19: Managing the Floodplain, 1999 [p1]; Exhibit 497, Second Statement of Peter Baddiley, 11 May 2011, Annexure PB2-4.
- 8 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p13-14].
- 9 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p96].
- 10 Note that this inverse relationship between annual exceedance probability and average recurrence interval is not consistent across the full range of annual exceedance probabilities. See [www.bom.gov.au/water/designRainfalls/ifd/glossary.shtml](http://www.bom.gov.au/water/designRainfalls/ifd/glossary.shtml).
- 11 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p97].
- 12 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p69]; State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p37: para A2.28].
- 13 Exhibit 883, Document number 7, Common expert reading list A, Brisbane, Mark Babister, WMAwater, Brisbane River 2011 Flood Event – Flood Frequency Analysis.
- 14 Exhibit 883, Document numbers 7-16, Common expert reading list A, Brisbane.
- 15 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p12: para 39; p13: para 44].
- 16 Transcript, Hydrology Expert Panel, 26 October 2011, Brisbane [p4392: line 43-50].
- 17 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p13: para 42].
- 18 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p5-11].
- 19 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011.
- 20 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p5: para 13].
- 21 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p5: para 13].
- 22 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p5: para 14].
- 23 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p6: para 15].

- 24 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p6: para 15].
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- 25 Transcript 26 October 2011, Brisbane: Rory Nathan [p4367: line 47 – p4368: line 5]; Michael Leonard [p4371: line 28; p4371: line 56]; Sharmil Markar [p4368: line 20]; Mark Babister [p4372: line 13]; Neil Collins [p4368: line 27] cf [p4424: line 6]; Drew Bewsher, 26 October 2011, Brisbane [p4369: line 4]; Colin Apelt, 26 October 2011, Brisbane [p4369: line 29].
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- 26 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4426: line 7].
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- 27 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4373: line 42].
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- 28 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4374: line 29].
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- 29 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4377: line 12].
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- 30 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4436: line 18].
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- 31 Transcript, Sharmil Markar, 26 October 2011, Brisbane [p4368: line 11]; Transcript, Neil Collins, 26 October 2011, Brisbane [p4368: line 27]; [p4424: line 26]; Transcript, Erwin Weinmann, 26 October 2011, Brisbane [p4370: line 53].
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- 32 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p6-7: para 19].
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- 33 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p8: para 20].
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- 34 For example, DERM completed a physical gauging of flow at Jindalee during the 2011 flood event of the Brisbane River. See section 2.6.3 *Stream gauges* of the Commission's interim report.
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- 35 A rating curve is a mathematical representation of the relationship between flood flow and height at a particular place along a river. For more information about rating curves, see section 2.6.3 *Stream gauges* of the Commission's interim report.
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- 36 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4363: line 16]; Transcript, Mark Babister, 26 October 2011, Brisbane [p4391: line 28].
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- 37 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4363: line 20].
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- 38 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4361: line 47].
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- 39 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p8: para 22].
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- 40 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4363: line 45].
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- 41 Exhibit 883, Document number 1, Common expert reading list A, Brisbane, Independent Review Panel (Russell Mein, Colin Apelt, John Macintosh, Erwin Weinmann), Review of Brisbane River Flood Study: Report to the Brisbane City Council [p20].
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- 42 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4364: line 8].
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- 43 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p8: para 22].
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- 44 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4412: line 32]; Transcript, Mark Babister, 26 October 2011, Brisbane [p4413: line 2].
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- 45 See, in a different context, Transcript, Michael Leonard, 26 October 2011, Brisbane [p4426: line 46].
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- 46 Transcript, Mark Babister, 26 October 2011, Brisbane [p4365: line 3]; Transcript, Rory Nathan, 26 October 2011, Brisbane [p4365: line 48].
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- 47 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p9: para 23].
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- 48 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4365: line 41].
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- 49 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p9: para 24].
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- 50 See the discussion in Exhibit 883, Document number 7, Common expert reading list A, Brisbane, Mark Babister, WMAwater, *Brisbane River 2011 Flood Event – Flood Frequency Analysis* [p27-29].
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- 51 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p10: para 25].
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- 52 Transcript, Mark Babister, 26 October 2011, Brisbane [p4366: line 6].
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- 53 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4366: line 18].
- 54 Transcript, Brisbane River Flood Frequency Expert Panel, 26 October 2011, Brisbane [p4361: line 47].
- 55 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p10: para 26].
- 56 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p10: para 26].
- 57 Exhibit 882, Joint Expert Statement of the Bremer River Flood Frequency Panel, 25 October 2011 [p5: para 13].
- 58 Exhibit 882, Joint Expert Statement of the Bremer River Flood Frequency Panel, 25 October 2011 [p12: para 36].
- 59 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p10: para 27].
- 60 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p10: para 28].
- 61 Trevor Johnson, Cardno, *Flooding Behaviour*, 11 November 2011 [p2].
- 62 Trevor Johnson, Cardno, *Flooding Behaviour*, 11 November 2011 [p3].
- 63 Exhibit 882, Joint Expert Statement of the Bremer River Flood Frequency Panel, 25 October 2011 [p12: para 36].
- 64 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p10: para 28].
- 65 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p10: para 28].
- 66 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p10: para 28 – p11: para 30]; Transcript, Neil Collins, 26 October 2011, Brisbane [p4391: line 5].
- 67 For information about rating curves, see section 2.6.3 *Stream gauges* of the interim report.
- 68 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p10: para 29].
- 69 Exhibit 882, Joint Expert Statement of the Bremer River Flood Frequency Panel, 25 October 2011 [p5: para 13].
- 70 One option is the Laurenson method used by Mark Babister in Exhibit 883, Babister, Hardwick-Jones and Gray, WMAwater, Supplementary Report – Ipswich Flood Frequency Analysis, October 2011, document number 1 on Ipswich Common Expert Reading List A [p19: para 50].
- 71 Transcript, Mark Babister, 26 October 2011, Brisbane [p4366: line 22].
- 72 Transcript, Mark Babister, 26 October 2011, Brisbane [p4366: line 30].
- 73 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p11: para 31].
- 74 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p11: para 34].
- 75 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4367: line 5].
- 76 Transcript, Michael Leonard, 26 October 2011, Brisbane [p4367: line 22].
- 77 Available at [www.climatechange.qld.gov.au/pd/inlandfloodstudy.pdf](http://www.climatechange.qld.gov.au/pd/inlandfloodstudy.pdf).
- 78 For a description of this study, see section 17.1.1 *The structure for the completion of the scientific investigations*.
- 79 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4435: line 39]; Transcript, Neil Collins, 26 October 2011, Brisbane [p4437: line 19].
- 80 Exhibit 882, Joint Expert Statement of the Bremer River Flood Frequency Panel, 25 October 2011 [p7: para 21].
- 81 Exhibit 882, Joint Expert Statement of the Bremer River Flood Frequency Panel, 25 October 2011 [p10: para 25].
- 82 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4432: line 49].
- 83 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4435: line 57].
- 84 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4438: line 23].

- 85 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4437: line 6].
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- 86 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p12: para 39]; Exhibit 882, Joint Expert Statement of the Bremer River Flood Frequency Panel, 25 October 2011 [p15: para 49].
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- 87 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p12: para 39]; Exhibit 882, Joint Expert Statement of the Bremer River Flood Frequency Panel, 25 October 2011 [p15: para 49].
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- 88 This defined flood level does not appear in Brisbane's planning scheme itself. The information is maintained elsewhere.
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- 89 See section 5.2 *Temporary local planning instruments*. See also the evidence of Mr Collins and Mr Babister, members of the hydrology expert panel on this point: Transcript, 26 October 2011, Brisbane [p4441].
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- 90 Freeboard is a height allowance that provides for uncertainty in the distance between the expected height of the water surface and the above floor.
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- 91 Brisbane City Council, Submission No. 2, 8 April 2011 [p2: para 2.2]; [p9: para 4.7].
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- 92 Sinclair Knight Merz, *City Design – Flood Modelling Services, Recalibration of the Mike11 Hydraulic Model and Determination of the 1 in 100 AEP Flood Levels*, 5 February 2004 [p11].
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- 93 Exhibit 547, Sinclair Knight Merz, Brisbane River Flood Study, June 1998, Appendices [p0245].
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- 94 Brisbane City Council, Submission No. 2, 8 April 2011 [p9: para 4.7].
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- 95 Brisbane City Council, Submission No. 2, 8 April 2011 [p12: para 4.26].
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- 96 Brisbane City Council, Submission No. 2, 8 April 2011 [p28: para 7.9-7.10]. That account is similar to the one provided in the statement of Martin Reason, the council's acting manager of City Planning and Economic Development. See Exhibit 544, Statement of Martin Reason, 1 September 2011 [p10: para 26]; [p15: para 45]; [p19: para 57]; [p20: para 60-61].
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- 97 Crime and Misconduct Commission, Brisbane River Flood Levels, March 2004 [p10].
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- 98 Crime and Misconduct Commission, Brisbane River Flood Levels, March 2004 [p11].
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- 99 Exhibit 547, Sinclair Knight Merz, Brisbane River Flood Study, June 1998, Appendices [p0245].
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- 100 Water Resources was named Waterways before being merged with the Infrastructure Management Branch in 2002: see Crime and Misconduct Commission, Brisbane River Flood Levels, March 2004 [p8].
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- 101 Crime and Misconduct Commission, Brisbane River Flood Levels, March 2004 [p11].
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- 102 Crime and Misconduct Commission, Brisbane River Flood Levels, March 2004 [p11]; Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p8]; Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p14: para 55]; Transcript, Barry Ball, 10 November 2011, Brisbane [p4897: line 50].
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- 103 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p9].
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- 104 Exhibit 883, Document number 37, Common expert reading list B, Brisbane, Professor Russell Mein, Brisbane River Flood Study: Review of Hydrological Aspects [p3-5].
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- 105 Exhibit 883, Document number 37, Common expert reading list B, Brisbane, Professor Russell Mein, Brisbane River Flood Study: Review of Hydrological Aspects [p5-6].
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- 106 Exhibit 883, Document number 37, Common expert reading list B, Brisbane, Professor Russell Mein, Brisbane River Flood Study: Review of Hydrological Aspects, 9 December 1998 [p1].
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- 107 Exhibit 883, Document number 37, Common expert reading list B, Brisbane, Professor Russell Mein, Brisbane River Flood Study: Review of Hydrological Aspects, 9 December 1998 [p2].
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- 108 Exhibit 883, Document number 37, Common expert reading list B, Brisbane, Professor Russell Mein, Brisbane River Flood Study: Review of Hydrological Aspects, 9 December 1998 [p6-7].
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- 109 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p10]; Transcript, Barry Ball, 10 November 2011, Brisbane [p4898: line 49].
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- 110 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p10]. City Design are the ordinary supplier of hydrology studies to Water Resources.
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- 111 Exhibit 883, Document number 38, Common expert reading list B, Brisbane, City Design, Sinclair Knight Merz, Brisbane River Flood Study (Draft), June 1999 [p9].
- 112 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p12]; Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p17: para 72-73]; Exhibit 947, Statement of Gavin Blakey, 4 November 2011 [p5: para 23].
- 113 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p13]; Exhibit 947, Statement of Gavin Blakey, 4 November 2011 [p5: para 24]; Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4828: line 50].
- 114 Exhibit 883, Document number 39, Common expert reading list B, Brisbane, Brisbane City Council, Further Investigations for the Brisbane River Flood Study, December 1999 [p3].
- 115 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p16].
- 116 Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p17: para 70]; [p18-19: para 82-86]. See also Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p15].
- 117 Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4829: line 30]; Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p19].
- 118 Exhibit 947, Statement of Gavin Blakey, 4 November 2011 [p7: para 35]; Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p19].
- 119 Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p19: para 86].
- 120 Transcript, Barry Ball, 10 November 2011, Brisbane [p4899: line 30].
- 121 Exhibit 947, Statement of Gavin Blakey, 4 November 2011 [p8: para 37]; Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p20-21: para 88]; Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p19]; Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4845: line 42].
- 122 Exhibit 947, Statement of Gavin Blakey, 4 November 2011 [p8: para 37]; Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p20-21: para 88]; Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p19]; Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4830: line 39]; Transcript, Barry Ball, 10 November 2011, Brisbane [p4899: line 20].
- 123 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p19]; Exhibit 947, Statement of Gavin Blakey, 4 November 2011 [p8: para 38].
- 124 Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p28: para 107(b)]; Exhibit 947, Statement of Gavin Blakey, 4 November 2011 [p6: para 29].
- 125 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p21, 24].
- 126 Crime and Misconduct Commission, Brisbane River Flood Levels, March 2004 [p1].
- 127 The Crime and Misconduct Commission investigated allegations of official misconduct in not releasing the June 1999 report to the public, and produced a report in March 2004 which did not find any misconduct, but did make recommendations as to the council's record keeping processes: Crime and Misconduct Commission, Brisbane River Flood Levels, March 2004 [p1].
- 128 See Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p26-27]; Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p23: para 92(a)].
- 129 Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4834: line 54].
- 130 Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4833: line 47].
- 131 Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4834: line 56].
- 132 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p26].
- 133 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p27].
- 134 Exhibit 947, Statement of Gavin Blakey, 4 November 2011 [p9: para 44].

- 135 Exhibit 947, Statement of Gavin Blakey, 4 November 2011 [p10: para 45].
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- 136 Transcript, Colin Apelt, 26 October 2011, Brisbane [p4383: line 41].
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- 137 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p27]; Transcript, Erwin Weinmann, 26 October 2011, Brisbane [p4383: line 24].
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- 138 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4377: line 54].
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- 139 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p32-33].
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- 140 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p32].
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- 141 Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4835: line 22].
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- 142 Exhibit 884, Statement of Roderic Nathan, 4 October 2011, Annexure RJN-31 [p3]. See also Transcript, Rory Nathan, 26 October 2011, Brisbane [p4382: line 28].
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- 143 The Crime and Misconduct Commission investigated allegations of official misconduct in not releasing the June 1999 report to the public, and produced a report in March 2004 which did not find any misconduct, but did make recommendations as to the council's record keeping processes: Crime and Misconduct Commission, Brisbane River Flood Levels, March 2004. Exhibit 883, Document number 5, Common expert reading list A, Brisbane, Sinclair Knight Merz, Flood Frequency Analysis for Brisbane River Catchment Summary Report: Flood Frequency Analysis of Brisbane River (Draft), 8 August 2003 [p4]; Exhibit 883, Document number 4, Common expert reading list A, Brisbane, Sinclair Knight Merz, Brisbane River Flood Study: Further Investigations of Hydrology & Hydraulics Incorporating Dam Operations and CRC Forge Rainfall Estimates (Draft), 29 August 2003 [p4].
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- 144 Exhibit 883, Document number 1, Common expert reading list A, Brisbane, Independent Review Panel (Russell Mein, Colin Apelt, John Macintosh, Erwin Weinmann), Review of Brisbane River Flood Study: Report to the Brisbane City Council [p22].
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- 145 Exhibit 883, Document number 1, Common expert reading list A, Brisbane, Independent Review Panel (Russell Mein, Colin Apelt, John Macintosh, Erwin Weinmann), Review of Brisbane River Flood Study: Report to the Brisbane City Council, Executive summary [p i, p22].
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- 146 Exhibit 883, Document number 1, Common expert reading list A, Brisbane, Independent Review Panel (Russell Mein, Colin Apelt, John Macintosh, Erwin Weinmann), Review of Brisbane River Flood Study: Report to the Brisbane City Council [p19-20].
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- 147 Exhibit 883, Document number 1, Common expert reading list A, Brisbane, Independent Review Panel (Russell Mein, Colin Apelt, John Macintosh, Erwin Weinmann), Review of Brisbane River Flood Study: Report to the Brisbane City Council [p20].
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- 148 Exhibit 883, Document number 1, Common expert reading list A, Brisbane, Independent Review Panel (Russell Mein, Colin Apelt, John Macintosh, Erwin Weinmann), Review of Brisbane River Flood Study: Report to the Brisbane City Council [p22].
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- 149 Exhibit 883, Document number 1, Common expert reading list A, Brisbane, Independent Review Panel (Russell Mein, Colin Apelt, John Macintosh, Erwin Weinmann), Review of Brisbane River Flood Study: Report to the Brisbane City Council [p22: para 5.2(a)].
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- 150 Exhibit 544, Statement of Martin Reason, 1 September 2011 [p6: para 23]; Annexure MJR-6, Attachment A [p1: para 1(c), (d)].
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- 151 Exhibit 544, Statement of Martin Reason, 1 September 2011, Annexure MJR-6 [p3].
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- 152 Exhibit 544, Statement of Martin Reason, 1 September 2011, Annexure MJR-6 [p3].
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- 153 Exhibit 544, Statement of Martin Reason, 1 September 2011 Annexure MJR-6 [p2-3].
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- 154 Transcript, Erwin Weinmann, 26 October 2011, Brisbane [p4390: line 17].
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- 155 Exhibit 544, Statement of Martin Reason, 1 September 2011, Annexure MJR-6, Attachment A [p1: para 1(i), (ii)].
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- 156 Exhibit 544, Statement of Martin Reason, 1 September 2011, Annexure MJR-7 [p3: para 100].
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- 157 Exhibit 544, Statement of Martin Reason, 1 September 2011, Annexure MJR-6, Attachment A [p1: para 1(iv)].
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- 158 Exhibit 883, Document number 6, Common expert reading list A, Brisbane, Sinclair Knight Merz, Brisbane River Flood Study: Further Investigation of Flood Frequency Analysis Incorporating Dam Operations and CRC-Forge rainfall estimates – Brisbane River (Final), 18 December 2003 [p5].
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- 159 Exhibit 883, Document number 2, Common expert reading list A, Brisbane, Sinclair Knight Merz, City Design – Flood Modelling Services, Recalibration of the Mike11 Hydraulic Model and Determination of the 1 in 100 AEP Flood Levels, 5 February 2004 [p11].
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- 160 Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p29: para 116]. See also [p63: para 232].
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- 161 Exhibit 952, Transcript of Interview – Commission Staff with Barry Ball, 7 November 2011 [p43-44].
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- 162 Exhibit 947, Statement of Gavin Blakey, 4 November 2011 [p15: para 61].
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- 163 Exhibit 947, Statement of Gavin Blakey, 4 November 2011 [p19-21: para 77-86]; Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4837: line 1]; Transcript, Barry Ball, 10 November 2011, Brisbane [p4904: line 3].
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- 164 Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4838: line 29].
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- 165 Transcript, 26 October 2011, Brisbane [p4388-4389, 4397-4401].
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- 166 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4397: line 39]. See Transcript, 26 October 2011, Brisbane [p4397-4401].
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- 167 Transcript, Sharmil Markar, 26 October 2011, Brisbane [p4398: line 15]; Transcript, Neil Collins, 26 October 2011, Brisbane [p4398: line 46]; Transcript, Drew Bewsher, 26 October 2011, Brisbane [p4399: line 16].
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- 168 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4397: line 49].
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- 169 Transcript, Drew Bewsher, 26 October 2011, Brisbane [p4399: line 27].
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- 170 Transcript, Neil Collins, 26 October 2011, Brisbane [p4398: line 25]; Transcript, Michael Leonard, 26 October 2011, Brisbane [p4401: line 16]; Transcript, Erwin Weinmann, 26 October 2011, Brisbane [p4400: line 24].
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- 171 Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4840: line 5].
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- 172 Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4838-4843].
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- 173 See section 2.6.3, above.
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- 174 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p4-5: para 14-15].
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- 175 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p11: para 23].
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- 176 Ipswich City Council, Submission No. 2, 28 April 2011 [p54: para 18.6(b)-(c)].
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- 177 Exhibit 883, Document number 1, Common expert reading list A, Ipswich, WMWater, Supplementary Report – Ipswich Flood Frequency Analysis (Final Report), October 2011 [p12: para 26].
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- 178 Exhibit 883, Document number 1, Common expert reading list A, Ipswich, WMWater, Supplementary Report – Ipswich Flood Frequency Analysis (Final Report), October 2011 [p12: para 26]. The chief executive officer of Ipswich City Council gave evidence that that section of Mr Babister's report was accurate: Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p11: para 23].
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- 179 Exhibit 883, Document number 1, Common expert reading list A, Ipswich, WMWater, Supplementary Report – Ipswich Flood Frequency Analysis (Final Report), October 2011 [p12: para 26].
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- 180 Second Submission of Ipswich City Council, 28 April 2011 [p38-39: para 14.8]; Babister's Bremer Report [p12: para 27]; [p14: para 33, Table 1].
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- 181 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p14: para 37].
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- 182 See *Resolution*, above and Exhibit 1017, Statement of Carl Wulff, 8 November 2011, Annexure CCW-3 [p1].
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- 183 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p17: para 51]; Annexure CCW-10; Annexure CCW-14.
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- 184 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p16: para 45].
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- 185 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p15-18: para 44-52]; [p21: para 63].
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- 186 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p22: para 65].
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- 187 Exhibit 1017, Statement of Carl Wulff, 8 November 2011, Annexure CCW-1 [p1].
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- 188 Exhibit 1017, Statement of Carl Wulff, 8 November 2011, Annexure CCW-1 [p2].
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- 189 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p8: para 21(c)].
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- 190 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p8: para 21(c)].
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- 191 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p9: para 21(d)].
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- 192 Exhibit 883, Document number 1, Common expert reading list A, Ipswich, WMWater, Supplementary Report – Ipswich Flood Frequency Analysis (Final Report), October 2011 [p14: Table 1].
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- 193 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p9: para 21(e)]; Annexure CCW-1 [p9].
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- 194 Exhibit 1017, Statement of Carl Wulff, 8 November 2011, Annexure CCW-23.
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- 195 Exhibit 1017, Statement of Carl Wulff, 8 November 2011, Annexure CCW-23.
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- 196 Exhibit 883, Document number 1, Common expert reading list A, Ipswich, WMWater, Supplementary Report – Ipswich Flood Frequency Analysis (Final Report), October 2011 [p17: para 38-39].
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- 197 Exhibit 883, Document number 1, Common expert reading list A, Ipswich, WMWater, Supplementary Report – Ipswich Flood Frequency Analysis (Final Report), October 2011 [p17: para 39].
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- 198 See section *2.3.5 A comprehensive study of the Brisbane River catchment*.
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- 199 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p19: para 55].
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- 200 Exhibit 1017, Statement of Carl Wulff, 8 November 2011, Annexure CCW-7 [p8]. See also Annexure CCW-20.
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- 201 Exhibit 1017, Statement of Carl Wulff, 8 November 2011, Annexure CCW-7 [p8].
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- 202 Sargent Consulting, Ipswich Rivers Flood Study Rationalisation Project: Phase 3 – “Monte Carlo” Analysis of Design Flows (Final Report) [p18-19].
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- 203 Exhibit 1017, Statement of Carl Wulff, 8 November 2011 [p7: para 19].
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- 204 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p7].
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- 205 Exhibit 992, Submission of RACQ – Flood Mapping [p1]; Exhibit 993, Submission Local Government Association of Queensland [p1]; Exhibit 994, Submission of Insurance Council of Australia – Flood Mapping [p1]; Exhibit 995, Submission of Ipswich City Council – Flood Mapping [para 3.2]; Exhibit 919, Submission of Commonwealth Government – Flood Mapping [p2: para 10]. It is also supported in the Queensland Reconstruction Authority draft guidelines *Planning for stronger, more resilient floodplains: Part 2 - Measures to support floodplain management in future planning schemes*, which was released for public consultation in January 2012.
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- 206 Exhibit 996, Submission Four of Brisbane City Council [p12]; Exhibit 917, Submission of State of Queensland – Flood Mapping [p4]; Exhibit 992, Submission of RACQ – Flood Mapping [p1]; Exhibit 994, Submission of Insurance Council of Australia – Flood Mapping [p1]; Exhibit 993, Submission of Local Government Association of Queensland [p1]; Exhibit 995, Submission of Ipswich City Council – Flood Mapping [para 1.2(b), 3.1, 37].
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- 207 Exhibit 917, Submission of State of Queensland – Flood Mapping [p4]; Exhibit 993, Submission from Local Government Association – Flood Mapping [p4]; Exhibit 996, Submission Four of the Brisbane City Council [p12].
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- 208 Exhibit 996, Submission Four of Brisbane City Council [p12]; Exhibit 995, Submission of Ipswich City Council – Flood Mapping [para 3.9].
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- 209 Transcript, Russell Cuerel, 5 October 2011, Brisbane [p3708: line 50]; Exhibit 728, Statement of Russell Cuerel, 14 September 2011 [p5: para 8(b)].
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- 210 Transcript, Russell Cuerel, 5 October 2011, Brisbane [p3702: line 10].
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- 211 Exhibit 919, Submission of the Commonwealth Government – Flood Mapping [p3: para 16]; Exhibit 917, Submission of the State of Queensland – Flood Mapping [p6].
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- 212 Exhibit 917, Submission of the State of Queensland [p6].
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- 213 Exhibit 917, Submission of the State of Queensland – Flood Mapping [p6]; Exhibit 919, Submission of the Commonwealth Government – Flood Mapping [p3-4: para 24].
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- 214 Exhibit 919, Submission of the Commonwealth Government – Flood Mapping [p5: para 33]; Exhibit 917, Submission of the State Government – Flood Mapping [p8]; Exhibit 534, Statement of Gary Mahon, 8 September 2011 [p24: para 119; p25: para 120].
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- 215 Exhibit 534, Statement of Gary Mahon, 8 September 2011 [p24-25: para 119-120].
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- 216 Exhibit 917, Submission of the State of Queensland – Flood Mapping [p4-5]. Since this submission was received, the Queensland Reconstruction Authority has released, for public consultation, a draft guideline *Planning for stronger, more resilient floodplains: Part 2 - Measures to support floodplain management in future planning schemes*. At page 5 it indicates that, while the Queensland Government's position is that responsibility for flood mapping should rest at the local level, there is a significant role for regional planning committees to oversee and co-ordinate at the catchment level.
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- 217 Correspondence from Queensland Government, 29 February 2012.
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- 218 Exhibit 993, Submission of the Local Government Association of Queensland – Flood Mapping [p3]; Exhibit 994, Submission of the Insurance Council of Australia – Flood Mapping [p1: para 2.1]; Exhibit 995, Submission of Ipswich City Council – Flood Mapping [para 3.7]; Exhibit 992, Submission of RACQ Insurance – Flood Mapping [p1-2].
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- 219 Exhibit 995, Submission of Ipswich City Council – Flood Mapping [para 3.7]; Exhibit 993, Submission of Local Government Association of Queensland [p3]; Exhibit 994, Submission of the Insurance Council of Australia – Flood Mapping [p1: para 2.1]; Exhibit 992, Submission of RACQ Insurance – Flood Mapping [p1-2].
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- 220 Exhibit 993, Submission of Local Government Association of Queensland [p3-4].
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- 221 Transcript, Julie McLellan, 9 November 2011, Brisbane [p4812: line 41]; Exhibit 951, Transcript of Interview – Commission Staff with Barry Ball, 28 October 2011 [p2].
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- 222 Transcript, Barry Ball, 10 November 2011, Brisbane [p4899: line 42]; Exhibit 951, Transcript of Interview – Commission Staff with Barry Ball, 28 October 2011 [p2-3].
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- 223 Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4827: line 17]; Exhibit 951, Transcript of Interview – Commission Staff with Barry Ball, 28 October 2011 [p2].
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- 224 Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4835: line 47].
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- 225 See Exhibit 951, Transcript of Interview – Commission Staff with Barry Ball, 28 October 2011 [p5-6].
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- 226 See also the statement in the independent review panel terms of reference Exhibit 883, Document number 1, Common expert reading list A, Brisbane, Independent Review Panel (Russell Mein, Colin Apelt, John Macintosh, Erwin Weinmann), Review of Brisbane River Flood Study: Report to the Brisbane City Council. See Transcript, Gavin Blakey, 9 November 2011, Brisbane [p4834: line 12].
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- 227 See Exhibit 951, Transcript of Interview – Commission Staff with Barry Ball, 28 October 2011 [p7].
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- 228 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4387: line 51]; Transcript, Michael Leonard, 26 October 2011, Brisbane [p4388: line 7].
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- 229 See, for further information about the limitations of models, section 16.14 *The effect of releases from Wivenhoe Dam on flooding in the Brisbane River*.
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- 230 See Exhibit 951, Transcript of Interview – Commission Staff with Barry Ball, 28 October 2011 [p10].
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- 231 Transcript, Barry Ball, 10 November 2011, Brisbane [p4905: line 14].
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- 232 Transcript, Mark Babister, 26 October 2011, Brisbane [p4362: line 9].
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- 233 Transcript, Mark Babister, 26 October 2011, Brisbane [p4362: line 32; p4363: line 7].
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- 234 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p6: para 17]; Exhibit 882, Joint Expert Statement of the Bremer River Flood Frequency Panel, 25 October 2011 [p7: para 19].
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- 235 Transcript, Erwin Weinmann, 26 October 2011, Brisbane [p4415: line 23]; Transcript, Colin Apelt, 26 October 2011, Brisbane [p4416: line 20].
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- 236 See also: Transcript, Mark Babister, 26 October 2011, Brisbane [p4415: line 14].
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- 237 Transcript, Erwin Weinmann, 26 October 2011, Brisbane [p4415: line 23]; Transcript, Mark Babister, 26 October 2011, Brisbane [p4415: line 6]; Transcript, Colin Apelt, 26 October 2011, Brisbane [p4416: line 20].
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- 238 Transcript, Drew Bewsher, 26 October 2011, Brisbane [p4415: line 47].
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- 239 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4417: line 16].
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- 240 See [www.ga.gov.au/flood-study-search](http://www.ga.gov.au/flood-study-search).
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- 241 Inquiry into flood insurance and related matters, September 2011, [www.ndir.gov.au/content/report/downloads/NDIR\\_final.pdf](http://www.ndir.gov.au/content/report/downloads/NDIR_final.pdf), recommendation number 25.
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- 242 See section *2.3.2 A comprehensive study of the Brisbane River catchment*, above.
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- 243 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p6: para 18].
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- 244 Transcript, Sharmil Markar, 26 October 2011, Brisbane [p4420: line 26].
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- 245 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4417: line 38]. See also Exhibit 995, Ipswich City Council – Flood Mapping Submission, 4 November 2011 [para 3.22].
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- 246 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p6: para 17].
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- 247 Exhibit 919, Submission of the Commonwealth Government – Flood Mapping [p6: para 39]; Exhibit 917, Submission of State of Queensland – Flood Mapping [p8-9]; Exhibit 993, Submission of Local Government Association of Queensland – Flood Mapping [p5].
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- 248 Exhibit 996, Brisbane City Council – Flood mapping submission Four dated 4 November 2011 [p14]; Exhibit 992, Submission of RACQ – Flood Mapping [p3].
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- 249 Transcript, Rory Nathan, 26 October 2011, Brisbane [p4363: line 1-10].
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- 250 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p xv].
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- 251 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p27, 36]; Emergency Management Australia, *Manual 19 - Managing the Floodplain*, 1999 [p xiii, xiv].
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- 252 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p14].
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- 253 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p14-15].
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- 254 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p57].
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- 255 Exhibit 966, Report of Paul Grech, *Report to Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, 15 October 2011 [p51]; Submission of Colin Apelt, 7 November 2011 [p2].
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- 256 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p24]; Exhibit 968, *Floodplain Development Manual: the management of flood liable land* [p14]. Similarly, the New South Wales Government's *Floodplain Development Manual* provides that the State Government's role in floodplain management encompasses policy and legislative support, the provision of specialised technical advice, the provision of emergency management and financial assistance through a subsidised program of floodplain risk management works and measures. See also National Flood Risk Advisory Group, *Flood Risk Management in Australia: Vision, Objectives and Guidance*, printed in *The Australian Journal of Emergency Management*, Vol. 23, No. 4 [p24].

- 257 Exhibit 961, Statement of Drew Bewsher, 9 November 2011 [p1].
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- 258 Council has submitted that it has spent approximately \$870 million on flood-related planning, mitigation, awareness and response initiatives since 2004: Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p34-35: para 139].
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- 259 Exhibit 946, Statement of Julie McLellan, 4 November 2011, Annexure JAM-12.
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- 260 Exhibit 299, Statement of Gordana Petroccitto, 3 May 2011, Attachment GP-02.
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- 261 Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p36: para 149].
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- 262 Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p37: para 152(d)].
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- 263 Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p43: para 168].
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- 264 Initial Submission of Brisbane City Council [p12]; Exhibit 946, Statement of Julie McLellan, 4 November 2011 [para 163].
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- 265 Initial Submission of Brisbane City Council [p10]; Exhibit 946, Statement of Julie McLellan, 4 November 2011 [para 164].
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- 266 Exhibit 1020, Statement of Evan Pardon, 20 October 2011, Attachment 2].
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- 267 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p14]; Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effect of Flood*, 10 November 2011 [p28: para 5.3.4].
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- 268 For the full list of planning schemes see the Department of Local Government and Planning website: [www.dlgp.qld.gov.au/local-area-planning/local-government-planning-schemes.html](http://www.dlgp.qld.gov.au/local-area-planning/local-government-planning-schemes.html).
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- 269 Exhibit 538, Statement of Brendan Nelson, 15 September 2011, Attachment BJN-13 [p12].
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- 270 Exhibit 538, Statement of Brendan Nelson, 15 September 2011, Attachment BJN-13.
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- 271 Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effect of Flood*, 10 November 2011 [p28: para 5.3.4].
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- 272 Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effect of Flood*, 10 November 2011 [p29: para 5.4.6]; Exhibit 917, Submission of the State of Queensland – Flood Mapping [p4]. See also the public consultation draft guideline *Planning for stronger, more resilient floodplains: Part 2 - Measures to support floodplain management in future planning schemes*, at page 11.
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- 273 Transcript, Gary White, 7 November 2011, Brisbane [p4608: line 12]; Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effect of Flood*, 10 November 2011 [p28: para 5.4.5].
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- 274 Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effect of Flood*, 10 November 2011 [p29: para 5.4.9-5.4.10].
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- 275 A town planner consulted by the Commission suggested some of these criteria. See Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effect of Flood*, 10 November 2011 [p28: para 5.3.4; p29: para 5.4.8-5.4.10; p30: para 5.6.2].
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- 276 State Planning Policy 1/03: *Mitigation the Adverse Impacts of Flood, Bushfire and Landslide* [p16: para A3.2].
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- 277 Exhibit 966, Report of Paul Grech, *Report to Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, 15 October 2011 [p10: para 7.14]; State Planning Policy 1/03: *Mitigation the Adverse Impacts of Flood, Bushfire and Landslide* [p16: para A3.2]; Exhibit 962, Report of Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p10: para 18]; Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p75].
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- 278 Exhibit 966, Report of Paul Grech, *Report to Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, October 2011 [p7: para 7.3].
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- 279 Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effects of Flood*, 10 November 2011 [p19: para 4.1.5]; Exhibit 966, Report of Paul Grech, *Report to Queensland Floods Commission of Inquiry*, October 2011 [p7: para 7.3; p8: para 7.10; p10: para 7.14]; Exhibit 881, Joint Expert Statement

- of the Brisbane River Flood Frequency Panel, 25 October 2011 [p4: para 10]; Exhibit 882, Joint Expert Statement of the Bremer River Flood Frequency Panel, 25 October 2011 [p4: para 10]; Exhibit 971, Drew Bewsher and John Maddocks, Do we need to consider floods rarer than 1% AEP?, 2003 [p1, 4-5]; Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p18-9].
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- 280 Transcript, Steve Reynolds, 11 November 2011, Brisbane [p4954: line 50]; Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effect of Flood*, 10 November 2011 [p18: para 4.1.4 – p19: para 4.1.5].
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- 281 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p73].
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- 282 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p33: A2.11; p35: A2.19].
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- 283 Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effects of Flood*, 10 November 2011 [p30: para 5.6.2]; Exhibit 962, Report of Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p24: para 79]; Exhibit 966, Report of Paul Grech, *Report to the Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, 15 October 2011 [p28: para 13.7 - p30: para 13.8].
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- 284 Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effect of Flood*, 10 November 2011 [p20: para 4.3.3]; Exhibit 966, Report of Paul Grech, *Report to the Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, 15 October 2011 [p19: para 10.5].
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- 285 Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effect of Flood*, 10 November 2011 [p28: para 5.3.4]; Transcript, Greg Vann, 11 November 2011, Brisbane [p4990: line 1–15]; Exhibit 966, Report of Paul Grech, *Report to the Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, 15 October 2011 [p20: para 10.7].
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- 286 Trevor Johnson, Cardno, *Flooding Behaviour*, 11 November 2011 [p3-4].
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- 287 Transcript, Steve Reynolds, 11 November 2011, Brisbane [p4955: line 48].
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- 288 Exhibit 962, Report of Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p24: para 79]; Exhibit 966, Report of Paul Grech, *Report to Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, 15 October 2011 [p20: para 10.7]; Transcript, Paul Grech, 11 November 2011, Brisbane [p4971: line 15].
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- 289 Exhibit 966, Report of Paul Grech, *Report to Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, 15 October 2011 [p20: para 10.7].
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- 290 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p71].
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- 291 Exhibit 962, Report of Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p24: para 76].
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- 292 Exhibit 1020, Statement of Evan Pardon, 20 October 2011, Attachment 2.
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- 293 Exhibit 962, Report of Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011, Appendix C [p6].
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- 294 Transcript, Steve Reynolds, 11 November 2011, Brisbane [p4955: line 13]; Exhibit 962, Report of Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p22: para 68]; Transcript, Greg Vann, 11 November 2011, Brisbane [p4990: line 3].
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- 295 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p16: para A3.1-A3.2].
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- 296 Transcript, Steve Reynolds, 11 November 2011, Brisbane [p4955: line 18]; Exhibit 962, Report of Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p25: para 80].
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- 297 Report of Trevor Johnson, 11 November 2011 [p4-5].
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- 298 Exhibit 927, Statement of Steven Jacoby, 17 October 2011 [p2: para 12].
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- 299 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p35-36: para A2.23].
- 300 For a description of what constitutes a flood frequency analysis, see section 2.3.2 *A comprehensive flood study of the Brisbane River catchment*; Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effect of Flood*, 10 November 2011 [p22; para 4.5.4 – 4.5.5].
- 301 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p35: para A2.23].
- 302 Ordered drainage data is a stream classification system used to determine a hierarchy of streams. Once this data set is overlaid on the map, it is possible for DERM officers to select the stream orders, or drainage lines, to include on the Interim Floodplain map. (Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p13: para 256(d)].
- 303 Generally 10 metre contours. More accurate contours are used, if they are available. Exhibit 927, Statement of Steven Jacoby, 17 October 2011, Attachment SKJ-11 [p7].
- 304 Exhibit 927, Statement of Steven Jacoby, 17 October 2011, Attachment SKJ-11.
- 305 Transcript, Steven Jacoby, 8 November 2011, Brisbane [p4726: line 1; p4727: line 51]; Transcript, Brendan Nelson, 19 September 2011, Brisbane [p2819: line 40].
- 306 Transcript, Steven Jacoby, 8 November 2011, Brisbane [p4729: line 1].
- 307 Exhibit 927, Statement of Steven Jacoby, 17 October 2011, Attachment SKJ-11 [p8: para 9].
- 308 Transcript, Brendan Nelson, 19 September 2011, Brisbane [p2823: line 40]; Transcript, Brendan Nelson, 20 September 2011, Brisbane [p2833: line 55].
- 309 Transcript, Brendan Nelson, 19 September 2011, Brisbane [p2817: line 44; p2821: line 1]; Transcript, Brendan Nelson, 20 September 2011, Brisbane [p2830: line 30]; Transcript, Brendan Nelson, 8 November 2011, Brisbane [p4706: line 15].
- 310 Transcript, Brendan Nelson, 19 September 2011, Brisbane [p2820: line 19; p2821: line 28; p2823: line 28]; Transcript, Brendan Nelson,
- 20 September 2011, Brisbane [p2829: line 46; p2831: line 1; p2831: line 24; p2836: line 43].
- 311 Exhibit 925, Supplementary Statement of Brendan Nelson, 21 October 2011 [p7: para 229]; Statement of Brendan Nelson, 30 November 2011 [p28: para 495; p29: para 501].
- 312 Third statement of Brendan Nelson, 30 November 2011 [p14: para 431].
- 313 Transcript, Robert Fredman, 13 October 2011, Gympie [p4064: line 3].
- 314 Transcript, Brendan Nelson, 19 September 2011, Brisbane [p2823: line 45].
- 315 Transcript, Brendan Nelson, 19 September 2011, Brisbane [p2823: line 45].
- 316 Transcript, Brendan Nelson, 19 September 2011, Brisbane [p2819: line 26; p2820: line 9]; 20 September 2011, Brisbane [p2834: line 39]; Exhibit 927, Statement of Steven Jacoby, 17 October 2011, Attachment SKJ-11 [p11]; Statement of Brendan Nelson, 30 November 2011 [p25: para 481]. See also Temporary State Planning Policy 2/11: *Planning for stronger, more resilient floodplains*, November 2011 [p20-21].
- 317 Exhibit 999, Statement of Paul Bawden, 13 October 2011 [p2: para 4]; Exhibit 998, Statement of Phil Berling, undated [p2: para 4]; Exhibit 766, Statement of Andrew Fulton, 6 October 2011 [p2: para 3.1].
- 318 Exhibit 926, Supplementary Statement of Brendan Nelson, 21 October 2011, Attachment BJJ-43 [p8].
- 319 *Planning for stronger, more resilient floodplains: Part 1 - Interim measures to support floodplain management in existing planning schemes* [p9].
- 320 Exhibit 927, Statement of Steven Jacoby, 17 October 2011 [p4: para 22; p7: para 37].
- 321 Transcript, Brendan Nelson, 8 November 2011, Brisbane [p4707: line 54].
- 322 Exhibit 966, Report of Paul Grech, *Report to Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, October 2011 [p22: para 10.10].
- 323 Exhibit 962, Report of Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p26-27: para 91]; Transcript, Steve Reynolds, 11 November 2011, Brisbane [p4959: 21].

- 324 The Guidelines to the State Planning Policy suggest that care should be taken when using such information to make a determination about flood risk. See, State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p36: para A2.25].
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- 325 Exhibit 962, Report of Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p27: para 91(d)]; Transcript, Steve Reynolds, 11 November 2011, Brisbane [p4959: line 30].
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- 326 Exhibit 966, Report of Paul Grech, *Report to Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, October 2011 [p22: para 10.12].
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- 327 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p36: para A2.25 – p37: para A2.26].
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- 328 Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effect of Flood*, 10 November 2011 [p28: para 5.4.4]; Exhibit 917, Submission from the State of Queensland regarding Flood Mapping [p4].
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- 329 See: Queensland Floods Commission of Inquiry, *Interim Report*, Chapters 3 - 6, 2011 [p 112 - 227].
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- 330 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p36: para B.4; p59: para H.1].
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- 331 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p99].
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- 332 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p17].
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- 333 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p17].
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- 334 Emergency Management Australia, Manual 19 - Managing the Floodplain, 1999 [p3: para 10].
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- 335 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p18-19, 69].
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- 336 Report on the Environmental Scan into a National Approach to Flood Modelling, June 2011 [p5: para 21].
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- 337 Exhibit 37, Statement of James Davidson, 4 April 2011, JD-1 [p8: para 46].
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- 338 Exhibit 37, Statement of James Davidson, 4 April 2011, JD-1 [p772: para 1].
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- 339 For a more detailed discussion of the Bureau's flood predictions and warnings during the 2010/2011 floods, see Queensland Floods Commission of Inquiry, *Interim Report*, 2011, Section 4.2.
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- 340 Exhibit 404, Statement of Ken Morris, 3 May 2011 [p13: para 3.1-p15: para 3.14].
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- 341 Exhibit 404, Statement of Ken Morris, 3 May 2011 [p15: para 3.10].
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- 342 Exhibit 854, Statement of Carl Wulff, 13 October 2011 [p6: para 40].
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- 343 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, Section 4.1.2 [p135].
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- 344 Exhibit 917, Submission of the State of Queensland – Flood Mapping [p9]; Exhibit 994, Submission of Insurance Council of Australia – Flood Mapping [p4: para 8.1]; Exhibit 996, Submission Four of Brisbane City Council [p13, 16].
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- 345 Arnison, P, Gotterson, R, Apelt, C, Independent Review of Brisbane City Council's Response to the January 2011 Flood [p18]; Exhibit 736, Statement of Jeanenne Wilkinson [p14: para 70, 71]; Transcript, Mark Middendorp, 21 September 2011, Brisbane [p2956: line 55].
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- 346 Exhibit 965, Report of Greg Vann, *Planning Aspects of Alternative Approaches to Mapping the Effect of Flood*, 10 November 2011 [p18: para 4.1.2]; Exhibit 561, Statement of Peita McCulloch, 15 September 2011 [p3: para 5]; Transcript, Peita McCulloch, 20 September 2011, Brisbane [p2880: line 37]. See also: Queensland Floods Commission of Inquiry, *Interim Report*, 2011, Section 4.1.2 [p135].
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- 347 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, Section 4.1.2 [p135].

- 348 For the purposes of generating the January 2011 Brisbane River flood level for the Brisbane City Council FloodWise Property Report, information was derived from the Queensland Reconstruction Authority maps. See Brisbane City Council, 'FloodWise Property Report', [www.brisbane.qld.gov.au/community/community-safety/disasters-and-emergencies/types-of-disasters/flooding/understanding-your-flood-risk/floodwise-property-report/index.htm](http://www.brisbane.qld.gov.au/community/community-safety/disasters-and-emergencies/types-of-disasters/flooding/understanding-your-flood-risk/floodwise-property-report/index.htm), accessed 22 January 2011.
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- 349 Not all sources of information are available for every lot within Brisbane City Council's jurisdiction.
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- 350 Exhibit 854, Statement of Carl Wulff, 13 October 2011 [p3: para 20].
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- 351 Exhibit 993, Submission of Local Government Association of Queensland – Flood Mapping, November [p6]; Exhibit 992, Submission of RACQ – Flood Mapping, 3 November 2011 [p5].
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- 352 Exhibit 919, Submission of the Commonwealth Government – Flood Mapping [p6: para 39].
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- 353 Transcript, 19 September 2011, Anthony Leighton [p2793: line 50]; Transcript 27 September 2011, David Dunworth [p3225: line 20].
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- 354 Section 245, *Sustainable Planning Act 2009*.
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- 355 Section 737, *Sustainable Planning Act 2009*.
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- 356 Sections 738-740, *Sustainable Planning Act 2009*.
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- 357 Conveyancing practice in Queensland is regulated by the *Property Agents and Motor Dealers Act 2000*.
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- 358 See section 52A of the *Conveyancing Act 1919* (NSW) and section 4 and schedule 1 of the *Conveyancing (Sale of Land) Regulation 2010* (NSW). These provisions provide that a seller must attach a Section 149 Property Certificate for the land the subject of the contract for sale.
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- 359 Section 52A(7), *Conveyancing Act 1919* (NSW).
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- 360 Transcript, Gary White, 7 November, Brisbane [p4628].
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- 361 Correspondence from King and Company, 24 January 2012.
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- 362 Exhibit 912, Statement of John Adams, 25 October 2011 [p12: para 38].
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- 363 The introduction of national guidelines for flood mapping was recommended in the Natural Disaster Insurance Review report. See: Natural Disaster Insurance Review, Inquiry into Flood Insurance and related matters, Recommendation 25, September 2011, [www.ndir.gov.au/content/report/downloads/NDIR\\_final.pdf](http://www.ndir.gov.au/content/report/downloads/NDIR_final.pdf), accessed 22 January 2011.
- 
- 364 Transcript, Mark Babister, 26 October 2011, Brisbane [p4373: line 11].
- 
- 365 Transcript, Mark Babister, 26 October 2011, Brisbane [p4373: line 25].
- 
- 366 Exhibit 919, Submission of the Commonwealth Government – Flood Mapping [p3-4: para 24].
- 
- 367 It does not represent a comprehensive approach to floodplain management: See Exhibit 966, Report of Paul Grech, *Report to Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, 15 October 2011 [p16: para 8.18].
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# 3

## 3 Planning framework

A number of chapters in this report make findings and recommendations about aspects of the planning framework. To give context to these findings, this chapter sets out an overview of the planning framework in Queensland.

The principal piece of planning legislation in Queensland is the *Sustainable Planning Act 2009*.<sup>1</sup> It provides for the regulation of land use planning at the state, regional and local levels through what are known as ‘planning instruments’. In essence, land use planning under the *Sustainable Planning Act* comprises two elements: the preparation of planning instruments and the assessment of applications for proposed development against the standards set out in those instruments. The Minister responsible for exercising the powers set out in the *Sustainable Planning Act 2009* is the Minister for Local Government.<sup>2</sup>

State planning instruments set out planning rules that apply across Queensland or within a region; local planning instruments set out planning rules that apply to each council area. In the event of any inconsistency, state planning instruments prevail over local planning instruments.<sup>3</sup>

State planning instruments are considered in detail in chapter 4 and local planning instruments in chapter 5.

### 3.1 State planning instruments

There are four categories of state planning instruments:<sup>4</sup>

- regional plans
- state planning regulatory provisions
- state planning policies
- the standard planning scheme provisions.

#### 3.1.1 Regional plans

For planning purposes, Queensland is divided into a number of regions; examples are far north Queensland and south-east Queensland. Separate regional plans have been prepared for each area. The first regional plan came into effect in 2005.<sup>5</sup>

Regional plans provide the framework for land use and infrastructure planning at a regional level. A regional plan sets out the ‘desired regional outcomes’ and the policy for achieving those outcomes for a particular region. The plan describes future land uses, provides for adequate infrastructure and nominates the environmental, economic and cultural resources that should be maintained or developed.<sup>6</sup>

For example, the *South East Queensland Regional Plan 2009 – 2031* establishes desired regional outcomes for three categories of land use: ‘Urban footprint’, ‘Rural living area’ and ‘Regional landscape and rural production area’. The categories relate to the expected level of development that will occur in each; as the names suggest, land in the ‘urban footprint’ is designated for urban development, ‘rural living areas’ for rural-residential development, and ‘regional landscape and rural production area’ for non-urban uses, such as agriculture and conservation.

Regional plans also identify growth centres, called ‘regional activity centres’: areas where growth is encouraged. For example, Goodna is marked as a major regional activity centre in the *South East Queensland Regional Plan 2009 – 2031*.<sup>7</sup> Regional plans are discussed in more detail in section 4.4.

Local planning instruments must be amended to reflect a regional plan.<sup>8</sup> In the absence of that amendment, development applications must be assessed against the regional plan<sup>9</sup> as well as the local planning instrument.

### 3.1.2 State planning regulatory provisions

A state planning regulatory provision is a type of planning instrument that the Minister may make,<sup>10</sup> for purposes identified in the *Sustainable Planning Act*, in relation to any area in Queensland.<sup>11</sup> State planning regulatory provisions can be used, among other things, to implement regional plans.<sup>12</sup> In that case, the state planning regulatory provision will contain the operative provisions of the regional plan setting out the rules that regulate how the regional plan is implemented in practice. It might, for example, prohibit the making of certain development applications, such as an application for urban development outside of the urban footprint.

### 3.1.3 State planning policies

State planning policies are planning instruments that are made to protect and regulate matters known as ‘state interests’.

A ‘state interest’ is defined by the *Sustainable Planning Act 2009* as ‘an interest that the Minister considers affects an economic or environmental interest of the State or a part of the State, including sustainable development; or an interest that the Minister considers affects the interest of ensuring there is an efficient, effective and accountable planning and development assessment system’.<sup>13</sup> Examples of state interests include koala conservation, management of acid sulfate soils, coastal management and the management of good quality agricultural land.

State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* is the state planning instrument most relevant to flood. It was made under the now-repealed *Integrated Planning Act 1997*, and continues as a state planning policy under the *Sustainable Planning Act 2009*.<sup>14</sup>

Councils should ensure their planning schemes reflect state planning policies. If a planning scheme does not reflect a state planning policy, the state planning policy will apply in assessing development applications,<sup>15</sup> together with the criteria in the planning scheme.

### 3.1.4 Standard planning scheme provisions

The standard planning scheme provisions, known as the ‘Queensland Planning Provisions’, are made by the Minister for Local Government. They act as template planning scheme provisions and are intended to provide a consistent structure for all planning schemes across Queensland. To that end, the Queensland Planning Provisions provide standardised definitions, zones, overlays, and development assessment codes.

More detailed information about the Queensland Planning Provisions is in section 4.3.

## 3.2 Local planning instruments

Local planning instruments regulate land use at the council level and include:<sup>16</sup>

- planning schemes
- planning scheme policies
- temporary local planning instruments.

Local planning instruments are considered in more detail in chapter 5.

### 3.2.1 Planning schemes

The planning scheme is the principal planning instrument for regulating development in Queensland. Planning schemes regulate which development must be assessed before it can be undertaken, the type of assessment required and the criteria used in an assessment.<sup>17</sup>

The process for making a planning scheme is set out in the *Sustainable Planning Act 2009* and the Statutory Guideline 01/12 *Making and amending local planning instruments*.<sup>18</sup>

The *Sustainable Planning Act* contains a list of matters that a planning scheme must address in order to provide an integrated planning policy for a council region.<sup>19</sup> However, flooding considerations are not included (or at least not expressly) in this list. When drafting planning schemes, councils must consider the ‘core matters’ listed in the Act: land use and development, infrastructure and valuable features.<sup>20</sup> Again, they do not include any explicit requirement to consider flooding. The Queensland Government Planner suggested, in evidence before the Commission, that flooding might fall within the term ‘valuable feature’<sup>21</sup> (as concerning ‘resources or areas … of ecological significance’), but that seems a rather tenuous connection. It might be argued, however, that flooding is a development constraint and thus part of the core matter of ‘land use and development’.

If there is an inconsistency between a regional plan and a planning scheme (or another planning instrument), the regional plan prevails.<sup>22</sup> Similarly, if there is an inconsistency between a state planning policy and a planning scheme (or another local planning instrument), the state planning policy prevails.<sup>23</sup>

A planning scheme regulates land use and development primarily through a system of zones, often represented as different areas on a map. Land is allocated a zone (such as a residential zone) in the planning scheme. Zoning is the principal means by which planning schemes establish the type of assessment which a development application should undergo: different rules apply to each zone. Overlay maps are also included in planning schemes; these maps depict extra information superimposed on zoning maps. The various parts of a planning scheme and how they operate are explained further in section 4.3 *Queensland Planning Provisions*; for an explanation of the development assessment process see 3.3.2 *Development assessment*.

Planning schemes prepared under the *Sustainable Planning Act* must be consistent with the Queensland Planning Provisions (the standard planning scheme provisions).<sup>24</sup> This requirement does not apply to planning schemes prepared under the repealed *Integrated Planning Act 1997*, which was the legislation in force before the *Sustainable Planning Act*. If the Queensland Planning Provisions are amended, a planning scheme made under the *Sustainable Planning Act 2009* must be amended within 90 days to reflect the change.<sup>25</sup>

In 2008, councils across Queensland were amalgamated in order to create larger local government areas. As a result, most councils are now responsible for the administration of a number of planning schemes. Each of these planning schemes is likely to be underpinned by different information and, as a result, may approach flood differently. For example, Bundaberg Regional Council administers the Kolan Shire Planning Scheme 2006, Isis Shire Planning Scheme 2007, Burnett Shire Planning Scheme 2006 and the Bundaberg Planning Scheme 2004; these planning schemes have varying standards and criteria to address flood and development.

The Queensland Government envisages that with time, and as planning schemes are reviewed,<sup>26</sup> each council will prepare a single planning scheme in accordance with the Queensland Planning Provisions to cover the whole of its area.<sup>27</sup>

### 3.2.2 Planning scheme policies

A planning scheme policy is a policy made by a council to support its planning scheme.<sup>28</sup>

Substantive planning content should be contained in the planning scheme, not the policy. The planning scheme policy supports the planning scheme by among other things:

- stating the information a council may request as part of a development application, such as a flood study
- containing standards identified in a planning scheme code, for example construction standards or flood hazard standards
- including guidelines or advice about how to satisfy assessment criteria in a planning scheme, including, for example, those relating to flooding.<sup>29</sup>

### 3.2.3 Temporary local planning instruments

A temporary local planning instrument is a tool councils can use to temporarily suspend and replace part of a planning scheme. It does not amend the planning scheme and will expire after 12 months.<sup>30</sup>

For example, after the 2010/2011 floods, the Department of Local Government and Planning worked with councils to develop temporary local planning instruments to help resolve rebuilding and development issues in flood affected areas.<sup>31</sup>

More detailed information on temporary local planning instruments is found in chapter 5 *Local planning instruments*.

## 3.3 Types of development and development assessment

### 3.3.1 Categories of development

The *Sustainable Planning Act 2009* provides for a number of categories of development:

- exempt development
- self-assessable development
- development requiring compliance assessment
- assessable development (which is further categorised into code assessable and impact assessable development)
- prohibited development.<sup>32</sup>

The category of development will determine whether the development needs to be assessed before it can be undertaken and how that assessment will occur. Each category of development is explained in more detail below.

#### Exempt development

Exempt development does not require any development approval to proceed.<sup>33</sup> It is defined in the *Sustainable Planning Act* as being a type of development that is not assessable, self-assessable or prohibited development or development requiring compliance assessment.<sup>34</sup>

The *Sustainable Planning Regulation* lists types of exempt development.<sup>35</sup> The list includes operational work that the Queensland Government is authorised to do under another state law;<sup>36</sup> an example would be the placement of fill for the purposes of building a state highway. This type of exempt development is the subject of further consideration in section 7.6 *Placement of fill in the floodplain*.

#### Self-assessable development

Self-assessable development means the person undertaking the development is responsible for ensuring that it complies with all applicable codes.<sup>37</sup> The council is not involved; it is a self-regulating process.

An example of development that may be self-assessable is the addition of a verandah to a house. This may not require a development approval but may nevertheless need to comply with requirements of a code, such as a requirement that the verandah be constructed no closer than a certain distance from the boundary of the property.

#### Development requiring compliance assessment

Development requiring compliance assessment does not require a development approval, but must be authorised by a compliance permit<sup>38</sup> granted by a council.<sup>39</sup>

This type of development concerns prescribed (usually simple) types of development in particular areas. The compliance assessment process allows councils to assess technical aspects of a development before it proceeds.

#### Assessable development

Assessable development is development for which development approval is needed before it can proceed.<sup>40</sup>

In order to obtain a development approval, the applicant submits to council<sup>41</sup> a development application that then must undergo the assessment procedure stipulated in the *Sustainable Planning Act*. This may involve ‘code assessment’, ‘impact assessment’, or both.

Code assessment involves a basic assessment of the information contained in the application against the applicable assessment criteria set out in codes in a planning scheme. The application must also be assessed against other matters specified in the Act; including any state planning instruments, such as a state planning policy.<sup>42</sup>

If an applicant meets the criteria in the codes, the council may give a development approval that authorises the development to take place.

Impact assessment applies where it is anticipated that the development may affect the surrounding area in a way that requires closer scrutiny; for example, where an industrial development is proposed in a residential area. The prospective ‘impact’ on the surrounding area means that the application is subject to more intense consideration. It must be assessed against the whole planning scheme, including not just the codes, but also broader statements of intent and policy in the planning scheme, and against other matters referred to in the *Sustainable Planning Act 2009*,<sup>43</sup> including state planning instruments. Impact assessable development is required to undergo a ‘notification stage’ (discussed further at 3.3.2).

## Prohibited development

Prohibited development is, self-evidently, development that is prohibited: no application can be made to authorise it.<sup>44</sup>

### 3.3.2 Development assessment

Applications for assessable development are generally, but not always, assessed by the responsible council.<sup>45</sup> In the usual case, the council receives an application seeking approval for a type of development, assesses and decides it. There are up to five stages in the assessment process:

- application stage
- information and referral stage
- notification stage
- decision stage
- compliance stage.

Each of these stages is described in more detail below.

The application stage involves lodging an application with the assessment manager. The application must meet certain legislative requirements in order to progress to subsequent stages.<sup>46</sup> If it does not, the assessment manager must give the applicant a notice that sets out how to fix the application so that it will meet those requirements.

The second stage is the information and referral stage. At this stage the assessment manager requests any further information necessary to complete the assessment. The application is also, at this stage, sent to ‘referral agencies’ for their assessment. Referral agencies are bodies that have an interest in some aspect of the type of development that is being considered; typically they are Queensland Government departments. For example, the Department of Transport and Main Roads may assess the traffic impacts of a development on a main road.<sup>47</sup> Referral agencies, like the assessment manager, are able to make information requests and assess certain aspects of the application.

The third stage is the notification stage, when a development application is put to the public for comment. The notification stage applies to impact assessable development. By making a submission on a development application, members of the public can secure a right to appeal the assessment manager’s decision to the Planning and Environment Court (a specialist court constituted by District Court judges).

In the decision stage, the assessment manager must decide to approve all or part of the application, approve all or part of the application with conditions, or refuse the application.

The compliance stage is only applicable to compliance assessment. Here, the decision is made whether to grant the applicant a compliance permit, the document which authorises the development.

### 3.3.3 Referral agencies

As explained earlier, referral agencies are bodies that have an interest in certain aspects of development. They include Queensland Government agencies, government owned corporations and certain private sector corporations. For example, vegetation management is overseen by the Department of Environment and Resource Management (DERM); some development applications that involve vegetation management are referred to DERM during the development assessment process for assessment and comment.

There are two types of referral agencies: concurrence agencies and advice agencies.<sup>48</sup>

Concurrence agencies have the power to direct the outcome of an application, by requiring that development conditions be imposed on any approval, or directing that the application be refused.<sup>49</sup> A concurrence agency may also ask an applicant for further information about an application.

Advice agencies provide non-binding advice to an assessment manager.<sup>50</sup> Advice agencies only provide advice in their areas of expertise; for example, the Department of Transport and Main Roads might provide advice on the impact of the development on roads, but would not comment on its impact on the electrical network.

The referral process's purpose is to streamline the development application system by allowing more than one regulatory entity to assess the development application at the one time.<sup>51</sup>

There is currently no referral agency with respect to flood.<sup>52</sup> As a part of its inquiries, the Commission considered whether a 'flood referral agency' should be established.

The Queensland Government Planner's view was that the referral of a development application to an entity set up for the purpose of assessing flooding issues would not be necessary if planning schemes contained adequate controls.<sup>53</sup> The absence of a referral trigger does not prevent a council from seeking advice from a particular Queensland Government department on an ad hoc basis.<sup>54</sup> Queensland Government departments also have an opportunity to consider the planning mechanisms proposed for a scheme as part of the procedure for making a planning scheme. This involvement is addressed in more detail in section 4.1 *State Planning Policy 1/03*.

The Commission considers that the introduction of a 'flood referral agency' would place an unnecessary burden on the development process and on Queensland Government resources.<sup>55</sup>

## (Endnotes)

- 1 The *Sustainable Planning Act 2009* replaced the now repealed *Integrated Planning Act 1997*.
- 2 Schedule, *Administrative Arrangements Order (No.2) 2011*.
- 3 Sections 19(1), 26(3), 43 and 53, *Sustainable Planning Act 2009*.
- 4 Section 15, *Sustainable Planning Act 2009*.
- 5 Exhibit 532, Statement of Gary White, 2 September 2011 [p5: para 25].
- 6 Section 28, *Sustainable Planning Act 2009*.
- 7 The State of Queensland (Queensland Department of Infrastructure and Planning), *South East Queensland Regional Plan 2009-2031*, July 2009 [p32].
- 8 Section 29(2), *Sustainable Planning Act 2009*.
- 9 Sections 313(2)(b), 314(2)(b) and 316(4)(c)(ii), *Sustainable Planning Act 2009*.
- 10 Or in some instances, the Minister jointly with another 'eligible' Minister who is responsible for administering the subject matter of the state planning regulatory provision, see: Section 20(3), *Sustainable Planning Act 2009*.
- 11 Section 20(1), *Sustainable Planning Act 2009*.
- 12 Sections 16 and 20, *Sustainable Planning Act 2009*.
- 13 Schedule 3, *Sustainable Planning Act 2009*.
- 14 Section 773, *Sustainable Planning Act 2009*.
- 15 Sections 313(2)(d), 314(2)(d) and 316(4)(c)(iii), *Sustainable Planning Act 2009*.
- 16 Section 77, *Sustainable Planning Act 2009*.
- 17 These matters are also dealt with, to a much more limited extent, in the *Sustainable Planning Regulation 2009* and in regional plans.
- 18 Section 117(1), *Sustainable Planning Act 2009*; Section 5, *Sustainable Planning Regulation 2009*.
- 19 Sections 79, 88 and 89, *Sustainable Planning Act 2009*.

- 20 Section 89, *Sustainable Planning Act 2009*.
- 21 Transcript, Gary White, 19 September 2011, Brisbane [p 2746: line 47].
- 22 Section 26(3), *Sustainable Planning Act 2009*.
- 23 Section 43, *Sustainable Planning Act 2009*.
- 24 Section 55, *Sustainable Planning Act 2009*.
- 25 Section 55(2), *Sustainable Planning Act 2009*; Exhibit 532, Statement of Gary White, 2 September 2011 [p22: para 122].
- 26 Planning schemes made under the *Integrated Planning Act 1997* are required to be reviewed every 8 years, see: Section 2.2.1, *Integrated Planning Act 1997*. Planning schemes made under the *Sustainable Planning Act 2009* are required to be reviewed every 10 years, see: Section 91, *Sustainable Planning Act 2009*.
- 27 Section 55, *Sustainable Planning Act 2009*.
- 28 Section 113, *Sustainable Planning Act 2009*.
- 29 Section 114, *Sustainable Planning Act 2009*; Exhibit 962, Humphreys Reynolds Perkins Planning Consultants, Steve Reynolds, *Flood Mapping in Queensland Planning Schemes: Recommendations for the Queensland Floods Commission of Inquiry*, 9 November 2011 [p33: para 123].
- 30 Section 104, *Sustainable Planning Act 2009*.
- 31 Exhibit 532, Statement of Gary White, 2 September 2011 [p57: para 320].
- 32 Section 231, *Sustainable Planning Act 2009*.
- 33 Section 235(1), *Sustainable Planning Act 2009*.
- 34 Section 231(2), *Sustainable Planning Act 2009*.
- 35 Schedule 4, *Sustainable Planning Regulation 2009*.
- 36 Schedule 4, Table 4, ‘By or on behalf of a public sector entity’, *Sustainable Planning Regulation 2009*.
- 37 Section 236, *Sustainable Planning Act 2009*.
- 38 Section 237, *Sustainable Planning Act 2009*.
- 39 Sometimes developments can be assessed by an agency other than a council, for example a Queensland Government department.
- 40 Section 238, *Sustainable Planning Act 2009*.
- 41 Sometimes developments can be assessed by an agency other than a council, for example a Queensland Government department.
- 42 Section 313, *Sustainable Planning Act 2009*.
- 43 Section 314, *Sustainable Planning Act 2009*.
- 44 Section 239, *Sustainable Planning Act 2009*.
- 45 In some cases the assessment manager is the chief executive of a Queensland Government department which administers relevant legislation: Section 246, *Sustainable Planning Act 2009*; Section 12 and Schedule 6, Column 2, *Sustainable Planning Regulation 2009*.
- 46 Sections 260 and 261, *Sustainable Planning Act 2009*.
- 47 By applying the provisions of the *Transport Infrastructure Act 1994* within the jurisdiction of the Department of Transport and Main Roads.
- 48 Section 252, *Sustainable Planning Act 2009*.
- 49 Section 285, *Sustainable Planning Act 2009*.
- 50 Section 291, *Sustainable Planning Act 2009*.
- 51 Clause 270, Explanatory Notes, *Sustainable Planning Bill 2009*.
- 52 Schedule 7 of the *Sustainable Planning Regulation 2009* sets out when a referral agency will be triggered to assess a development application within the terms of its jurisdiction.
- 53 Transcript, Gary White, 7 November 2011, Brisbane [p4624: lines 3-25]; Town Planning experts, Greg Vann and Steve Reynolds agreed with Mr White’s view, see: Transcript, Greg Vann, 11 November 2011, Brisbane [p4992: lines 27-50]; Transcript, Steve Reynolds, 11 November 2011, Brisbane [p4963: lines 10-32]; Similarly, town planner, Paul Grech, also says that if a competent flood risk management plan has been prepared and the recommendations of the plan are implemented the relevant agency should have had appropriate input to that process at the planning scheme preparation stage and should not normally have a role at the development application stage, see: Transcript, Paul Grech, 11 November 2011, Brisbane [p4987: lines 18-50].
- 54 Transcript, Greg Vann, 11 November 2011, Brisbane [p4992: lines 36-47].
- 55 This view is supported by the Queensland Government Planner, Gary White, and town planner, Steve Reynolds, see: Transcript, Gary White, 7 November 2011, Brisbane [p4624: lines 3-25]; Transcript, Steve Reynolds, 11 November 2011, Brisbane [p4963: lines 10-32].



# 4

## 4 State planning instruments

Because a development generally has its greatest effect on its immediate neighbourhood and the surrounding community, decisions about development and planning are appropriately made at a local level, primarily by councils.<sup>1</sup> The Queensland Government's role is at a higher level, and is played through state planning instruments. These are the means by which the Queensland Government formally articulates matters which local level planning instruments should address, and which it considers should be taken into account in the development assessment process.<sup>2</sup> The Commission has examined the state planning instruments which influence how the issue of flooding is addressed by councils: the State Planning Policy 1/03, the Queensland Planning Provisions and Regional Plans.

### 4.1 State Planning Policy 1/03

#### 4.1.1 The purpose and objectives of State Planning Policy 1/03

State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* took effect on 1 September 2003.<sup>3</sup> It records the Queensland Government's policy position that 'development should minimise the potential adverse impacts of flood, bushfire and landslide on people, property, economic activity and the environment'.<sup>4</sup>

The Queensland Government's objective in implementing State Planning Policy 1/03 was to reduce the increasing costs incurred by the community, government and the insurance industry in recovering from natural disasters.<sup>5</sup> State Planning Policy 1/03 seeks to achieve this objective, as it relates to flood, by ensuring that the natural hazard of flood is adequately considered when decisions are made about development;<sup>6</sup> that is, 'when development applications are assessed, when planning schemes are made or amended and when land is designated for community infrastructure'.<sup>7</sup>

To this end, State Planning Policy 1/03 contains 'development outcomes' relevant to the assessment of development applications,<sup>8</sup> as well as outcomes relevant to making and amending planning schemes.<sup>9</sup>

In addition to adopting State Planning Policy 1/03, the Queensland Government published the State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*. Its purpose is to 'provide advice and information on interpreting and implementing the State Planning Policy 1/03'.<sup>10</sup>

## 4.1.2 Application of State Planning Policy 1/03

### Natural hazard management areas

State Planning Policy 1/03 applies to areas identified as ‘natural hazard management areas’.

A natural hazard management area for flood is determined by measuring the extent of land which is inundated during what State Planning Policy 1/03 refers to as a ‘defined flood event’<sup>11</sup> – the flood event selected by a council to regulate development in the council’s region.<sup>12</sup> The policy expresses the Queensland Government’s position that a planning scheme’s defined flood event should, generally, be a flood with a one per cent annual exceedance probability.<sup>13</sup> However, the policy also acknowledges that a council may, subject to consultation with the Queensland Government, elect to use a flood event with a higher chance of occurring – a flood with an annual exceedance probability of two per cent, for example – to determine its natural hazard management area for flood.<sup>14</sup>

Clause 6.6 of State Planning Policy 1/03 states that until a council has determined its defined flood event and identified the area affected by that flood event in its planning scheme, State Planning Policy 1/03 ‘does not take effect for development assessment in relation to flood hazard in that locality’.<sup>15</sup> Queensland’s Government Planner accepted that this excludes State Planning Policy 1/03 from applying to development assessed in council regions that do not have a flood map.<sup>16</sup> The Department of Community Safety’s Assistant Director-General, Strategic Policy Division, explained that clause 6.6 was not intended to limit the application of State Planning Policy 1/03 by operating as an ‘opt out clause’.<sup>17</sup> However, the terms of clause 6.6 are clear: State Planning Policy 1/03 cannot apply to assessment unless a natural hazard management area for flood has been identified in a planning scheme.<sup>18</sup> And development proposals can only sensibly be assessed against the development outcomes in State Planning Policy 1/03 when land at risk from flooding has been identified.

Plainly, the application of State Planning Policy 1/03 hinges on councils’ identifying a natural hazard management area for flood. The State Planning Policy 1/03 Guideline provides information about how this is to be achieved. Best practice, according to the guideline, is for councils to prepare detailed flood studies and flood modelling for the whole of the floodplain. However, the guideline recognises that this can be expensive. Accordingly, it outlines other less costly methods – including using historical data, existing flood studies or topographical features – to determine the natural hazard management area for flood. More detailed findings and recommendations about flood studies and flood mapping are made in chapter 2 *Floodplain management*.

### The development outcomes

To achieve its objectives, State Planning Policy 1/03 contains ‘development outcomes’ relevant to the assessment of development applications,<sup>19</sup> as well as outcomes relevant to making and amending planning schemes.<sup>20</sup>

Outcomes 1 to 3 in State Planning Policy 1/03 are relevant to the regulation of development in areas at risk of flood.

The first criterion, Outcome 1, focuses on limiting development in natural hazard areas which is not ‘compatible with’ the hazard:<sup>21</sup> for present purposes, flood.

Outcome 2 in State Planning Policy 1/03 acknowledges the possibility of development occurring despite its incompatibility with flood, and focuses instead on minimising, as far as possible, the unacceptable risk to people or property.<sup>22</sup>

Outcome 3 encourages the location and design of community infrastructure so that it can function effectively during and immediately after flood events<sup>23</sup> (see 7.2 *Community infrastructure*).

The outcomes are expressed generally; more specific advice is contained in the guideline about how development can achieve the policy’s outcomes.<sup>24</sup> The guideline also contains examples of solutions that, once adapted by a council to reflect local knowledge and conditions, can be used as assessment criteria in a planning scheme,<sup>25</sup> and more detailed (although in some cases obvious) direction about how to decide appropriate land use in a floodplain. For example, open space is identified as an appropriate land use in areas with a high risk of flood, and residential uses and hospitals are appropriate in areas with a low risk of flood.

## The exception for development commitments

Where flood is the relevant natural hazard, a development will comply with Outcome 1 of State Planning Policy 1/03 when it:<sup>26</sup>

- maintains the safety of people on the development site from all floods up to and including the defined flood event
- does not result in adverse impacts on people's safety or the capacity to use land within the floodplain
- minimises the potential damage from flooding to property on the development site
- does not adversely affect public safety and the environment through the detrimental impacts of floodwater on hazardous materials manufactured or stored in bulk
- maintains the functioning of essential services infrastructure (for example, on-site electricity, gas, water supply, sewerage and telecommunications) during a defined flood event.

However there are exceptions to the application of Outcome 1 where:

- the development proposal is a 'development commitment', or
- there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal.

'Development commitment' is defined in State Planning Policy 1/03 as including any of the following:

- development with a valid preliminary approval
- a material change of use that is code assessable or otherwise consistent with the requirements of the relevant planning scheme
- a reconfiguration of a lot and/or work that is consistent with the requirements (including any applicable codes) of the relevant planning scheme, or
- development consistent with a designation for community infrastructure.<sup>27</sup>

The second limb of that definition – that 'development commitment' includes a material change of use that is code assessable or otherwise consistent with the planning scheme – is of concern. It has a broad application:<sup>28</sup> effectively, any development which is 'consistent' with the requirements of an existing planning scheme may proceed, even if the development is not 'compatible with' the flood hazard.<sup>29</sup> The definition also extends to development which is simply 'code assessable', but which is not consistent with the applicable planning scheme.<sup>30</sup>

The Queensland Government Planner agreed that 'a major proportion' of development could fall within this exception to State Planning Policy 1/03.<sup>31</sup> Consequently, the definition of development commitment does little to encourage the consideration of flooding as part of the development assessment process. However, according to the Queensland Government Planner, the way that Outcome 1 is framed – with its broad exception – is acceptable;<sup>32</sup> it is designed to protect the position of those with existing approvals for development or a clear expectation that they can develop land in a certain way.<sup>33</sup> He suggested that planning schemes were a more appropriate instrument for particularising constraints on development (such as those concerning flood risk) and thus qualifying people's expectations about what land can be used for development, and how.<sup>34</sup>

The Commission agrees generally with that position. Councils should, ideally, include flooding considerations in their planning schemes, and, where such considerations do not already exist, should change their schemes accordingly. However, under the *Sustainable Planning Act 2009*, changes to a planning scheme can, in some circumstances, give rise to a liability for payment of compensation.<sup>35</sup> Accordingly, councils may be averse to amending their schemes to include planning controls that deal with flooding because of the risk of incurring liability to pay compensation.<sup>36</sup> Section 5.5 *Compensation* sets out a more detailed discussion of the specific concerns raised by councils about their exposure to liability. As described in that section, the Commission considers that the Queensland Government, in response to these concerns, should investigate whether the compensation provisions of the *Sustainable Planning Act* are a deterrent to the inclusion of flood controls in a planning scheme and whether they ought to be amended.

The ultimate aim, however it is achieved, is for Queensland's planning framework to encourage the consideration of flooding in the assessment of development applications.

## Recommendation

- 4.1 The Queensland Government should:
- narrow the definition of ‘development commitment’ in State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* to ensure more development applications are assessed for compatibility with flood, and
  - investigate whether the compensation provisions of the *Sustainable Planning Act 2009* act as a deterrent to the inclusion of flood controls in a planning scheme and consider whether they ought be amended.

### 4.1.3 Review of State Planning Policy 1/03

It has been nearly nine years since State Planning Policy 1/03 came into effect. Like all state planning policies, it will cease to have effect after ten years. Accordingly, State Planning Policy 1/03 is being reviewed to inform the development of a new state planning policy that deals with natural hazards. The review, which is due to be completed by September 2013,<sup>37</sup> will consider matters such as:<sup>38</sup>

- the extent to which planning schemes comply with State Planning Policy 1/03<sup>39</sup>
- how flood studies should be conducted<sup>40</sup>
- whether natural hazard management areas for flood should be based on a ‘zones of risk’ approach – low, medium, and high for instance – or continue to be determined by reference to a defined flood event<sup>41</sup>
- how to take into account the Queensland Reconstruction Authority’s work, and in particular part 2 of the guideline to Temporary State Planning Policy 2/11 *Planning for stronger more resilient floodplains*<sup>42</sup>
- the recommendations made in the report Increasing Queensland’s resilience to inland flooding in a changing climate: Final report on the Inland Flooding Study, which include the following:
  - the review (of State Planning Policy 1/03) should consider whether there should be a standard method for undertaking a flood study and determining a defined flood event<sup>43</sup>
  - the review should consider developing criteria that make clear the circumstances in which it is appropriate to use a defined flood event greater than, or less than, a 1% AEP flood, as a planning control for residential development<sup>44</sup>
  - the review should consider how to improve the integration of land use planning and disaster management<sup>45</sup>
- whether there should be a department or departments responsible for monitoring whether planning schemes appropriately reflect the (next) state planning policy that deals with flood<sup>46</sup> and include a flood map derived from an adequate flood study<sup>47</sup>
- the recommendations of the Queensland Floods Commission of Inquiry.<sup>48</sup>

The Commission endorses consideration being given to the issues identified in the review of State Planning Policy 1/03. In the nine years that have passed since its advent, there have been significant developments in land planning and, in particular, in the technology available to conduct flood studies to determine what land is susceptible to flooding.<sup>49</sup> The review of State Planning Policy 1/03 is a valuable opportunity to consider these developments so as to determine the best approach to measuring flood risk and crafting the most appropriate land planning controls.<sup>50</sup> Chapter 2 *Floodplain management* contains a detailed discussion about of the matters surrounding the completion of flood studies, flood maps and floodplain management plans.

### 4.1.4 State interest review of planning schemes

The state interest review process is the mechanism by which the Queensland Government determines whether planning schemes incorporate the outcomes set out in state planning policies. It represents the Queensland Government’s principal opportunity to ensure that State Planning Policy 1/03 is appropriately reflected in planning

schemes.<sup>51</sup> Given the objective of State Planning Policy 1/03 is to ensure that flooding is adequately considered in decisions about development, achieving that outcome is important.

The process is set out in Statutory Guideline 01/12: *Making and amending local planning instruments*.<sup>52</sup> This guideline took effect on 16 January 2012 and replaces Statutory Guideline 02/09: *Making and amending local planning instruments*.

## Steps in the process

The state interest review process includes the steps described below.

### *Planning scheme preparation*

The council prepares a proposed planning scheme or amendment.<sup>53</sup> Under the new guideline, a council is required to consult with relevant Queensland Government agencies while preparing a proposed planning scheme.

### *First state interest review*

Once a proposed planning scheme has been prepared, it is submitted to the Department of Local Government and Planning for the ‘first state interest review’.<sup>54</sup> At this stage, the council is required to provide a report about the extent and outcomes of any consultation undertaken with Queensland Government agencies, and about how the planning scheme reflects all relevant state planning instruments. The Department of Local Government and Planning provides the proposed planning scheme to Queensland Government agencies and seeks comments on whether state interests are affected.<sup>55</sup>

As part of the first state interest review, the Department of Community Safety is expected to assess whether a planning scheme appropriately reflects State Planning Policy 1/03.<sup>56</sup> As the department responsible for disaster management – including natural hazards – it is the Queensland Government agency whose interests are articulated in State Planning Policy 1/03. It provides its comments to the Department of Local Government and Planning, which collates the remarks of all Queensland Government agencies to forward to the council for response.<sup>57</sup> The Department of Local Government and Planning then attempts to resolve any matters about which the council and the Queensland Government agencies do not agree.<sup>58</sup>

The Department of Local Government and Planning then prepares a briefing note to the Minister detailing key matters of state interest raised in the review process and any outstanding issues to be considered by the Minister.<sup>59</sup> Having considered whether any state interests are adversely affected, the Minister advises the council either that it:

- can commence public notification of the proposed planning scheme or amendment (with or without conditions imposed by the Minister), or
- cannot proceed further.<sup>60</sup>

### *Public notification*

The period for public notification is 30 business days.<sup>61</sup> After considering all properly made submissions, the council may choose to incorporate changes arising out of submissions received during the public notification period.

Alternatively, it may proceed with no changes, or not proceed at all.<sup>62</sup>

### *Second state interest review*

The Minister receives the council’s proposed planning scheme (which may or may not be amended as a result of public notification) and considers whether a second state interest review is required. If so, this review is limited to matters such as those which have already been identified during the first review, or matters that have arisen out of changes made to the proposed scheme subsequent to the first review.<sup>63</sup> The second state interest review is more targeted; comments are only sought from agencies affected by any unresolved matters, or any new ones.<sup>64</sup>

As with the first state interest review, the Department of Local Government and Planning collates the remarks of Queensland Government agencies, provides them to the council for response, and attempts to resolve any issues still outstanding.<sup>65</sup>

Finally, the Minister is briefed with information about the key state interests that have been raised by Queensland Government agencies, and those that remain outstanding.<sup>66</sup> The Minister then makes a decision about whether the council may adopt the proposed planning scheme or amendment (with or without conditions), and advises the council accordingly.<sup>67</sup> If the Minister advises that the proposed planning scheme or amendments may be adopted, the Minister must also advise which state planning instruments, including state planning policies (or parts of state planning policies), are reflected in the proposed planning scheme or amendment.<sup>68</sup>

#### 4.1.5 The role of the Department of Local Government and Planning

Under the State Planning Policy 1/03 Guideline, the role of the Department of Local Government and Planning is to review proposed planning schemes, or proposed amendments, to ensure that the outcomes sought by State Planning Policy 1/03 are achieved.<sup>69</sup>

The Minister for Local Government is also the responsible Minister for the purposes of the state interest review process. Ultimately, it is the Minister for Local Government who decides whether a planning scheme can be declared to appropriately reflect State Planning Policy 1/03. Accordingly, it is also the Minister (and by extension the Department of Local Government and Planning) who must determine what weight to afford the comments made by Queensland Government agencies as part of the state interest review process.

Determining which Queensland Government agency comments should result in the imposition of a condition requiring a council's amendment of its proposed planning scheme demands the exercise of a considerable degree of judgment.<sup>70</sup> However, the basis upon which the Department of Local Government and Planning decides whether or not to act on comments, including those of the Department of Community Safety concerning the reflection of State Planning Policy 1/03, is far from clear.

The process by which Brisbane's planning scheme, City Plan, was amended is instructive. In 2004, the state interest review process was commenced in respect of amendments to the planning scheme.<sup>71</sup> One of the proposed amendments, called amendment 'C6', sought the insertion into City Plan of a statement declaring that Brisbane's planning scheme appropriately reflected State Planning Policy 1/03.<sup>72</sup> As part of the state interest review, the Department of Community Safety requested that the reference to State Planning Policy 1/03 be deleted from the amendments; according to the department, there was insufficient 'hazard mapping' to support such a statement.<sup>73</sup> Brisbane City Council agreed to delete the reference.<sup>74</sup> Despite that agreement, the amendments to City Plan that took effect on 1 January 2006 listed State Planning Policy 1/03 as one with which the planning scheme complied.<sup>75</sup> The reinsertion of this reference appears to have been unintentional.

The Queensland Government Planner gave evidence that, in his view, Brisbane's planning scheme did in fact comply.<sup>76</sup> However, the Department of Community Safety's position remains unchanged: since the City Plan 2004 amendments were proposed, the Department of Community Safety has advised the Department of Local Government and Planning, on 16 separate occasions, that Brisbane City Council's planning scheme does not comply with State Planning Policy 1/03.<sup>77</sup> Twelve out of those 16 occasions were after the 2010/2011 floods, and in each case the advice was provided as part of the state interest review process. Despite these reiterations (many are quite recent), there is no record of the Department of Local Government and Planning giving consideration to the Department of Community Safety's advice that Brisbane's City Plan does not appropriately reflect State Planning Policy 1/03. Nor is there any record of whether the two departments have attempted to reconcile the different positions.

In 2004, the Department of Community Safety made similar comments with respect to the Emerald planning scheme; it stated that the proposed scheme did not adequately address State Planning Policy 1/03, due to the absence of flood mapping.<sup>78</sup> At the time of writing its advice, the Department understood that the (then) Emerald Council had access to at least one flood study, the Nogoa River Flood Plain Study. The department suggested that the results of this study be incorporated into the Emerald planning scheme by way of an overlay map.<sup>79</sup> The second state interest review occurred two years later, and the mapping had still not been incorporated. As it had two years prior, the Department of Community Safety advised that the results of any flood studies available to the council should inform the development of a flood hazard overlay.<sup>80</sup>

Subsequent to the state interest review process, the council adopted the Emerald planning scheme. The scheme does not appropriately reflect State Planning Policy 1/03: it does not include any flood mapping, nor does it nominate a defined flood event.<sup>81</sup> There is no evidence before the Commission to explain why the Department of Local Government and Planning, or Emerald Council, did not heed the advice of the Department of Community Safety about incorporating the results of the Nogoa River Flood Plain Study.

It is evident that the Department of Local Government and Planning does not insist, through the imposition of conditions, that every comment made by every department be incorporated into a council's planning scheme – and nor should it. However, where comments are of a substantive nature, and relate to compliance with an important state planning policy, as in the cases of Brisbane's and Emerald's planning schemes, it seems reasonable that the Department of Local Government and Planning articulate its reasons for not reflecting the Department of Community Safety's comments in conditions attached to adoption of the planning scheme, and advise the latter accordingly.<sup>82</sup>

#### **4.1.6 The role of the Department of Community Safety**

The Department of Community Safety is responsible for reviewing draft planning schemes to determine whether State Planning Policy 1/03 has been appropriately reflected and to provide advice about the implementation of the policy.<sup>83</sup> As part of this responsibility, the Department of Community Safety is expected to consult with the Department of Environment and Resource Management (DERM) to provide guidance about determining natural hazard management areas for use in planning schemes.<sup>84</sup>

The evidence suggests that the Department of Community Safety takes a reactive approach to its role.

In preparation for the Commission's public hearings, the Department of Community Safety compiled a schedule of each instance in which it had provided advice to the Department of Local Government and Planning about the appropriate reflection of State Planning Policy 1/03 in Brisbane's planning scheme.<sup>85</sup> Preparing this schedule revealed to the department that its advice was not always being taken into account.<sup>86</sup> It is of some concern that the department did not fully appreciate this fact until the Commission's public hearings.

The assistant director of the strategic policy division in the Department of Community Safety gave evidence that the department is currently reviewing its administrative processes so that it can better ascertain whether its comments are being incorporated into planning schemes.<sup>87</sup> This is encouraged. Any process that is developed should ensure that the department can readily determine what advice it has given in respect of each planning scheme, and when its advice about State Planning Policy 1/03 needs to be followed up.

#### **4.1.7 The role of DERM**

DERM also plays a role in the state interest review process. As part of this role, DERM provides advice to the Department of Community Safety about whether:<sup>88</sup>

- the proposed planning scheme has an adequate flood map. This includes an assessment of whether the map shows areas and properties which are affected. DERM does not check the accuracy of the modelling used to produce the flood map.
- the information about flooding provided in support of the proposed planning scheme accords with the information held by DERM for the area. If there is additional information, DERM will advise the council so that it can be incorporated into any flood study or map.
- the council has identified an appropriate defined flood event in its planning scheme. In particular, where the council has adopted a defined flood event lower than the 1% AEP flood, DERM will provide comments to the Department of Community Safety about the appropriateness of the nominated flood event.
- the council has taken adequate steps to appropriately reflect State Planning Policy 1/03 in its planning scheme.

According to the Department of Community Safety, DERM's contribution in respect of those matters is sought routinely as part of the state interest review process.<sup>89</sup> However, there is no record of the Department of Community Safety's requesting advice from DERM about Brisbane or Ipswich city councils' planning schemes.<sup>90</sup> This is particularly noteworthy in the case of the Brisbane planning scheme; the Department of Community Safety's central issue with that scheme is its failure to identify a defined flood event.

In providing advice about the appropriateness of a council's defined flood event, or its flood mapping, DERM relies on the professional expertise of the engineers whose flood modelling is the subject of DERM's review.<sup>91</sup> On occasion, the Department of Community Safety has asked DERM to assess the adequacy of the flood modelling done to support the selection of a defined flood event in a proposed planning scheme.<sup>92</sup> The Department of Community Safety would like DERM to provide such advice on a more regular basis. DERM resists this idea.<sup>93</sup> At present, DERM is not always able to provide the advice sought in the timeframes proposed.<sup>94</sup> Unless more resources are made available to DERM, there is little reason to think this situation will change.

The Department of Community Safety and DERM would both benefit from greater clarity about DERM's role in reviewing planning schemes' appropriate reflection of State Planning Policy 1/03. The Commission considers that DERM's expertise would be better used earlier in the process of preparing or amending a planning scheme: for example, if it were requested to help councils determine the best methodology for a proposed flood study prior to its being undertaken.

In addition, access to detailed guidelines about the conduct of flood studies and the production of flood maps would help councils prepare these components, and might reduce the need for DERM's input at a later stage.<sup>95</sup> The preparation of guidelines and the technical aspects of preparing a flood study and flood map are discussed further in chapter 2 *Floodplain management*.

## 4.1.8 Gaps identified

The Commission has identified some gaps in the process, as already described; in particular:

- When the Minister for Local Government chooses not to impose conditions reflecting comments made by the Department of Community Safety about a proposed planning scheme's compliance with State Planning Policy 1/03 before the relevant council may proceed with the planning scheme, the basis of the decision is not made clear. When this occurs, it would assist if it were articulated and the Department of Community Safety advised why the decision has been made.
- The Department of Community Safety has not been, until very recently, in a position to ascertain easily whether its comments about planning schemes reflecting State Planning Policy 1/03 are being taken into account as part of the state interest review process.
- The role of DERM in the state interest review process is unclear.

Some of the difficulties identified may be a product of the way State Planning Policy 1/03 defines each department's role: as only to 'review' or 'provide advice'.<sup>96</sup> The policy does not contemplate a monitoring role, or that any department be responsible for taking steps to encourage compliance with State Planning Policy 1/03.

Whether there should be a single department, or a number of departments, with responsibility for monitoring councils' compliance with State Planning Policy 1/03, or the adequacy of councils' flood studies and flood mapping, is a policy decision to be made by the Queensland Government.<sup>97</sup> There is value in having different departments involved, each providing advice on matters within its area of expertise.<sup>98</sup> On the other hand, a single department might be charged with the task of ensuring planning schemes reflect State Planning Policy 1/03.<sup>99</sup> As noted in section 4.1.3, this is a topic being considered as part of the review of State Planning Policy 1/03 which is currently on foot.<sup>100</sup> The Commission endorses consideration being given to the issue by the Queensland Government. In the meantime, the gaps which the Commission has identified should be addressed.

## Recommendations

- 4.2 If, as part of a state interest review process, the Department of Local Government and Planning decides that no condition should be imposed requiring a council's proposed planning scheme to incorporate the effect of the Department of Community Safety's comments about State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, it should advise the Department of Community Safety of the reasons for its decision.
- 4.3 The Department of Community Safety should put in place administrative arrangements which ensure it can readily ascertain whether its comments are being reflected in council planning schemes. If the Department of Community Safety becomes aware that its comments are not being adequately addressed, it should take steps to follow this up with the Department of Local Government and Planning.
- 4.4 The Queensland Government should ensure that the circumstances in which the Department of Community Safety is to consult the Department of Environment and Resource Management about a planning scheme's flood modelling and flood mapping are clear.

## 4.2 Temporary state planning policy

A temporary state planning policy can suspend or affect the operation of an existing state planning policy, but does not amend it.<sup>101</sup> It operates for a maximum of 12 months, at which point the existing state planning policy will resume operation if, in the meantime, it has not been amended or replaced.

Following the 2010/2011 floods, the Queensland Government through the Queensland Reconstruction Authority released a draft Temporary State Planning Policy 2/11: *Planning for stronger, more resilient floodplains*.<sup>102</sup> This temporary state planning policy, which commenced on 14 November 2011,<sup>103</sup> affects the operation of State Planning Policy 1/03 by suspending the operation of paragraphs A3.1 and A3.2.<sup>104</sup> In consequence, until 14 November 2012, a council can identify the natural hazard management area for flood by reference to the 1% AEP flood or by using the 'Interim Floodplain Assessment Overlay mapping' and 'Model Code' provided by the Queensland Reconstruction Authority (with amendments where a council considers them appropriate). In this way, the temporary state planning policy aims to assist councils to identify the natural hazard management area for flood and to develop planning controls to regulate assessable development within the natural hazard management area.

### 4.2.1 Mapping referred to in the temporary state planning policy

The interim floodplain assessment overlay mapping is a series of maps released by the Queensland Reconstruction Authority that a council may choose to incorporate in a planning scheme together with an associated code to regulate development.<sup>105</sup>

The Queensland Government Planner described the interim floodplain assessment overlay mapping as representing 'work in progress'; it was, he said, useful as an interim measure.<sup>106</sup> However, he recognised this difficulty: Temporary State Planning Policy 2/11 encourages councils to adopt the interim map by way of a permanent amendment to their existing planning schemes or as part of a new planning scheme. As planning schemes are only required to be reviewed every 10 years, there is a risk that the temporary state planning policy may encourage councils to use the interim maps produced by the Queensland Reconstruction Authority as their final position on flood. The Queensland Government Planner acknowledged this risk: a result which was unintended.<sup>107</sup> A more detailed assessment of the adequacy of the interim maps is at chapter 2 *Floodplain management*.

### 4.2.2 The Model Code provided by the Queensland Reconstruction Authority

Temporary State Planning Policy 2/11 does not permit the use of the mapping alone, instead requiring councils to use the interim floodplain assessment overlay mapping together with the Model Code.<sup>108</sup> This approach is curious, given the temporary state planning policy is not intended to be used for development assessment processes; it has not suspended the development assessment provisions of State Planning Policy 1/03.<sup>109</sup>

The Model Code forms Schedule 1 to the Queensland Reconstruction Authority's *Planning for stronger, more resilient floodplains: Part 1 – Interim measures to support floodplain management in existing planning schemes*. As that document identifies, it includes interim planning scheme measures supporting the mapping.<sup>110</sup>

The Model Code was based on the principles of State Planning Policy 1/03, particularly the specific outcomes in Annex 4, as well as flood mitigation provisions in existing local planning instruments such as Brisbane City Council's Temporary Local Planning Instrument 1/11 and the Rockhampton Regional Council's planning scheme. The Department of Local Government and Planning, including Building Codes Queensland, and the Department of Community Safety also contributed to the development of the Model Code.<sup>111</sup>

At its outset, the Model Code explains that it applies to assessable development involving land wholly or partly within the areas identified on floodplain maps. The code goes on to state that it is a 'Queensland Planning Provisions-compliant code'. A more detailed explanation of the Queensland Planning Provisions is at section 4.3 *Queensland Planning Provisions*.

Should a council elect to amend its planning scheme to incorporate the interim floodplain assessment overlay mapping together with the Model Code (in their original form or amended for local conditions), it will apply in place of the development assessment provisions of State Planning Policy 1/03. As already identified in respect of the mapping, this, too, may have the result of entrenching provisions that are clearly intended to reflect the Queensland Government's interim position.

The interim nature of the provisions is apparent from the authority's guideline: it explains that '[a]s an interim solution, Part 1 does not offer a comprehensive solution for managing new or existing development in floodplain areas'.<sup>112</sup> It intends to include in Part 2 guidance on incorporating floodplain management principles and processes into future planning schemes.<sup>113</sup> A draft of Part 2 was released for public consultation on 23 January 2012. The Commission commends the consistent approach to floodplain management proposed by the authority.

### 4.2.3 Reflecting the Temporary State Planning Policy in planning schemes

Any council that chooses to amend its planning scheme to make it consistent with the temporary state planning policy would risk the amendments' being inconsistent with, or not 'appropriately reflect[ing]' the Queensland Government's longer term policy position. The Commission is concerned at the prospect of diverting limited council resources into the making of permanent planning scheme amendments which may, after 12 months, no longer represent the Queensland Government's preferred approach to planning for floodplains.

The Commission considers, given the 'interim' nature of the Model Code, together with the Queensland Government's intention to finalise Part 2 of the authority's guideline, that the Temporary State Planning Policy 2/11 should be changed to remove the option for councils to use the interim floodplain assessment overlay mapping and the Model Code as part of a permanent amendment to their existing planning schemes or as part of new planning schemes.

Part 1 of the Queensland Reconstruction Authority's guideline notes a council may use a temporary local planning instrument to give effect to the temporary state planning policy, but indicates that this is not the preferred approach.<sup>114</sup>

In contrast, the Queensland Government Planner gave evidence that it would be appropriate for the temporary state planning policy to be given effect as part of a temporary local planning instrument, rather than as a permanent amendment to a planning scheme.<sup>115</sup> The Commission agrees with the Queensland Government Planner. It is not appropriate for councils to incorporate interim planning measures in permanent planning schemes, particularly where the interim measures give effect to state policy which is subject to revision after 12 months.

## Recommendation

- 4.5 The Queensland Government should change Temporary State Planning Policy 2/11: *Planning for stronger more resilient floodplains* to remove the possibility of councils' using the interim floodplain assessment overlay mapping and Model Code as part of a permanent amendment to their existing planning scheme or as part of a new planning scheme.

## 4.3 Queensland Planning Provisions

Under the *Integrated Planning Act 1997*, now repealed, there were no requirements about the structure planning schemes should take, and little guidance about content. The *Sustainable Planning Act 2009* changes this by permitting the Minister for Local Government to make standard planning scheme provisions,<sup>116</sup> known as the 'Queensland Planning Provisions', that provide:

- a consistent structure for all new planning schemes
- both mandatory and optional provisions, including some provisions that can be adapted by councils to reflect local conditions within their region.<sup>117</sup>

If the Queensland Planning Provisions are amended, a planning scheme made under the *Sustainable Planning Act* must be amended to reflect the change.<sup>118</sup> Questions of compensation do not arise where a planning scheme is amended to reflect a mandatory component of the Queensland Planning Provisions.<sup>119</sup>

### 4.3.1 History of the Queensland Planning Provisions

Version 1.0 of the Queensland Planning Provisions became available on the commencement of the *Sustainable Planning Act* on 18 December 2009. On 4 October 2010, following further consultation with the public and interested parties, version 2.0 of the Queensland Planning Provisions was released. The consultation period on the latest draft (version 3.0) was carried out between 28 October 2011 and 25 November 2011.<sup>120</sup> This version is proposed to be released in early 2012.<sup>121</sup>

While existing planning schemes were not required to be changed on the advent of the *Sustainable Planning Act*,<sup>122</sup> councils are required to ensure new planning schemes are consistent with the Queensland Planning Provisions.<sup>123</sup>

The Commission is only aware of one council, the Toowoomba Regional Council, which has ready for adoption a planning scheme using the Queensland Planning Provisions template.<sup>124</sup> However, many other councils are preparing draft planning schemes following the template and are in the consultation stage with Queensland Government departments.<sup>125</sup>

### 4.3.2 Structure of the Queensland Planning Provisions

The Queensland Planning Provisions contain a number of elements that can be used to promote the consideration of flooding in planning schemes. These are explained below.

The Queensland Planning Provisions are made up of two parts, or modules: Module A (Planning Scheme Structure) and Module B (Drafting Instructions).

Module A sets the structure each council in Queensland must replicate when adopting a new planning scheme. It contains both mandatory and optional provisions.<sup>126</sup>

Module B contains instructions for drafting planning schemes and provides 'standard suites' from which optional components may be drawn for insertion into the Module A structure.<sup>127</sup> For example, councils have an option whether or not to include a layer in their schemes known as a 'development constraint category overlay'. This involves using a map to identify land which should be subjected to additional planning controls in response to certain factors, such as flooding. However, if a council elects to include this layer of detail in its planning scheme, it may only use overlays which are provided within Module B. This allows councils to choose the level of detail most appropriate for their planning schemes, while still ensuring a level of consistency throughout Queensland.<sup>128</sup>

There are a number of mechanisms within the Queensland Planning Provisions that allow for flooding considerations to be addressed in planning schemes. They are explained below.

## Assessment criteria

‘Assessment criteria’ are the provisions in a planning scheme that establish the outcomes sought for self-assessable development, assessable development and development requiring compliance assessment.<sup>129</sup> Assessment criteria include ‘overall outcomes’, ‘performance outcomes’ and ‘acceptable outcomes’.<sup>130</sup>

Overall outcomes are outcomes that achieve the purpose of the code.

Performance outcomes must meet the overall outcomes and purpose of the code and are the detailed requirements with which a development must comply.

Acceptable outcomes are suggested ways a development may comply with the performance outcome. When a development complies with an acceptable outcome, it is deemed to comply with the performance outcome. Accordingly, care must be taken when drafting assessment criteria to ensure compliance with an acceptable outcome in fact achieves the related performance outcome.

## Zones

The first layer of information in a planning scheme is ‘zones’.

All land within a planning scheme area<sup>131</sup> is mapped into zones, which are used by councils to give a general indication of the type of land use that is preferred in a particular location. The preference is indicated, in part, through the use of ‘tables of assessment’ for each zone, which prescribe for each land use the level of assessment that must be undertaken if a development application is made for that use.

Module B of the Queensland Planning Provisions provides a list of zones from which councils may choose. There are five categories: residential,<sup>132</sup> centre,<sup>133</sup> recreation,<sup>134</sup> industry<sup>135</sup> and other.<sup>136</sup>

According to the Queensland Planning Provisions, each zone chosen by a council is to have a corresponding zone code within the planning scheme. Each zone code must include a mandatory purpose statement, an additional purpose statement and overall outcomes that achieve the purpose of the code.<sup>137</sup>

The mandatory purpose statement for each zone code is already contained within the Queensland Planning Provisions. The additional purpose statement is to be drafted by a council to refine the general mandatory statement to reflect the local context.<sup>138</sup> The Queensland Planning Provisions provide a list of suggested overall outcomes for inclusion in a council’s zone code.<sup>139</sup> However, a council may formulate its own.

For most zones, a suggested overall outcome addressing flooding considerations is included. The Commission identified a number of inconsistencies in the overall outcomes that address flooding,<sup>140</sup> but they have been rectified in the new draft of the Queensland Planning Provisions (version 3.0). These improvements should be retained in the latest version of the Queensland Planning Provisions.

Although nothing prevents a council from drafting its own overall outcomes addressing flooding, the Commission’s view is that the model provisions promote consistency, ease the drafting burden on councils and ensure that flooding is not overlooked during development assessment. This view is discussed further in section *5.1.1 Model flood planning controls*.

The zone code may also include ‘performance outcomes’ and ‘acceptable outcomes’ (described above).<sup>141</sup> The Queensland Planning Provisions do not stipulate any model performance or acceptable outcomes within the zone codes. It is up to the council to draft these.

Within the ‘other’ zones category, the Queensland Planning Provisions provide for a ‘limited development (constrained land)’ zone. The purpose of this zone is to identify land known to be significantly affected by one or more factors, such as flooding, so as to impose ‘severe restrictions on the ability of the land to be developed for urban purposes’.<sup>142</sup>

Councils may find it useful to adopt this zone for parts of council regions that are susceptible to severe and frequent floods.<sup>143</sup> That would encourage proper consideration of the types of development appropriate for such areas.

## Recommendation

- 4.6 Councils should consider using the limited development (constrained land) zone in their planning schemes for areas that have a very high flood risk.

## Overlays

A further layer of information in a planning scheme is an ‘overlay’.

An overlay in a planning scheme is used to identify areas that are affected by a particular constraint or areas that present opportunities for development.<sup>144</sup> This layer of information is generally presented on an overlay map and accompanied by an overlay code. Overlays prevail over most other elements of the planning scheme.<sup>145</sup>

An overlay may change the level of assessment<sup>146</sup> to be undertaken for a particular type of development application.<sup>147</sup> For example, the use of land in the ‘general residential’ zone for a house might ordinarily be code assessable, unless it is designated on an overlay map as subject to flooding, in which case it may be required to undergo impact assessment.

The Queensland Planning Provisions recommend that overlays rarely be used as a mechanism for changing the level of assessment,<sup>148</sup> to ensure planning schemes remain user-friendly.<sup>149</sup> However, the Commission considers it may be appropriate to do so where the land has a high risk of flood,<sup>150</sup> particularly for sensitive developments such as child care centres and aged care facilities.

The Queensland Planning Provisions provide a list of standard overlays from which councils may choose.<sup>151</sup>

Councils are not required to use all overlays and may propose additional overlays to address or reflect a particular local circumstance, provided the overlays do not duplicate or conflict with the overlays in the list.<sup>152</sup>

The overlays listed in the ‘development constraints category’ include a ‘flood hazard’ overlay. This overlay deals with areas of land identified by councils as subject to State Planning Policy 1/03.<sup>153</sup> The flood hazard overlay currently provides for the mapping of both ‘flooding and inundation’ and ‘overland flow paths’.<sup>154</sup>

As councils are afforded the flexibility to choose which overlays are included in their planning scheme, the adoption of an overlay depicting flood hazard is optional, even where a council has the relevant flood mapping information available.

The Queensland Planning Provisions allow assessment criteria for overlays to be contained within an overlay map, overlay code, zone code or local plan code.<sup>155</sup> The most recent draft of the Queensland Planning Provisions (version 3.0) provides that the assessment criteria for an overlay may only be contained within an overlay map or overlay code, omitting the reference to a zone code or local plan code.<sup>156</sup> The Commission agrees with this approach: all overlay assessment criteria should be contained in an overlay code, as opposed to any other type of code.<sup>157</sup> The Commission’s view on this point is further explored in *5.1.2 Features of the model flood planning controls*.

Where assessment criteria for an overlay are included in an overlay code, the code must include a statement articulating the purpose of the code and overall outcomes identifying how the purpose of the code can be achieved. The codes may also include specific criteria in the form of performance outcomes and acceptable outcomes.<sup>158</sup>

The Queensland Planning Provisions provide limited assistance with the content of assessment criteria for overlays, including the ‘flood hazard overlay’. Councils must draft all purpose statements and overall, performance and acceptable outcomes.

By way of an improvement, the new draft Queensland Planning Provisions (version 3.0) provides that a flood hazard overlay should apply where the development:

- increases the number of people living and working in the natural hazard management area, except where the premises are occupied on a short term or intermittent basis
- involves institutional uses where evacuating people may be difficult
- involves the manufacture or storage of hazardous materials in bulk.<sup>159</sup>

The level of guidance the Queensland Planning Provisions should provide on the content of assessment criteria is discussed further in *5.1.2 Features of the model flood planning controls*.

## Planning scheme policies

The Queensland Planning Provisions require councils to include planning scheme policies (if they have any) in schedule 4 of their planning schemes. Planning scheme policies are documents that can provide guidance to applicants and assessing authorities about how to comply with the planning scheme. A planning scheme policy must not regulate or prohibit development or the use of premises, or take the place of a policy which should be contained within the main body of the planning scheme.<sup>160</sup>

The role of a planning scheme policy is further explained in chapter 3 *Planning framework*. The Commission's recommendations as to how planning scheme policies can be used to improve the consideration of flooding in development assessment can be found in *5.3 Planning scheme policies* and *8.1.2. Site-specific flood information provided by an applicant*.

## 4.4 Regional plans

A regional plan is a state planning instrument which sets out the desired land use and development outcomes for a particular region and the ways in which those outcomes can be achieved.

The requirements of a regional plan will prevail over any state planning policy, in the event of an inconsistency.<sup>161</sup> Councils within a regional plan's geographical area must amend their planning schemes to reflect the provisions of the applicable regional plan.<sup>162</sup> Consequently, a regional plan's stipulation that land be used in a particular way – as an urban area, for example – can determine planning for the region.

The *Sustainable Planning Act 2009* sets out the elements which each regional plan must address.<sup>163</sup> The matters listed are described in general terms, such as a requirement that regional plans identify key regional environmental, economic and cultural resources to be preserved, maintained and developed.<sup>164</sup> There is, however, no reference to natural hazards, such as flooding. Regional plans are not required to reflect the contents of state planning policies, such as State Planning Policy 1/03. This means that there is currently no requirement that regional plans be prepared having regard to the flood risk of parts (or all) of a particular region. (A description of regional plans is in chapter 3 *Planning Framework*.)

There is, on the other hand, nothing to preclude the issue of flooding being addressed, and all existing regional plans do contain land use policies which articulate the need to protect development from the potential effects of natural hazards.<sup>165</sup> Nonetheless, the Commission considers it advisable that a matter of such importance in the planning process be directly addressed by statute, by way of a requirement that consideration be given to flooding when preparing or revising a regional plan.

### 4.4.1 Land use designations under the South East Queensland Regional Plan

#### Goodna as a major regional activity centre

The Commission considered Goodna's designation as a 'major regional activity centre' under the South East Queensland Regional Plan 2009-2031. About 34 per cent of the area comprising the Goodna major regional activity centre lies below the 1% AEP flood level; 42.7 per cent of that area was affected by the January 2011 floods.<sup>166</sup> Clearly, Goodna is susceptible to flooding but, as a major regional activity centre, it is nonetheless expected to accommodate significant growth in the form of commercial and residential development, public transport hubs and regional cultural and entertainment precincts.<sup>167</sup>

Ipswich City Council's City Planner indicated that there is a need in the Ipswich area for Goodna to serve as a major regional activity centre.<sup>168</sup> He said that, at present, Goodna contains enough land at low risk of flooding for it to retain its current designation and for growth to continue within the suburb.<sup>169</sup> (This, however, may not always be the case.)

The Commission does not have sufficient evidence to make any finding about the appropriateness of Goodna's designation as a major regional activity centre under the South East Queensland Regional Plan 2009-2031.

However, given the influence that a regional plan can have on development in a region, the example highlights the importance of having regard to flood risk and impact when regional plans are prepared.

## Male Road Caboolture

The South East Queensland Regional Plan has also influenced how development has occurred in the Caboolture area. Like some parts of Goodna, Male Road in the Moreton Bay Regional Council area is highly susceptible to flooding.<sup>170</sup> In 2008, as a result of concerns raised by residents about Male Road's propensity to flood, the Moreton Bay Regional Council sought to amend the Caboolture planning scheme to change the zoning of the area from residential A to rural residential.<sup>171</sup> Correspondence from the (then) Minister for Infrastructure and Planning indicates that the amendment could not proceed because the land proposed to be zoned as rural residential fell within the South East Queensland Regional Plan's 'Urban Footprint'.<sup>172</sup> The Minister advised that flooding constraints were more appropriately dealt with as part of the development assessment process.<sup>173</sup> This position conforms with the provisions of the *Sustainable Planning Act 2009* which stipulate that planning schemes must be amended to reflect regional plans.<sup>174</sup>

While the Queensland Government's advice that Male Road must remain zoned for residential use reflects the current hierarchy of planning instruments, it demonstrates the impact that regional plans can have on council level decisions about development. Again, the example reinforces the argument for the risk of flooding to be taken into account when land uses in regional plans are designated.

## Recommendation

- 4.7 The Queensland Government should consider amending the *Sustainable Planning Act 2009* to require that consideration be given to the risk of flooding in the preparation or revision of a regional plan.

## (Endnotes)

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- 1 Exhibit 532, Statement of Gary White, 2 September 2011 [p5: para 24]; Transcript, Gary White 19 September 2011, Brisbane [p2746: line 1].
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- 2 Exhibit 532, Statement of Gary White, 2 September 2011 [p5: para 24]; Transcript, Gary White 19 September 2011, Brisbane [p2746: line 1].
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- 3 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p2].
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- 4 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p3].
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- 5 Exhibit 534, Statement of Gary Mahon, 13 October 2011 [p3: para 12]; Transcript, Gary Mahon, 19 September 2011, Brisbane [p2778: line 25].
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- 6 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p3: para 1.1].
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- 7 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p5: para 4.7].
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- 8 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, 2003 [p5: para 6.1].
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- 9 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, 2003 [p8-9: Outcomes 4, 5 and 6].
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- 10 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, 2003 [p1: para 1.1].
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- 11 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, Annex 3 [p16: para A3.2].
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- 12 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p10: para 9.1].
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- 13 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, Annex 3 [p16: para A3.2].
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- 14 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, Annex 3 [p16: para A3.2].
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- 15 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p6: para 6.6].

- 16 Transcript, Gary White, 19 September 2011, Brisbane [p2747: line 10]; Transcript, Gary White, 19 September 2011 [p2767: line 40]; Exhibit 532, Statement of Gary White, 2 September 2011 [p29: para 152].
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- 17 Transcript, Gary Mahon, 19 September 2011, Brisbane [p2782: para 25]; Exhibit 534, Statement of Gary Mahon, 2 September 2011 [p18: para 91].
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- 18 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p6: para 6.6].
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- 19 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p5: para 6.1].
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- 20 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p8-9: Outcomes 4, 5 and 6].
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- 21 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p6: Outcome 1].
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- 22 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p7: Outcome 2].
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- 23 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p8: Outcome 3].
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- 24 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p10-20].
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- 25 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p23: para 7.16; p53-59].
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- 26 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p6: para 6.8; p18].
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- 27 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p10: para 9.1].
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- 28 Transcript, Gary White, 7 November 2011, Brisbane [p4629: line 18].
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- 29 Transcript, Gary White, 7 November 2011, Brisbane [p4629: line 25]; Transcript, John Adams, 28 October 2011, Brisbane [p4584, lines 11-55].
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- 30 Transcript, John Adams, 28 October 2011, Brisbane [p 4584, line 11].
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- 31 Transcript, Gary White, 7 November 2011, Brisbane [p4629: line 30].
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- 32 Transcript, Gary White, 7 November 2011, Brisbane [p4630: line 5].
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- 33 Transcript, Gary White, 7 November 2011, Brisbane [p4629: line 39; p4629: line 51 – p4630: line 1].
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- 34 Transcript, Gary White, 7 November 2011, Brisbane [p4630: line 5].
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- 35 Chapter 9, part 3 of the *Sustainable Planning Act 2009* outlines the circumstances in which a change to a planning scheme may trigger compensation.
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- 36 Transcript, John Adams, 28 October 2011, Brisbane [p4585: line 3]; Transcript, Gary White, 7 November 2011, Brisbane [p4631: line 9 – p4632: line 18].
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- 37 Section 45, *Sustainable Planning Act 2009*; Exhibit 534, Statement of Gary Mahon, 2 September 2011 [p19: para 98].
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- 38 Exhibit 534, Statement of Gary Mahon, 8 September 2011 [p20: para 99].
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- 39 Exhibit 534, Statement of Gary Mahon, 8 September 2011 [p20: para 99(a)].
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- 40 Exhibit 534, Statement of Gary Mahon, 8 September 2011 [p20: para 99(c)].
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- 41 Exhibit 534, Statement of Gary Mahon, 8 September 2011 [p20: para 99(d)].
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- 42 Exhibit 534, Statement of Gary Mahon, 8 September 2011 [p21: para 105-106].
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- 43 Exhibit 534, Statement of Gary Mahon, 8 September 2011, GLM-39 [p8].
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- 44 Exhibit 534, Statement of Gary Mahon, 8 September 2011, GLM-39 [p8].
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- 45 Exhibit 534, Statement of Gary Mahon, 8 September 2011, GLM-39 [p9].
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- 46 Transcript, Gary Mahon, 19 September 2011, Brisbane [p2778: line 21].
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- 47 Transcript, Gary Mahon, 19 September 2011, Brisbane [p2777: line 25].
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- 48 Exhibit 534, Statement of Gary Mahon, 8 September 2011 [p21: para 104].
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- 49 This was discussed by the Brisbane River Expert Panel in relation to the availability of Monte Carlo analysis: Transcript, 26 October 2011 [p4388: line 14, p4397: line 22 – p4401: line 26]. For more general observations see: Transcript, Neil Collins, 26 October 2011, Brisbane [p4398: line 38 – p4400: line 6].

- 50 Transcript, Gary White, 19 September 2011, Brisbane [p2765: line 31]; Transcript, Greg Vann, 11 November 2011 [p4990: lines 9-18].
- 51 It is not the only opportunity. The Minister can, whenever he or she pleases, direct a council to give effect to a state interest. See section 126(1) *Sustainable Planning Act 2009*. However, the Minister has rarely used this power.
- 52 The Minister is entitled to make guidelines that assist the administration of the *Sustainable Planning Act 2009* (section 759(1), *Sustainable Planning Act 2009*).
- 53 Statutory Guideline 01/12: *Making and amending a local planning instrument*, 16 January 2012 [p7: para 2.1].
- 54 Statutory Guideline 01/12: *Making and amending a local planning instrument*, 16 January 2012 [p9: para 4.1A].
- 55 Exhibit 532, Statement of Gary White, 2 September 2011 [p12].
- 56 Exhibit 532, Statement of Gary White, 2 September 2011 [p12].
- 57 Exhibit 532, Statement of Gary White, 2 September 2011 [p12].
- 58 Exhibit 532, Statement of Gary White, 2 September 2011 [p12].
- 59 Statutory Guideline 01/12: *Making and amending a local planning instrument*, 16 January 2012 [p12-13: para 6.2-6.3].
- 60 Statutory Guideline 01/12: *Making and amending a local planning instrument*, 16 January 2012 [p13: para 6.3].
- 61 Statutory Guideline 01/12: *Making and amending a local planning instrument*, 16 January 2012 [p15: para 7.2].
- 62 Statutory Guideline 01/12: *Making and amending a local planning instrument*, 16 January 2012 [p16-17: para 8.5].
- 63 Statutory Guideline 01/12: *Making and amending a local planning instrument*, 16 January 2012 [p21-22: para 10.2].
- 64 Exhibit 532, Statement of Gary White, 2 September 2011 [p13].
- 65 Exhibit 532, Statement of Gary White, 2 September 2011 [p13].
- 66 Exhibit 532, Statement of Gary White, 2 September 2011 [p13].
- 67 Statutory Guideline 01/12: *Making and amending a local planning instrument*, 16 January 2012 [p22: para 10.3].
- 68 Statutory Guideline 01/12: *Making and amending a local planning instrument*, 16 January 2012 [p22: para 10.4].
- 69 State Planning Policy 1/03 Guideline: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide, 2003 [p24: para 8.9].
- 70 Transcript, Gary White, 7 November 2011, Brisbane [p4626: line 15].
- 71 Exhibit 913, Statement of Gary White, 7 October 2011 [para 11].
- 72 Exhibit 913, Statement of Gary White, 7 October 2011, Attachment 1 [para 11].
- 73 Exhibit 913, Statement of Gary White, 7 October 2011, Attachment 4 [para 14].
- 74 Exhibit 913, Statement of Gary White, 7 October 2011, Attachment 6 [para 16].
- 75 Exhibit 913, Statement of Gary White, 7 October 2011, Attachment 21 [para 32].
- 76 Transcript, Gary White, 19 September, Brisbane [p2757: line 39].
- 77 Exhibit 918, Statement of Gary Mahon, 13 October 2011, Attachment GLM-2.
- 78 Exhibit 534, Statement of Gary Mahon, 8 September 2011, Attachment GLM-33.
- 79 Exhibit 534, Statement of Gary Mahon, 8 September 2011, GLM-33 [p2]. See also Exhibit 728, Statement of Russell Cuerel, 14 September 2011, Attachment RKC-07 [p6].
- 80 Exhibit 534, Statement of Gary Mahon, 8 September 2011, Attachment GLM-34 [p4].
- 81 Exhibit 670, Statutory declaration of Luke Lankowski, 1 September 2011 [p2: para 1.9; p3: para 2.1-2.2].
- 82 Transcript, Gary Mahon, 7 November 2011, Brisbane [p4646: line 56; p4647: line 16].
- 83 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p24: para 8.5-8.6].
- 84 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p24: para 8.7].
- 85 Transcript, Gary Mahon, 7 November 2011, Brisbane [p4644: line 30]; Exhibit 918, Statement

- of Gary Mahon, 13 October 2011, Attachment GLM-2.
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- 86 Transcript, Gary Mahon, 7 November 2011, Brisbane [p4646: line 1; p4647: line 44].
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- 87 Transcript, Gary Mahon, 7 November 2011, Brisbane [p4647: line 41].
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- 88 Exhibit 728, Statement of Russell Cuerel, 14 September 2011 [p4-5: para 8]; Transcript, Russell Cuerel, 5 October 2011, Brisbane [p3703: line 40].
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- 89 Transcript, Gary Mahon, 7 November 2011, Brisbane [p4650: line 25].
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- 90 Transcript, Russell Cuerel, 5 October 2011, Brisbane [p3707: line 26; p3709: line 3].
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- 91 Transcript, Russell Cuerel, 5 October 2011, Brisbane [p3703: line 51-p3704: line 18].
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- 92 Transcript, Gary Mahon, 7 November 2011, Brisbane [p4652: line 31].
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- 93 Transcript, Russell Cuerel, 5 October 2011, Brisbane [p3704: line 34 – p3705: line 2].
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- 94 Transcript, Gary Mahon, 7 November 2011, Brisbane [p4652: line 40].
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- 95 Transcript, Russell Cuerel, 5 October 2011, Brisbane [p3704: line 23].
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- 96 State Planning Policy 1/03 *Guideline: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p24: para 8.5 – p25: para 8.10].
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- 97 Transcript, Gary Mahon, 7 November 2011, Brisbane [p4649: line 30].
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- 98 Transcript, Gary Mahon, 7 November 2011, Brisbane [p4648: line 54].
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- 99 Transcript, Gary Mahon, 7 November 2011, Brisbane [p4649: line 30].
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- 100 Transcript, Gary Mahon, 19 September 2011, Brisbane [p2777: line 25; line 47; p2778: line 21].
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- 101 Section 48, *Sustainable Planning Act 2009*.
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- 102 Exhibit 538, Statement of Brendan John Nelson, 15 September 2011, Attachment BJJN-10.
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- 103 Third Supplementary Statement of Brendan John Nelson, 30 November 2011 [p16: para 443].
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- 104 Paragraphs A3.1 and A3.2 in State Planning Policy 1/03 (Annex 3, Natural hazard management areas, Flood) are:
- A3.1 A natural hazard management area (flood) is land inundated by a Defined Flood Event (DFE) and identified in a planning scheme.
- A3.2 The Queensland Government's position is that, generally, the appropriate flood event for determining a natural hazard management area (flood) is the 1% Annual Exceedance Probability (AEP) flood. However, it may be appropriate to adopt a different DFE depending on the circumstances of individual localities. This is a matter that should be reviewed when preparing or undertaking relevant amendments to a planning scheme. Local governments proposing to adopt a lower DFE in their planning scheme to determine a natural hazard management area (flood) for a particular locality will be expected to demonstrate to the satisfaction of the Department of Emergency Services (DES) and the Department of Natural Resources and Mines (NR&M) that the proposed DFE is appropriate to the circumstances of the locality.
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- 105 Exhibit 538, Statement of Brendan John Nelson, Attachment BJJN-10 [p4].
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- 106 Transcript, Gary White, 7 November 2011, Brisbane [p4613: line 32].
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- 107 Mr White acknowledged that this would be an appropriate matter for amendment in the Temporary State Planning Policy: Transcript, Gary White, 7 November 2011, Brisbane [p4615: line 17].
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- 108 Exhibit 531, Temporary State Planning Policy 2/11 ‘Planning for stronger, more resilient floodplains’ [p7].
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- 109 Supplementary Statement of Brendan Nelson, 30 November 2011 [p15: para 434].
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- 110 Queensland Reconstruction Authority, *Planning for stronger, more resilient floodplains: Part 1 - Interim measures to support floodplain management in existing planning schemes* [p4].
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- 111 Supplementary Statement of Brendan Nelson, 30 November 2011 [p23: para 468].
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- 112 Queensland Reconstruction Authority, *Planning for stronger, more resilient floodplains: Part 1 - Interim measures to support floodplain management in existing planning schemes* [p4].
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- 113 Queensland Reconstruction Authority, *Planning for stronger, more resilient floodplains: Part 1 - Interim measures to support floodplain management in existing planning schemes* [p4].

- 114 Queensland Reconstruction Authority, *Planning for stronger, more resilient floodplains: Part 1 - Interim measures to support floodplain management in existing planning schemes* [p12].
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- 115 Transcript, Gary White, 7 November 2011, Brisbane [p4615: line 17].
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- 116 Section 54, *Sustainable Planning Act 2009*.
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- 117 Section 50, *Sustainable Planning Act 2009*; Queensland Planning Provisions (version 2.0), 4 October 2010, Background and usage [p4].
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- 118 Sections 55(2), 117(1), *Sustainable Planning Act 2009*. If a council fails to change their planning scheme in response to an amendment to the Queensland Planning Provisions within 90 business days, the Minister for Local Government has the power to make the changes to the planning scheme on council's behalf - section 55(3)-(6), *Sustainable Planning Act 2009*.
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- 119 Section 706, *Sustainable Planning Act 2009*.
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- 120 The Queensland Government Planner has confirmed that, subject to the consultation process, the draft Queensland Planning Provisions (version 3.0) are the Government's current way of thinking (Transcript, Gary White, 7 November 2011, Brisbane [p4618]).
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- 121 Department of Local Government and Planning, Queensland Planning Provisions, [www.dlqp.qld.gov.au/statewide-planning/queensland-planning-provisions.html](http://www.dlqp.qld.gov.au/statewide-planning/queensland-planning-provisions.html) accessed on 22 February 2012.
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- 122 Section 777, *Sustainable Planning Act 2009*.
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- 123 Section 55(1), *Sustainable Planning Act 2009*.
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- 124 It is anticipated the Toowoomba Regional Planning Scheme will commence operation in 2012 (Toowoomba Regional Council 'Final version of council's planning scheme now awaits Minister approval' [www.toowoombarc.qld.gov.au/our-region/major-projects/toowoomba-regional-planning-scheme.html](http://www.toowoombarc.qld.gov.au/our-region/major-projects/toowoomba-regional-planning-scheme.html) accessed on 23 February 2012).
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- 125 For example, Brisbane City Council, Moreton Bay Regional Council, Fraser Coast Regional Council and Somerset Regional Council. The Grantham Development Scheme, while not a planning scheme prepared under the *Sustainable Planning Act 2009*, reflects the Queensland Planning Provisions (version 2.0). It is discussed in more detail in section 11.2 *Rebuilding Grantham*.
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- 126 Queensland Planning Provisions (version 2.0), Background and usage [p4].
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- 127 Queensland Planning Provisions (version 2.0), Background and usage [p4].
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- 128 Queensland Planning Provisions (version 2.0), Background and usage [p4].
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- 129 Self assessable development, assessable development and development requiring compliance assessment are explained further in chapter 3 *Planning framework* and in the glossary.
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- 130 Draft Queensland Planning Provisions (version 3.0), Module B [p113]. Queensland Planning Provisions (version 2.0) does not include a definition of 'assessment criteria'.
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- 131 'Planning scheme area' is defined in section 82 of the *Sustainable Planning Act 2009*.
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- 132 The 'residential' zones category includes 'level 1' zones: general residential; and 'level 2' zones: residential living, residential choice, apartment residential, character residential and tourist accommodation - Queensland Planning Provisions (version 2.0), Module B [p22].
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- 133 The 'centre' zones category includes 'level 1' zones: centre; and 'level 2' zones: principal centre, major centre, district centre, local centre, neighbourhood centre, and specialised centre - Queensland Planning Provisions (version 2.0), Module B [p22].
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- 134 The 'recreation' zones category includes 'level 1' zones: recreation and open space; and 'level 2' zones: sport and recreation, and open space - Queensland Planning Provisions (version 2.0), Module B [p23].
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- 135 The 'industry' zones category includes 'level 1' zones: industry; and 'level 2' zones: low impact industry, medium impact industry, high impact industry, noxious and hazardous industry, waterfront marine industry, high technology industry, and industry investigation - Queensland Planning Provisions (version 2.0), Module B [p23].
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- 136 The 'other' zones category includes 'level 1' zones: community purposes, emerging communities, environmental management and conservation, extractive industry, innovation, limited development (constrained land), mixed use, road, rural, rural residential, and township - Queensland Planning Provisions (version 2.0), Module A [p23].
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- 137 Queensland Planning Provisions (version 2.0), Module B [p24 and 50].
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- 138 Queensland Planning Provisions (version 2.0), Module B [p24].
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- 139 Queensland Planning Provisions (version 2.0), Module B [p50].
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- 140 For example, the zones ‘residential choice’, ‘apartment residential’ and ‘character residential’ include the suggested overall outcome ‘development responds to land constraints, including but not limited to topography, bushfire and flooding constraints’. Curiously, however, no corresponding overall outcome is suggested for any other zone. These inconsistencies were acknowledged by the Queensland Government Planner - Transcript, Gary White, 19 September 2011, Brisbane [p2749 – 2752].
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- 141 Queensland Planning Provisions (version 2.0), Module B [p50].
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- 142 Queensland Planning Provisions (version 2.0), Module B [p46 , 47].
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- 143 This zone is used in the Grantham Development Scheme discussed in more detail in section 11.2 *Rebuilding Grantham*.
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- 144 The Queensland Planning Provisions state the purpose of an overlay is to address both state and local government interests by identifying areas that include one or all of the following: are sensitive to the effects of development, constrain land or development, are subject to valuable resources or present opportunities for development - Queensland Planning Provisions (version 2.0), Module B [p52]; See also exhibit 532, Statement of Gary White, 2 September 2011 [p22: para 120].
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- 145 The current version of the Queensland Planning Provisions (version 2.0) state that overlays prevail over all elements of a planning scheme , other than the strategic framework, to the extent of the inconsistency (Queensland Planning Provisions (version 2.0), Module A, Section 1.5(5)(b)); the draft Queensland Planning Provisions (version 3.0) state that overlays prevail over all elements of a planning scheme, other than the strategic framework and statewide codes, to the extent of any inconsistency, (Queensland Planning Provisions, (version 3.0) Module A, Section 1.6(3)(c)).
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- 146 Levels of development assessment are explained in chapter 3 *Planning framework*.
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- 147 Queensland Planning Provisions (version 2.0), Module A, Section 5.3.
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- 148 Queensland Planning Provisions (version 2.0), Module B [p52].
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- 149 Town planner, Steve Reynolds, says that the avoidance of using overlays to change levels of assessment promotes efficiency in the planning system. See Exhibit 962, Report of Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p32: para 114].
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- 150 This view is supported by town planner, Steve Reynolds, exhibit 962, Report of Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p32: para 114], and the Queensland Government Planner, transcript, Gary White, 7 November 2011, Brisbane [p4619].
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- 151 A standardised approach to the mapping of overlays is also provided (Queensland Planning Provisions (version 2.0), Module B, schedule 2).
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- 152 Queensland Planning Provisions (version 2.0), Module B [p52]; Exhibit 532, Statement of Gary White, 2 September 2011 [p22: para 120].
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- 153 Queensland Planning Provisions (version 2.0), Module B [p53].
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- 154 Queensland Planning Provisions (version 2.0), Module B [p53]; Exhibit 532, Statement of Gary White, 2 September 2011 [p22: para 121].
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- 155 Queensland Planning Provisions (version 2.0), Module B [p55].
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- 156 The draft Queensland Planning Provisions (version 3.0) also clarifies that where development is proposed on a lot or premises partly affected by an overlay, the assessment criteria for the overlay only relate to the part of the lot or premises affected by the overlay (draft Queensland Planning Provisions Version 3.0), Module A, Section 1.6(2)).
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- 157 Zone codes should be aimed at achieving the purpose of the zone type. Local plan codes, which provide finer grained planning at a neighbourhood or suburb level, are more appropriately used to identify heritage or amenity characteristics (see Queensland Planning Provisions (version 2.0), Module B [p51]).
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- 158 Queensland Planning Provisions (version 2.0), Module B [p56].
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- 159 Draft Queensland Planning Provisions (version 3.0), Module B [p72].
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- 160 Queensland Planning Provisions (version 2.0),  
Module B [p91].
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- 161 Section 26(3), *Sustainable Planning Act 2009*.
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- 162 Section 29(2), *Sustainable Planning Act 2009*.
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- 163 Section 28, *Sustainable Planning Act 2009*.
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- 164 Section 28(b)(iii), *Sustainable Planning Act 2009*
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- 165 Central West Regional Plan, September 2009  
[p39: para 4.4.1]; Far North Queensland  
Regional Plan 2009-2031, February 2009 [p90:  
para 4.7.1]; South West Regional Plan, August  
2009 [p31: para 4.3.4]; North West Regional  
Plan, August 2010 [p46: para 4.4.1]; Maranoa-  
Balonne Regional Plan, September 2009 [p35:  
para 4.4.1]; Wide Bay Burnett Regional Plan,  
September 2011 [p51: para 1.4.5]; South East  
Queensland Regional Plan 2009-2031, July 2009  
[p44: para 1.4].
- 
- 166 Exhibit 912, Supplementary statement of  
John Adams, 25 October 2011 [p9: para 26];  
Transcript, John Adams, 28 October 2011,  
Brisbane [p4595: line 38].
- 
- 167 South East Queensland Regional Plan 2009-  
2031, July 2009 [p97].
- 
- 168 Transcript, John Adams, 28 October 2011,  
Brisbane [p4595: line 52].
- 
- 169 Transcript, John Adams, 28 October 2011,  
Brisbane [p4595: line 52; p4596: line 1].
- 
- 170 Transcript, Lola Worthington, 26 September  
2011, Brisbane [p3116: lines 43-50; p3117:  
line 13-17]; Exhibit 614, Statement of Anthony  
Martini, 9 September 2011, Attachment  
1680907-2 [p19].
- 
- 171 Exhibit 620, Ordinary Council Meeting,  
Report of consideration of submissions to the  
draft amendments, 12 February 2008 [p389];  
Transcript, Christopher Warren, 26 September  
2011, Brisbane [p3158: lines 1-21].
- 
- 172 Exhibit 621, Letter from Paul Lucas MP, Minister  
for Infrastructure and Planning to John Rauber,  
16 October 2008 [p1].
- 
- 173 Exhibit 621, Letter from Paul Lucas MP, Minister  
for Infrastructure and Planning to John Rauber,  
16 October 2008 [p1].
- 
- 174 Section 29(2), *Sustainable Planning Act 2009*.



# 5

## 5 Local planning instruments

Councils are responsible for preparing local planning instruments and implementing planning controls at a local level. Where flooding is an issue, councils should craft their local planning instruments so that a balance is achieved between using available land for development and restricting development to ensure the safety of people and property from flooding. This chapter considers some of the challenges councils face in ensuring their local planning instruments strike this balance. Planning schemes, planning scheme policies and temporary local planning instruments are considered, together with councils' exposure to claims for compensation or damages.

### 5.1 Planning schemes

Each council in Queensland maintains a planning scheme or planning schemes for its area of responsibility. The planning scheme is the principal planning instrument against which development applications are assessed; it should include a mechanism for considering how flood might affect a development. Councils are, generally, in the best position to decide whether a development should go ahead;<sup>1</sup> they have local knowledge about past flooding events and the ability to decide whether certain uses are appropriate in a flood-affected area.<sup>2</sup>

The Queensland Government, primarily through State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, places the onus on councils to ensure flooding considerations are taken into account when planning schemes are drafted and development assessment is carried out.<sup>3</sup> Planning schemes should reflect State Planning Policy 1/03; if they do not, all development applications to which the policy applies must be assessed against both the policy and the applicable planning scheme.<sup>4</sup>

There are, presently, limits on the extent of prescription for how flooding considerations are to be taken into account in making planning schemes and assessing development:

- planning schemes are not expressly required to address flooding (this is discussed in more detail in section 3.2.1 *Planning schemes*)
- State Planning Policy 1/03 does not take effect for development assessment until a council adopts a flood event and identifies the affected area in the planning scheme<sup>5</sup> (this is discussed in more detail in section 4.1.2 *Application of State Planning Policy 1/03*)
- State Planning Policy 1/03 and the associated guideline contain only generic assessment criteria<sup>6</sup> which are not adapted to local circumstances
- there is no requirement that the assessment criteria in State Planning Policy 1/03 be incorporated into planning schemes<sup>7</sup>
- flood related assessment criteria can be dispersed throughout a planning scheme<sup>8</sup> and may vary between planning schemes

- there is no formulation for general use of the type of information about flooding that should be included in development applications.<sup>9</sup>

These limitations should be addressed by developing model flood planning controls to be included in a state planning instrument and mandating that they be incorporated into new planning schemes. Those controls would act as minimum standards to promote consistency of approach to flooding across Queensland, aiding councils in the drafting exercise they would have to undertake, while allowing councils discretion to tailor their planning schemes to accommodate local conditions.

### **5.1.1 Model flood planning controls**

Model flood planning controls could be incorporated into planning schemes through one of two mechanisms: a state planning policy dealing with flood or the Queensland Planning Provisions. (See chapter 4 *State planning instruments* for an explanation of these instruments.) The merits of these alternatives are discussed under separate headings below. The decision as to which of the two options is used should be made by the Queensland Government, in consultation with councils.

#### **State planning policy dealing with flood**

The *Sustainable Planning Act 2009* provides that a state planning policy gives expression to the Queensland Government's policy position about a matter of state interest.<sup>10</sup> Given this purpose, a state planning policy would seem an appropriate planning instrument to deliver model flood planning controls which accord with the Queensland Government's policy position, and to promote incorporation of those controls into new planning schemes.

An advantage of including the model flood planning controls in a state planning policy stems from the requirement that, if a planning scheme fails to reflect a state planning policy, development applications to which the policy applies must be assessed against the policy as well as the planning scheme.<sup>11</sup> Accordingly, any model flood planning controls contained in a state planning policy would, in the absence of their incorporation into planning schemes, still be considered in the assessment of development applications. This would ensure that the substance of the model flood planning controls had effect throughout Queensland.

However, placing the model controls in a state planning policy has a significant disadvantage: the *Sustainable Planning Act 2009* does not require councils to include the contents of state planning policies in their planning schemes. In contrast, such a requirement exists in respect of the Queensland Planning Provisions and regional plans: the *Sustainable Planning Act* provides that a council '*must ensure* each of its local planning instruments is consistent with' the Queensland Planning Provisions<sup>12</sup> and a council '*must amend* its planning scheme ... to reflect the ... region's regional plan'<sup>13</sup> (emphasis added).

For the reasons already given, model flood planning controls would still have effect even if they were not included in planning schemes. However, the result is likely to be a more complicated development assessment process; it would also mean that councils had not tailored the model controls to local conditions.

Consequently, if the decision is taken to incorporate model flood planning controls in a state planning policy dealing with flood, the *Sustainable Planning Act* should be amended to require, expressly, that new planning schemes are to reflect or be consistent with any state planning policy dealing with flood. It may be appropriate for some provisions contained within such a policy to be mandatory and for others to be optional; the model flood planning controls should be mandatory.

In addition, if the model flood planning controls are included in a state planning policy dealing with flood, the problem identified in section 4.1.2 *Application of State Planning Policy 1/03* needs to be addressed: that is, the policy should apply to all development applications, not just those in respect to land mapped in a council's planning scheme as affected by flood.

#### **Queensland Planning Provisions**

Alternatively, the Queensland Planning Provisions are a mechanism through which model flood planning controls could be incorporated into new planning schemes. Some components of the Queensland Planning Provisions are mandatory, while others are not.<sup>14</sup> If included in the Queensland Planning Provisions, the model flood planning controls should be mandatory.

As section 4.3 *Queensland Planning Provisions* explains, the Queensland Planning Provisions are designed to provide a consistent structure for planning schemes and to set out standard provisions that can be adapted according to local requirements and incorporated into planning schemes.<sup>15</sup>

One view is that any flood assessment criteria which would form part of the model flood planning controls should not be placed in the Queensland Planning Provisions, because the provisions are not designed to articulate the government's policy position about matters of state interest, but are simply meant to provide the format and structure for new planning schemes. Against that view, the *Sustainable Planning Act* expressly permits the Queensland Planning Provisions to provide 'standard provisions'. It appears to the Commission that there is no legal impediment or significant conceptual objection to the model flood planning controls' being included in the Queensland Planning Provisions.

The *Sustainable Planning Act* unequivocally requires new planning schemes to be consistent with the Queensland Planning Provisions.<sup>16</sup> Consequently, if the Queensland Government elected to include model flood planning controls in the Queensland Planning Provisions, all new planning schemes would have to be consistent with those model controls.

A disadvantage of including model flood planning controls in the Queensland Planning Provisions is that the provisions have no application to the development assessment process until they are adopted by a council into a planning scheme.<sup>17</sup> This means the controls would not take effect until a council adopted a planning scheme which was compliant with the Queensland Planning Provisions.

### **5.1.2 Features of the model flood planning controls**

The Queensland Government should address in the model flood planning controls the matters set out below. This is not necessarily an exhaustive list; the Queensland Government, in consultation with councils, the public and other interested parties, should consider if there are other matters that should also be included.

The model flood planning controls should comply with the format and structure of the Queensland Planning Provisions and be drafted so as to allow councils to adapt them to local circumstances.

#### **Flood overlay map**

A flood overlay map is a map in a planning scheme that identifies areas where flood related planning controls are imposed.

The flood overlay map should identify the areas of the council region:

- that are known not to be affected by flood
- that are affected by flood and on which the council has imposed planning controls (there may be subsets in each area to which different planning controls attach)
- for which there is no flood information available to council.

The Queensland Government should, as an aspect of model flood planning controls, require councils to include such a flood overlay map in their planning schemes.<sup>18</sup>

The Queensland Planning Provisions include some sample maps and instructions to assist councils to prepare their planning scheme maps.<sup>19</sup> Similar guidance should be included in the model flood planning controls.

At present, a number of councils in Queensland have flood maps that are not formally incorporated into their planning schemes.<sup>20</sup> Where a council has carried out the necessary flood studies, it should incorporate a flood map into its planning scheme. Instructions about how to prepare the map may assist councils to do so.

The Commission deals with the topic of what areas should be shown on a flood overlay map in section 2.7 *Flood mapping for land planning controls*.

#### **Model flood overlay code**

A flood overlay code contains planning controls used to regulate development potentially affected by flood. The application of a flood overlay code in the development assessment process is triggered by a flood overlay map. The code may affect development assessment in two ways: it may change the level of assessment and it may impose additional criteria against which the development will need to be assessed.

The model flood overlay code should comprise a consolidated set of flood related assessment criteria. That would assist in eliminating the scattering of such criteria throughout planning schemes which commonly occurs now and would provide clarity for planning scheme users. The Queensland Government Planner agrees that consolidating assessment criteria relating to flood in a single code is a useful and definitive way of imposing constraints on development within flood prone areas.<sup>21</sup>

Some planning schemes already consolidate all flood related assessment criteria into a single code: examples are the Bundaberg planning scheme<sup>22</sup> and the Ipswich planning scheme.<sup>23</sup> The Toowoomba draft planning scheme<sup>24</sup> has included a flood hazard overlay code and accompanying flood hazard overlay map. Flood related planning controls are currently dispersed throughout Brisbane's planning scheme,<sup>25</sup> but Brisbane City Council is presently preparing a flood code which will consolidate the various assessment criteria that relate to flooding.<sup>26</sup>

The model flood overlay code should include model assessment criteria that apply to the assessment of developments where there is the potential for flooding.<sup>27</sup> This will promote consistency between planning schemes. The Queensland Government Planner considers a code with model assessment criteria would alleviate the drafting burden for councils, provided local conditions are able to be taken into account.<sup>28</sup>

The assessment criteria of the model flood overlay code should be devised by the Queensland Government in consultation with councils, the public and other interested parties. They should be drafted so that they have application in the development assessment process regardless of whether a council has a flood map that identifies the areas susceptible to flooding.<sup>29</sup>

The Commission has made findings and recommendations about assessment criteria relating to:

- community infrastructure
- commercial development
- industrial uses and hazardous materials
- filling in a floodplain
- access routes
- electrical infrastructure.

These findings and recommendations are contained in chapter 7 *Development and flood considerations* and section 10.3 *Electrical infrastructure*.

The guideline *Planning for stronger, more resilient floodplains: Part 1 – Interim measures to support floodplain management in existing planning schemes*, prepared by the Queensland Reconstruction Authority contains a 'Model Code' which includes assessment criteria relating to matters such as evacuation routes, design and construction of development, hazardous materials and community infrastructure.<sup>30</sup> The authority's code is also compliant with the format and structure of the Queensland Planning Provisions.<sup>31</sup>

In addition, it would appear that the Queensland Government accepts that it should develop model flood planning controls. Since receiving the Commission's draft findings it has, on 16 January 2012, released for public consultation a draft guideline, *Planning for stronger, more resilient floodplains: Part 2 – Measures to support floodplain management in future planning schemes*. That draft guideline includes, as schedule 2, example planning scheme provisions dealing with flood. They are more extensive than those in Part 1 of the guideline. For example, they contain sample 'overall outcomes', 'performance outcomes' and 'acceptable outcomes' for the 'Limited development (constrained land) zone code'. They, like the Model Code, the example planning scheme provisions in Part 2, are also compliant with the format and structure of the Queensland Planning Provisions. (See section 4.3.2 *Structure of the Queensland Planning Provisions* for a more detailed explanation of these types of controls.)

## Model planning scheme policy

A planning scheme policy should provide guidance to applicants about the type of flooding information required to support a development application and the form in which that information should be provided.

Where the proposed development is located in an area where the likelihood of flooding is unknown, a planning scheme policy could be used to provide guidance about what further information the applicant should supply to support its application.<sup>32</sup>

The Queensland Government should include a model planning scheme policy in the model flood planning controls.

A more detailed discussion of the type of guidance councils should provide to applicants when a development is at risk of flooding is provided in section *5.3 Planning scheme policies* and section *8.1.2 Site-specific information provided by an applicant*.

## Recommendations

- 5.1 The Queensland Government should draft model flood planning controls, using a similar format and structure to that in the Queensland Planning Provisions, that councils can adapt for local conditions. The Queensland Government should require these controls to be reflected in new planning schemes. This may be achieved by including the controls in either:
  - a state planning policy dealing with flood, with an accompanying amendment to the *Sustainable Planning Act 2009*, or
  - the Queensland Planning Provisions.
 The Queensland Government should consult councils to determine which of the two state planning instruments is the more appropriate to include the model flood planning controls.
- 5.2 The Queensland Government should include in the model flood planning controls a requirement that councils have a flood overlay map in their planning schemes. The map should identify the areas of the council region:
  - that are known not to be affected by flood
  - that are affected by flood and on which councils impose planning controls (there may be subsets in each area to which different planning controls attach)
  - for which there is no flood information available to council.
- 5.3 If the Queensland Government does not include a requirement for such an overlay map in the model flood planning controls, councils should include a flood overlay map in their planning schemes. The map should identify the areas of a council region:
  - that are known not to be affected by flood
  - that are affected by flood and on which councils impose planning controls (there may be subsets in each area to which different planning controls attach)
  - for which there is no flood information available to council.
- 5.4 The Queensland Government should include in the model flood planning controls a model flood overlay code that consolidates assessment criteria relating to flood.
- 5.5 If the Queensland Government does not include such a code in the model flood planning controls, councils should include in their planning schemes a flood overlay code that consolidates assessment criteria relating to flood.
- 5.6 The Queensland Government should include in the model flood planning controls a model planning scheme policy that:
  - for development proposed on land susceptible to flooding, outlines what additional information an applicant should provide to the assessment manager as part of the development application, or
  - for development proposed on land where the potential for flooding is unknown, requires an applicant to provide:
    - as part of the development application, information to enable an assessment of whether the subject land is susceptible to flooding, and
    - upon a determination the subject land is susceptible to flooding, more detailed information, to allow an assessment of the flood risk.

- 5.7 If the Queensland Government does not include such a policy in the model flood planning controls, councils should include in their planning schemes a planning scheme policy that:
- for development proposed on land susceptible to flooding, outlines what additional information an applicant should provide to the assessment manager as a part of the development application, or
  - for development proposed on land where potential for flooding is unknown requires an applicant to provide:
    - as part of the development application, information to enable an assessment of whether the subject land is susceptible to flooding, and
    - upon a determination the subject land is susceptible to flooding, more detailed information to allow an assessment of the flood risk.

## 5.2 Temporary local planning instruments

A temporary local planning instrument is a temporary planning mechanism that a council may use to protect a planning scheme area from adverse impacts.<sup>33</sup>

A temporary local planning instrument can be made for all or part of a planning scheme area and can suspend or affect the operation of all or part of a planning scheme for up to one year.<sup>34</sup> It does not change or amend the planning scheme; rather it overrides the relevant provisions and replaces them temporarily. After the year has expired, the planning scheme will operate as it did before the temporary local planning instrument was created, unless the planning scheme has been amended within the year using the process outlined in section 5.4 *Amending planning schemes*.

The process for making a temporary local planning instrument is set out in the *Sustainable Planning Act 2009*<sup>35</sup> and Statutory Guideline 01/12: *Making and amending local planning instruments*.

In brief, a council resolves to make a temporary local planning instrument and drafts the instrument. The council then applies to the Minister for Local Government<sup>36</sup> to consider the proposed instrument against criteria set out in section 105 of the Act and to decide whether the council can adopt the proposed instrument. The Minister may approve a temporary local planning instrument only if the Minister is satisfied that:

- there is a significant risk of serious environmental harm, or serious adverse cultural, economic or social conditions happening in the planning scheme area
- the delay involved in amending the council's existing planning scheme would increase the risk
- state interests would not be adversely affected by the proposed temporary local planning instrument
- the proposed temporary local planning instrument appropriately reflects the standard planning scheme provisions.<sup>37</sup>

Unlike a major amendment to a planning scheme, the process for making a temporary local planning instrument does not involve mandatory referral to Queensland Government agencies for public consultation. This is considered justified because temporary local planning instruments are a planning solution for urgent circumstances and have only a limited period of application.

The Queensland Government Planner notes that temporary local planning instruments are adopted sparingly; they create additional layers to a planning scheme, making the scheme more difficult for the general public to use and understand.<sup>38</sup>

### 5.2.1 Interim flood regulation through temporary local planning instruments

In response to the 2010/2011 floods, some councils have adopted, or resolved to prepare, temporary local planning instruments that replace provisions in their existing planning schemes.

The Somerset Regional Council initially resolved, in June 2011, to prepare a temporary local planning instrument but it has since advised the Commission that it will instead adopt the Queensland Reconstruction Authority's Interim Floodplain Assessment Overlay and Model Code (discussed in detail in section 4.2 *Temporary state planning policy*).<sup>39</sup>

The Central Highlands Regional Council also resolved in June 2011 to prepare a temporary local planning instrument to establish an interim residential flood level for known flood affected areas in Emerald.<sup>40</sup> It proposes

that the instrument will include data obtained from the 2008 and 2010/2011 floods<sup>41</sup> and regulate development in Emerald until more detailed flood studies are completed.<sup>42</sup>

The Lockyer Valley Regional Council has prepared and adopted two temporary local planning instruments intended, respectively, to help flood-affected Grantham businesses to recover and to establish temporary premises<sup>43</sup> and to enable the start of works on land designed for new development in Grantham.<sup>44</sup> The council has also resolved to prepare a further temporary local planning instrument to respond, more generally, to an interim flood study which it has commissioned.<sup>45</sup>

Brisbane City Council and Ipswich City Council have each prepared and adopted a temporary local planning instrument following the 2010/2011 floods to provide interim planning standards for both new and existing development in areas that were affected by flood.<sup>46</sup>

Each council's temporary local planning instrument includes requirements imposed on building work within the area designated by the interim flood regulation lines. These building work requirements are unique in Queensland planning instruments. There is debate as to whether the regulation of building work should be dealt with in planning schemes at all, including in temporary local planning instruments, or whether it should be confined to the building codes created under the *Building Act 1975*.<sup>47</sup> This debate is discussed elsewhere in this report, see chapter 9 *Building controls*.

Each of the Brisbane and Ipswich city councils' temporary local planning instruments adopts an interim flood regulation line and associated development provisions which permit corresponding increases in building heights. The Brisbane interim residential flood level is the outer limit of the January 2011 flood event and the council's 'defined flood level' (that is, a flood of 3.7 metres AHD at the Brisbane City Gauge).<sup>48</sup> The Ipswich interim flood regulation line is based on the outer limit of the council's existing '1 in 100 flood line', the January 2011 flood event and known information about the 1974 flood.<sup>49</sup> The Commission endorses the adoption of these flood regulation levels as an interim form of floodplain management.

In addition, Ipswich City Council's temporary local planning instrument 01/2011 discourages the intensification of residential uses on land situated below its interim flood regulation line and identifies 'special opportunities areas' within which it reduces the assessment levels for low impact, non-residential uses to encourage a transition away from residential uses.<sup>50</sup>

The chief executive officer of Brisbane City Council has advised the Commission that an extension to the council's temporary local planning instrument is likely to be required, and would be highly desirable, to allow the council to properly consider its final response to the 2010/2011 floods and the Commission's recommendations.<sup>51</sup> The council has, however, begun drafting a full amendment to its planning scheme to reflect the changes effected by the temporary local planning instrument.<sup>52</sup>

Ipswich City Council's City Planner also gave evidence that the 12 month time limit on the life of its temporary local planning instrument presents difficulty for the council,<sup>53</sup> which is unable to complete a suitable flood study before the temporary local planning instrument expires.<sup>54</sup> The City Planner indicated that he would like the period of the temporary local planning instrument's application to be extended; but another option, he suggested, would be to fast-track an interim amendment to the council's planning scheme.<sup>55</sup>

Some urgency attaches to resolving the problems identified by Brisbane City Council and Ipswich City Council. Brisbane City Council's Temporary Local Planning Instrument 01/11 will cease to have effect on 15 May 2012; Ipswich City Council's Temporary Local Planning Instrument 01/11 on 19 June 2012.

Given those councils' concerns and the Commission's recommendations in section 2.3.2 *A comprehensive study of the Brisbane River catchment*, the question arises whether councils should be afforded an express statutory means by which to extend or remake a temporary local planning instrument dealing with interim flood regulation.

No provision of the *Sustainable Planning Act 2009* expressly allows a temporary local planning instrument to be extended beyond the 12 months time limit or 'remade' at the end of its period of application (although the Queensland Government considers that nothing prevents a council from remaking a temporary local planning instrument). Neither does Statutory Guideline 01/12: *Making and amending local planning instruments* provide a procedure for extending or remaking a temporary local planning instrument.

In the Commission's view, it would be preferable for the *Sustainable Planning Act* expressly to confer a power to extend or remake a temporary local planning instrument with the relevant process prescribed in a new iteration of Statutory Guideline 01/12. The alternative – basing the remaking of a temporary local planning instrument on an absence of prohibition in the legislation – may create uncertainty and be susceptible to changing ministerial views or to court challenge.

The Commission takes no position as to whether the power ought to be to extend or to remake a temporary local planning instrument, provided there is an attendant process of review, which can result in substantive change. Such a process is necessary to ensure the instrument's provisions:

- remain relevant
- do not duplicate or conflict with other requirements that may have been introduced during the time the original temporary local planning instrument was in effect
- take into account any information that may have become available during the time the original temporary local planning instrument was in effect.

It would seem sensible, in the Commission's view, for the process of remaking or extending a temporary local planning instrument to be permitted only where the Minister is satisfied that the circumstances listed in section 105 of the *Sustainable Planning Act 2009* still exist and that there are good grounds for the failure to make a permanent scheme amendment during the original period of operation of the temporary local planning instrument. Because the proposed process requires neither referral to Queensland Government agencies nor public consultation, the remade or extended instrument should not be given effect for more than a limited period.

## Recommendation

- 5.8 The Queensland Government should consider amending the *Sustainable Planning Act 2009* to expressly provide either a power to remake or a power to extend a temporary local planning instrument containing interim flood regulation for a further limited period. The power to remake or extend should:
- a. permit the modification of the temporary local planning instrument to the extent required to ensure its provisions remain relevant, having regard to any requirement that may have been introduced or any information that may have become available while the original temporary local planning instrument was in force
  - b. be contingent on the Minister's being satisfied that the circumstances listed in section 105 of the *Sustainable Planning Act* continue to exist and that there are proper grounds for the failure to make a permanent scheme amendment while the original temporary local planning instrument was in force.

## 5.3 Planning scheme policies

Planning scheme policies are local planning instruments that are intended to support a planning scheme and assist councils to make decisions about development applications.<sup>56</sup> Planning scheme policies may be used (among other things) to set out the information a council may request for a development application or to include guidelines or advice for applicants about satisfying assessment criteria.<sup>57</sup> (Planning scheme policies are also discussed in chapter 3 *Planning framework* and section 4.3 *Queensland Planning Provisions*.)

State Planning Policy 1/03 identifies planning scheme policies as an appropriate instrument for providing guidance about the type of information that should accompany a development application in order to address flooding considerations.<sup>58</sup> The Commission considers such guidance is best contained in a planning scheme policy as opposed to a guideline. A guideline has no binding effect, and, unlike a planning scheme policy,<sup>59</sup> may not be subject to public scrutiny before adoption.

The Commission is aware of several councils that already use planning scheme policies in this way. For example, Ipswich City Council has a planning scheme policy entitled 'Information Local Government May Request', which applies if an application involves land subject to flooding or major stormwater flows. It informs applicants that

council may request further information about matters such as depth, volume and velocity of flows across the site, the likely impact of the proposed development and areas of the site preferred for various activities.<sup>60</sup>

In addition to its planning scheme policy, Ipswich City Council has a guideline entitled Implementation Guideline No. 24 ‘Stormwater Management’. The guideline provides detailed information about what ‘flood impact assessment’ is required when the land on which a development is proposed is constrained by flooding or urban stormwater flow paths.<sup>61</sup> The guideline also provides advice about matters such as the appropriate hydrologic and hydraulic models to use, the hydraulic parameters requiring analysis and assessment, the data sources to be used and the requirements for survey and historical flood data. The guideline is further described in chapter 8 *Development assessment in practice*. For the reasons given, it would be preferable if this information were contained in a planning scheme policy rather than a guideline.

Toowoomba Regional Council’s draft planning scheme<sup>62</sup> includes a planning scheme policy entitled ‘Development Application Requirements’.<sup>63</sup> Pursuant to that policy, once the flood hazard overlay code is triggered, a site-specific ‘flood hazard assessment’ must be carried out by a suitably qualified person and provided in support of the development application.<sup>64</sup>

A report provided to the Commission by consulting hydrologists, Sinclair Knight Merz,<sup>65</sup> provides a summary of minimum<sup>66</sup> and additional<sup>67</sup> information requirements that should be included as part of all ‘flood-prone development’ applications. The report suggests that a development application should, at a minimum, show:

- existing flood levels (that is, under pre-development conditions) at the site
- impacts of the development on adjacent and upstream flood levels
- velocities at the site, with and without the development
- flood depths and velocities along evacuation route(s) from the proposed development to high ground
- the amount of floodplain storage, if any, that would be lost as a result of the development.<sup>68</sup>



*Swimming pool flooding at West End apartment block (photo courtesy Diane Robertson)*

The report proposes that a development application would provide this information with a plan (showing the site, the proposed development, ground and floor levels, and all waterways from which the site could be flooded), describe the methods and assumptions, and identify the sources of survey information, used to determine flood levels.<sup>69</sup>

Plainly, any development application should make clear the development's potential for constituting a threat to human life, property and the environment.

When drafting a planning scheme policy for inclusion in the model flood planning controls the Queensland Government should consider including the type of information requirements identified in Ipswich's planning scheme policy and implementation guideline, and in the Sinclair Knight Merz report. The model planning scheme policy should also contain a requirement that the flood risk assessment be carried out by a suitably qualified person.

Some councils administer planning scheme policies that contain substantive planning provisions, such as assessment criteria. For example, Brisbane's planning scheme is supported by the Subdivision and Development Guidelines<sup>70</sup> which stipulate that residential and non-residential subdivisions be designed so that new lots are not located on land susceptible to flooding.<sup>71</sup> Similarly, Somerset Regional Council's Planning Scheme Policy 12 'Flood Mitigation in the Lowood and Fernvale Locality' provides guidance about 'the standards Council will rely on when determining the level of flood immunity' for development in Lowood and Fernvale.<sup>72</sup>

Having regard to the role of planning scheme policies identified above, the Commission considers planning schemes policies are not the appropriate instrument to provide substantive planning content; such content should be confined to the planning scheme itself.<sup>73</sup>

## 5.4 Amending planning schemes

Planning schemes have a long life: they can remain unchanged for up to ten years.<sup>74</sup> Invariably, the behaviour of flooding will change over this period as a result of changes to the natural watercourse and the surrounding built environment, and environmental conditions such as rainfall and runoff. A planning scheme cannot reflect such changes unless its flood map is updated, but to do so requires the planning scheme's amendment.

Amendments to planning schemes are categorised as 'major', 'minor' or 'administrative'.<sup>75</sup> The time entailed in each type of amendment varies, with quite a different process for administrative amendments compared with that for major amendments.

Changes to flood maps in planning schemes are defined as major amendments. They are, as a consequence, required to undergo a period of public consultation and at least one state interest review prior to the Minister's considering whether the council may adopt the amendment.<sup>76</sup> The entire process can take around 18 months.<sup>77</sup> (See section 4.1.4 *State interest review of planning schemes* for a detailed description of the state interest review process.)

In response to a council's submission,<sup>78</sup> the Commission considered the appropriateness of requiring updates to planning scheme flood maps to be subject to this lengthy, and sometimes complex, process.

### 5.4.1 A shorter process?

It is important for development decisions to be based on the most up to date information. Ideally, planning scheme overlay maps should reflect updated flood data as that data becomes available.<sup>79</sup> But this is an unrealistic goal: it would require councils to undertake regular major amendments.

There are, however, important benefits deriving from the major amendment process. The state interest review allows Queensland Government agencies, particularly the Department of Environment and Resource Management (DERM), to review the proposed mapping and to advise councils of the existence of any additional flood studies or flood data that should be incorporated.<sup>80</sup> The public consultation process also has value. Individuals, particularly those in rural or regional areas, may have information about local flooding conditions that contradicts what is displayed on a flood map derived from a flood model (which is an artificial estimation of the potential extent of flooding). And public consultation allows anyone likely to be affected by the proposed mapping (particularly any individual whose property now falls within the mapped area) to make submissions to the council. These features of the major amendment process – public and state consultation – make the amendment process most appropriate for the introduction of new flood mapping into a planning scheme (of unmapped catchments or sub-catchments, for instance).

Nonetheless, a shortened amendment process could apply to updating *existing* flood mapping information.<sup>81</sup> The Commission considered the appropriateness of using the minor amendment process for this purpose.

A minor amendment is defined in Statutory Guideline 01/12: *Making and amending local planning instruments*. It is an amendment that the Minister is satisfied:

- reflects a current development approval, a master plan or an approval under other legislation
- includes a planning scheme policy
- reflects a change made in response to a regional plan that is applicable to the relevant council region
- reflects all or part of a state planning policy
- reflects changes to a planning scheme in response to a ministerial direction, where those changes have been subject to adequate public consultation, or
- has involved adequate consultation with the public and the state
- if in south-east Queensland, reflects changes to the planning scheme relating to water and wastewater infrastructure and services.<sup>82</sup>

Accordingly, to make a minor amendment a council must prepare the amendment and then submit it to the Minister, who determines whether he or she is satisfied that the amendment is indeed a minor one.<sup>83</sup> The minor amendment process still requires Queensland Government consultation.<sup>84</sup>

The Queensland Reconstruction Authority interim floodplain maps can be incorporated into a planning scheme by way of the minor amendment process.<sup>85</sup> The streamlined procedure is justified on the basis that the authority considers itself to have undertaken the state interest review process and the public consultation on behalf of the council.<sup>86</sup>

The Commission considers it acceptable for flood mapping information to be updated by way of a minor amendment process, provided that adequate public consultation has occurred, allowing individuals potentially affected by any proposed changes to the existing planning scheme flood map an opportunity to comment.

## *Recommendation*

- 5.9 The Queensland Government should consider allowing councils to amend a planning scheme to update existing flood mapping information by way of the minor amendment process, provided that adequate public consultation has occurred.

## 5.5 Compensation

The Commission received a number of submissions from local government concerning councils' exposure to claims for flood-related compensation or damages.<sup>87</sup> The submissions raised two distinct issues:

- the protection of councils against liability for losses arising from the provision of flood advice or from acts done, or omitted to be done, in respect of land subject to flooding
- councils' exposure to compensation claims under the *Sustainable Planning Act 2009* for a reduction in land value because of a change to the flood controls contained in a planning scheme or planning scheme policy.

### 5.5.1 Statutory immunity

Currently, councils in Queensland have no specific statutory protections in relation to the provision of flood information or decisions concerning development of flood-affected land.

The Local Government Association of Queensland has submitted that councils are concerned about the prospect of liability; for example, for losses caused by flood where rebuilding has been approved after previous flooding, even if the owner knew of the risk.<sup>88</sup>

Gold Coast City Council has raised similar concerns about liability should it publish information about possible effects of climate change, and has pointed out that the lack of legislative prescription for flood modelling may leave local government flood modelling open to challenge on a case by case basis.<sup>90</sup>

Mr Steve Reynolds, an expert planning witness engaged by the Commission, expressed the view that councils' exposure to liability presented a challenge for achieving effective flood management under the Queensland planning system.<sup>90</sup>

It is of some interest that the Natural Disaster Insurance Review has recommended that, to encourage provision of flood risk information to the public, Commonwealth, state and territory governments grant indemnities to those making it available, if it is obtained and provided in good faith and in the absence of any gross negligence.<sup>91</sup>

Both the Local Government Association of Queensland and the Gold Coast City Council contended that uncertainty about local governments' exposure to liability could be relieved by the introduction of a legislative exemption from liability for reasonably based local government decision-making.<sup>92</sup> They proposed a statutory immunity modelled on section 733 of the *Local Government Act 1993* (NSW). (The Brisbane City Council also supports the introduction of such an immunity.<sup>93</sup>)

Section 733 provides that a council does not incur any liability in respect of advice given or acts done or omitted to be done in good faith in respect of the likelihood of any land being flooded or the nature or extent of any such flooding.

The immunity has general application to anything done or omitted to be done in the exercise of a council's functions under legislation and has explicit application to particular circumstances including:

- the preparation or making of an environmental planning instrument
- the granting or refusal of consent to a development application, including any conditions imposed
- the preparation or making of a coastal zone management plan
- the furnishing of advice in planning certificates which may specify, for instance, whether or not development on land is subject to flood related development controls<sup>94</sup>
- the carrying out of flood mitigation works
- the carrying out of coastal management works
- the failure to upgrade flood mitigation works or coastal management works in response to projected or actual impacts of climate change
- the provision of information relating to climate change or sea level rise.

Under the provision, unless the contrary is proved, a council is taken to have acted in good faith if it has acted substantially in accordance with principles contained in manuals published by the Minister for Planning.

The circumstances surrounding and the intentions behind the enactment of section 733 can be discerned from the second reading speech of the responsible minister.<sup>95</sup> It was informed by reasoning that, as flooding is a natural and recurring but unpredictable phenomenon, local governments should be protected against claims for damages arising from development and building approvals and the provision of flood information or advice. Local government made strong representations that the existing law was inadequate to protect councils from claims for damages arising from planning and development decisions and the issue of advice relating to flood liable land, even though they had acted in accordance with the relevant government policy and in good faith. This uncertainty was alleged to have caused a number of councils to adopt an excessively conservative approach to decision-making, for instance unnecessarily refusing development applications or imposing superfluous and costly development and building conditions. The immunity was said to strike the appropriate balance between protecting the rights of individuals, on the one hand, and the problems encountered by local government, on the other, by only protecting actions taken in good faith.

In late 2010, the New South Wales parliament extended the exemption to climate change related decision-making. It now applies to things done in relation to coastal management and the provision of information relating to climate change or sea level rise.

The evidence before the Commission as to whether councils' concerns about liability adversely affect their willingness or ability to minimise infrastructure or other property damage from floods is limited and mixed.

The Queensland Government Planner has given evidence that the Queensland Government is trying to help local governments to respond to climate change by developing a ‘co-ordinative framework’ to enable a consistent approach.<sup>96</sup> However, Gold Coast City Council has expressed its concern that the current legislative framework may not provide adequate support for local governments that wish to publish the latest credible information, for example flood maps or data which take into account sea level rise or the storm surge impacts of climate change, but fear that doing so may open them to claims for compensation.<sup>97</sup>

The director of development and environment at the North Burnett Regional Council gave evidence that the council had reservations about adopting a defined flood event recommended by a commissioned flood study which adopted a climate change factor of 20 per cent.<sup>98</sup> It had, however, undertaken a joint project with the Queensland Government to assist it in incorporating climate change into its flood risk management framework.<sup>99</sup> It has yet to fix on a defined flood event which takes climate change into account. Council officers are presently working to simplify the way in which climate change is incorporated into the council’s planning scheme to ensure that the information is comprehensible by the general public.<sup>100</sup>

Resolutions made by the Central Highlands Regional Council since the 2010/2011 floods seem to demonstrate conservative decision-making based on uncertainty about the likelihood of flooding. On 21 February 2011, the council resolved that it would not provide any flooding information (historic or current) to any person or entity except in response to an application under the *Right to Information Act 2009* or some other lawful process.<sup>101</sup> The chief executive officer of the council gave evidence that this was ‘a slowdown tactic’ while the council was doing further work to ascertain flood levels; it was concerned about giving the wrong information to the public.<sup>102</sup>

The council also resolved to defer a number of development applications until it obtained information on flood levels from the 2010/2011 floods.<sup>103</sup> This case by case response to development applications has been supplemented by a council resolution to defer (with some exceptions<sup>104</sup>) the consideration of all development applications located within the Emerald town zone on land subject to inundation during the 2010/2011 flood event until such time as flood studies commissioned by the council were finalised.<sup>105</sup> But it is not apparent whether the council, in adopting these resolutions, was motivated by concern about liability or whether it simply considered its actions best served the public interest.

The Local Government Association of Queensland’s position that local government is concerned about the issue of liability where a development approval is given to rebuild in an area affected by recent flood events is given some credence by measures adopted, but shortly after rescinded, by the Lockyer Valley Regional Council in response to the January 2011 flooding.<sup>106</sup>

A council resolution of 28 June 2011 stated that the council would require owners rebuilding a dwelling on land where a dwelling existed prior to the January flood to provide an immunity statement to council confirming that they were aware of the risks associated with rebuilding below an interim minimum habitable floor level adopted by the council.<sup>107</sup> The relevant part of that resolution was rescinded on 7 September 2011.<sup>108</sup> Despite inquiries, the council has not given any clear account of its concerns or intentions in making and revoking the resolution.

There are, in the examples cited, some hints that council decision-making may have been influenced by apprehension about exposure to liability arising from the provision of flood advice or actions in respect of land subject to flooding. However, the evidence before the Commission is insufficient for it to form a view about the utility of introducing a statutory immunity.

The Queensland Government has advised the Commission that it will investigate the viability of introducing legislation similar to section 733 of the *Local Government Act 1993* (NSW).<sup>109</sup> The Commission endorses the proposal; any such investigation should occur in consultation with councils.

## 5.5.2 Reduction in land value

The statutory regime for the payment of compensation for a reduction in land value because of a change to a planning scheme or planning scheme policy<sup>110</sup> in Queensland is contained in the *Sustainable Planning Act 2009*.

Under sections 704 and 705 of the Act, the owner of an interest in land is entitled to be paid reasonable compensation by a council for such reduction in land value ‘in specified circumstances’ if he or she is adversely affected by changes to a planning scheme.

Section 706 of the Act limits the circumstances in which compensation must be paid; it is not, for example, payable:

- if a change to a planning scheme has the same effect as a state planning instrument (such as State Planning Policy 1/03) in relation to which compensation is not payable: section 706(1)(a), or
- if a change to a planning scheme affects development which, under the superseded planning scheme, would have led to significant risk to persons or property from flood and the risk could not have been significantly reduced by conditions attached to a development approval: section 706(1)(i)(i).

Some matters have been identified to the Commission as restricting or making doubtful the availability of the section 706(1)(a) exclusion in relation to the imposition of flood controls in a planning scheme, particularly where reliance on State Planning Policy 1/03's effect is proposed.

The Queensland Government Planner's evidence was that the breadth of the definition of 'development commitment' in the policy (which allows development incompatible with a natural hazard where it is a development commitment) would make it difficult for a council to rely upon the exclusion.<sup>111</sup> For more detail about the definition of development commitment in State Planning Policy 1/03, see section 4.1.2 *Application of State Planning Policy 1/03*.

Brisbane City Council pointed out that the requirement that changes to a planning scheme have the 'same effect' as a state planning instrument produced uncertainty, because current state planning instruments do not provide a sufficient degree of detail for confidence on the point.<sup>112</sup> It may be open to challenge, for example, whether changes which expand upon the operation of State Planning Policy 1/03's development outcomes have the 'same effect' as those outcomes.

In respect of the section 706(1)(i)(i) exemption, Brisbane and Ipswich city councils contended that the scope of the phrases 'significant risk' and 'the risk could not have been significantly reduced by conditions attached to a development approval' was open to argument.<sup>113</sup>

Ipswich City Council observed that the section 706(1)(i)(i) exclusion was further limited, in this way: it does not apply if conditions on development could have significantly reduced the risk; and the range of conditions that may be imposed is in turn restricted by section 347(1) of the *Sustainable Planning Act*, which provides that:

a condition must not be inconsistent with a condition of an earlier development approval or compliance permit still in effect for the development.<sup>114</sup>

Ipswich City Council has expressed the view that exposure to compensation claims for a reduction in land value because of a change to a planning scheme or planning scheme policy acts as a deterrent to the inclusion of flood controls in a planning scheme.<sup>115</sup> The evidence of the council's City Planner was that it had concerns that it would be liable for compensation if it were to 'down-zone' land below its 1 in 20 development line, previously designated for residential uses under a superseded planning scheme. In his view, further limiting the entitlement to compensation where a planning scheme is amended following a natural disaster would allow councils more scope to make zoning decisions.<sup>116</sup> Mr Reynolds, the planning expert engaged by the Commission, similarly regarded the prospect of liability to compensation under the *Sustainable Planning Act* as an impediment to local governments wanting to 'down-zone'.<sup>117</sup>

Councils proposed the following changes to the *Sustainable Planning Act* to ensure that its compensation provisions did not deter local governments from including appropriate provisions in their planning schemes:

- Ipswich City Council supported amendment to exempt all planning scheme controls for flooding (and other natural processes) from giving rise to compensation for a reduction in land value because of a change to a planning scheme or planning scheme policy<sup>118</sup>
- Brisbane City Council supported amendment of section 706(1)(i)(i) to clarify the intent of the subsection, provide certainty to council as to the scope of the exemption and remove the words 'significant risk' and 'the risk could not have been significantly reduced by conditions attached to a development approval'<sup>119</sup>
- Gold Coast City Council suggested that the entitlement to compensation be limited where a planning scheme is changed to meet the impacts of climate change.<sup>120</sup>

The Queensland Government Planner accepted that some local governments were reluctant to change their planning schemes to preclude development on flood constrained land where doing so might trigger an entitlement to compensation.<sup>121</sup> He agreed, in principle, that the *Sustainable Planning Act* should be amended to make clear that no compensation was payable should a local planning instrument be amended for the purposes of mitigating flood, while pointing out that larger policy implications would have to be considered.

Although the Queensland Government does not currently propose to investigate the viability of change to the compensation provisions of the *Sustainable Planning Act*, the concerns expressed by councils suggest that such change should at least be considered, to ensure that councils are not inhibited by the prospect of statutory liability to compensation from adopting appropriate land planning regulation and making appropriate land planning decisions where flooding is a consideration. Whether this is necessary may hinge upon any action taken by the Queensland Government to narrow the definition of development commitment so that more development applications are assessed against flood criteria. For the Commission's recommendation as to these matters, see section 4.1.2 *Application of State Planning Policy 1/03*.

## (Endnotes)

- 1 Transcript, Gary White, 19 September 2011, Brisbane [p2746: line 1; p2769: line 15].
- 2 Exhibit 666, Statement of Glen Brumby, 15 September 2011 [p14: para 56].
- 3 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p8: para 7.1].
- 4 Chapter 6, Part 5, Division 2, *Sustainable Planning Act 2009*; Exhibit 532, Statement of Gary White, 2 September 2011 [p30: para 158].
- 5 Clause 6.6, State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p6].
- 6 Assessment criteria are referred to in State Planning Policy 1/03 and the associated guideline as 'development outcomes', 'specific outcomes' and 'solutions'.
- 7 Exhibit 532, Statement of Gary White, 2 September 2011 [p30: para 156]. The Queensland Government Planner stated the reason the *Sustainable Planning Act 2009* does not require councils to include the contents of a state planning policy as not all parts of a state planning policy will be relevant to all councils (Transcript, Gary White, 7 November 2011, Brisbane [p4615: line 54]). However, as it is the Minister for Local Government who approves planning schemes that are developed or amended by councils, it is within the Minister's prerogative to not approve a planning scheme or an amendment to a planning scheme until a matter the Minister considers must be addressed is done so to the Minister's satisfaction. Further, the Minister may direct a council at any time to amend an existing planning scheme under Chapter 3, Part 6 of the *Sustainable Planning Act 2009* to address a state interest, such as flood management (Exhibit 532, Statement of Gary White, 2 September 2011 [p31: para 159]). This power has not been exercised to the Queensland Government Planner's knowledge (Transcript, Gary White, 19 September 2011, Brisbane [p2748: line 8]).
- 8 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, notes that development assessment codes dealing with floods in planning schemes may take the form of 'special hazard management codes' or be incorporated into broader codes, as appropriate (State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p23: para 7.15]).
- 9 Limited guidance is currently provided by the Queensland Government as to the type of flooding information that should be submitted with development applications (see State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* and the associated guideline).
- 10 Section 40(b), *Sustainable Planning Act 2009*.
- 11 Chapter 6, Part 5, Division 2, *Sustainable Planning Act 2009*.
- 12 Section 55(1), *Sustainable Planning Act 2009*. Existing planning schemes are not required to be consistent with the Queensland Planning Provisions (see section 777, *Sustainable Planning Act 2009*).
- 13 Section 29(2), *Sustainable Planning Act 2009*.
- 14 For a more detailed discussion of the structure of the Queensland Planning Provisions, see section 4.3 *Queensland Planning Provisions*.
- 15 Section 50(b), *Sustainable Planning Act 2009*.

- 16 Section 55(1), *Sustainable Planning Act 2009*. Existing planning schemes are not required to be consistent with the Queensland Planning Provisions (see 777, *Sustainable Planning Act 2009*).

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- 17 For what is to be taken into account in the assessment of development applications, see Chapter 6, Part 5, Division 2, *Sustainable Planning Act 2009*.

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- 18 This is in line with the ‘flood hazard overlay’ as proposed by the new draft Queensland Planning Provisions, version 3.0, October 2011, section 4.3 *Queensland Planning Provisions*.

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- 19 See Schedule 2, Queensland Planning Provisions (version 2.0).

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- 20 For example, Brisbane City Council, Moreton Bay Regional Council and Somerset Regional Council.

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- 21 Transcript, Gary White, Brisbane, 7 November 2011, Brisbane [p4618: line 17]. Town planner Steve Reynolds’s view is that where mapping data exists, all flooding matters should be dealt with in a flood overlay and flood overlay code a planning scheme (Exhibit 962, Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p29: para 105]).

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- 22 The Flood Management Code is triggered by a Flood Management Overlay in the Bundaberg planning scheme.

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- 23 The Flooding and Urban Stormwater Flow Path Areas Development Constraint Code is triggered by the Flooding and Urban Stormwater Flow Path Areas Overlay in the Ipswich Planning Scheme. The operation of this code is currently suspended due to the introduction of the Temporary Local Planning Instrument 01/2011 – Flooding Regulation.

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- 24 The draft Toowoomba Regional Council planning scheme is consistent with the Queensland Planning Provisions.

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- 25 The mechanisms used in the Brisbane planning scheme to deal with flooding are the House Code, Compensatory Earthworks Planning Scheme Policy, Filling and Excavation Code, Stormwater Management Code, Subdivision Code, Structure Planning Code, Waterway Code, Park Planning and Development Code and the Child Care Facility Code. The council’s Subdivision and Development Guidelines also deal with flooding
- (see Exhibit 953, Statement of Colin Jensen, 31 August 2011 [p8, 9: para 3.17]).

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- 26 Exhibit 953, Statement of Colin Jensen, 31 August 2011 [p9: para 3.18, 3.20].

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- 27 For example, a purpose statement, overall outcomes, and performance outcomes and acceptable outcomes (Queensland Planning Provisions (version 2.0) [p55 -57]).

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- 28 Transcript, Gary White, 7 November 2011, Brisbane [p4619: line 14].

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- 29 This is to overcome the difficulty identified with the application of State Planning Policy 1/03 in that a natural hazard management area for flood must be identified for the policy to apply. See section 6.6 of State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, 2003; Exhibit 532, Statement of Gary White, 2 September 2011 [p29: para 148; 152] and Transcript, Gary White, 19 September 2011, Brisbane [p2747: line 10]. The limitations of State Planning Policy 1/03 are explained in further detail in section 4.1 *State Planning Policy 1/03*.

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- 30 The Queensland Reconstruction Authority Guideline *Planning for Stronger, More Resilient Floodplains: Part 1 - Interim measures to support floodplain management in existing planning schemes* [p18, 19].

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- 31 The Queensland Reconstruction Authority Guideline *Planning for Stronger, More Resilient Floodplains: Part 1 - Interim measures to support floodplain management in existing planning schemes* [p18].

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- 32 Town planner, Steve Reynolds, has the view that where there is no flood data available there should be two tiers of information requirements in a planning scheme policy: the first tier to determine whether the site has characteristics which warrant further study and the second tier to set out the usual flood study requirements of a council (Exhibit 962, Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, [p27: para 91.d]).

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- 33 Section 101, *Sustainable Planning Act 2009*.

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- 34 Sections 103, 104, *Sustainable Planning Act 2009*.

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- 35 Chapter 3 Part 5, Division 2.

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- 36 Section 105 of the *Sustainable Planning Act 2009* states that a local government may make a temporary local planning instrument for all or part of its planning scheme area only if ‘the

- Minister' is satisfied of certain matters. Since 22 June 2011, and as at 19 January 2012, the Minister responsible for administering the *Sustainable Planning Act 2009* is the Minister for Local Government, see: *Administrative Arrangements Order (No. 2) 2011*.
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- 37 Section 105, *Sustainable Planning Act 2009*.
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- 38 Exhibit 532, Statement of Gary White, 2 September 2011 [p59: para 317].
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- 39 Exhibit 1002, Statement of Robert Bain, 21 October 2011 [p6: para 30-31].
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- 40 Exhibit 670, Statement of Luke Lankowski, 1 September 2011 [p3: para 2.3, 2.4].
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- 41 Exhibit 670, Statement of Luke Lankowski, 1 September 2011 [p3: para 2.5].
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- 42 Exhibit 683, Statement of Bryan Ottone, 6 September 2011 [p3].
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- 43 Lockyer Valley Regional Council, Adoption of Temporary Local Planning Instrument 02/11, available at [www.lockyervalley.qld.gov.au/news-events/public-notices/1310-public-notice-adoption-of-temporary-local-planning-instrument-0211](http://www.lockyervalley.qld.gov.au/news-events/public-notices/1310-public-notice-adoption-of-temporary-local-planning-instrument-0211) as at 1 December 2011.
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- 44 Queensland Government Gazette, 27 May 2011, Notice under the *Sustainable Planning Act 2009* that on 27 May 2011 the Lockyer Valley Regional Council adopted Temporary Local Planning Instrument 03/11 Operational Work for the Grantham Reconstruction Area.
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- 45 Lockyer Valley Regional Council, Extraordinary Meeting of Council: Minutes, 7 October 2009 [p6-8], available at [www.lockyervalley.qld.gov.au/images/PDF/about\\_council/meetings/minutes/OC\\_07102009\\_MIN\\_AT\\_EXTRA.pdf](http://www.lockyervalley.qld.gov.au/images/PDF/about_council/meetings/minutes/OC_07102009_MIN_AT_EXTRA.pdf) as at 7 October 2009; Exhibit 984, Statement of Ian Flint, 26 October 2011, Attachment ICF-2 [part 2].
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- 46 Exhibit 911, Statement of John Adams, 2 September 2011, JA-10; Exhibit 953, Statement of Colin Jensen, 31 August 2011, CDJ-35.
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- 47 Transcript, Gary White, 7 November 2011, Brisbane [p4638-4639]; Exhibit 532, Statement of Gary White, 2 September 2011 [p59: para 321]; Statement of Glen Brumby, 16 November 2011 [p12-13: para 24-25]; Sustainable Planning and Other Legislation Amendment Bill 2011, introduced 11 October 2011.
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- 48 Exhibit 953, Statement of Colin Jensen, 31 August 2011, CDJ-35 [p2: para 1.2]; Table A.
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- 49 Exhibit 911, Statement of John Adams, 2 September 2011 [p18: para 34].
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- 50 Exhibit 911, Statement of John Adams, 2 September 2011, JA-10, Attachments 2, 3 and 4.
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- 51 Exhibit 953, Statement of Colin Jensen, 31 August 2011 [p5: para 3.8].
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- 52 Exhibit 953, Statement of Colin Jensen, 31 August 2011 [p5: para 3.9].
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- 53 Transcript, John Adams, 28 October 2011, Brisbane [p4588: line 49].
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- 54 Transcript, John Adams, 28 October 2011, Brisbane [p4588: lines 36-54].
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- 55 Transcript, John Adams, 28 October 2011, Brisbane [p4588: line 56 – p4589: line 9].
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- 56 Section 108(c), *Sustainable Planning Act 2009*.
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- 57 Section 114, *Sustainable Planning Act 2009*.
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- 58 Where the information is not provided at the application stage, the information should be the subject of an information request under the Integrated Development Assessment System (State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, 2003 [p9: para 7.7]). The Integrated Development Assessment System is described in more detail in chapter 3 *Planning framework*.
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- 59 Statutory Guideline 01/12: *Making and amending local planning instruments* [p27-28].
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- 60 Ipswich City Planning Scheme Policy 2 'Information Local Government May Request' [p6: section 8].
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- 61 The Flooding and Stormwater Flow Path Areas overlay map and related provisions have been suspended and replaced by Temporary Local Planning Instrument 1/11 – Flooding Regulation, which may remain in effect up until 19 June 2012: Ipswich City Council's Implementation Guideline No. 24 Stormwater Management [p10: para 7.1].
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- 62 The Toowoomba Regional Council draft scheme has been drafted in compliance with the Queensland Planning Provisions.
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- 63 Draft Toowoomba Regional Planning Scheme, Schedule 4, Planning Scheme Policy No. 1 'Development Application Requirements' [SC4.1.6].

- 64 Draft Toowoomba Regional Planning Scheme, Schedule 4, Planning Scheme Policy No. 1 'Development Application Requirements' [SC4.1.6].
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- 65 Sinclair Knight Merz, Brisbane 2011 Flood Event – Investigation into Causes of Property Inundation: Hydrology Requirements for Development Applications, Final A, 15 November 2011.
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- 66 Sinclair Knight Merz, Brisbane 2011 Flood Event – Investigation into Causes of Property Inundation: Hydrology Requirements for Development Applications, Final A, 15 November 2011 [section 2.3.2].
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- 67 Sinclair Knight Merz, Brisbane 2011 Flood Event – Investigation into Causes of Property Inundation: Hydrology Requirements for Development Applications, Final A, 15 November 2011 [section 2.3.3].
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- 68 Sinclair Knight Merz, Brisbane 2011 Flood Event – Investigation into Causes of Property Inundation: Hydrology Requirements for Development Applications, Final A, 15 November 2011 [section 2.3.2].
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- 69 Sinclair Knight Merz, Brisbane 2011 Flood Event – Investigation into Causes of Property Inundation: Hydrology Requirements for Development Applications, Final A, 15 November 2011 [section 2.3.2].
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- 70 The title of the Subdivision and Development Guidelines does not identify it as a planning scheme policy, as is the usual practice.
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- 71 Brisbane City Council Subdivision and Development Guidelines, Part A Hazard Management, Chapter 1 Flood Affected Land [p1: section 2.1].
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- 72 The Former Esk Shire Planning Scheme Policy No. 12 (Flood Mitigation in the Lowood and Fernvale Locality) is not triggered by the planning scheme (see Exhibit 1002, Statement of Robert Bain, 21 October 2011 [p1: para 4]).
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- 73 Clause 108, Explanatory Notes for the Sustainable Planning Bill 2009. This approach is also similar to the Practice Notes accompanying the Victorian Planning Provisions which provide an explanation of the flood zone and flood overlays, the types of development suitable in floodways and the extra material that should be included in the development application.
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- 74 Section 91(1), *Sustainable Planning Act 2009*.
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- 75 Sections 5, *Sustainable Planning Regulation 2009*; Section 117, *Sustainable Planning Act 2009*.
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- 76 Statutory Guideline 01/12: *Making and amending local planning instruments* [p6-24].
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- 77 Statement of Andrew Fulton, 11 November 2011 [p4: para 1.2].
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- 78 Exhibit 764, Submission of Bundaberg Regional Council [p13: para 12]; Statement of Andrew Fulton, 11 November 2011 [p6: para 2.2].
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- 79 Transcript, Gary White, 19 September 2011, Brisbane [p2765: line 30]; Statement of Andrew Fulton, 11 November 2011 [p4: para 1.1-1.2].
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- 80 Exhibit 728, Statement of Russell Cuerel, 14 September 2011 [p4-5: para 8]; Transcript, Russell Cuerel, 5 October 2011, Brisbane [p3709: line 3].
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- 81 Statement of Andrew Fulton, 11 November 2011 [p6: para 2.2].
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- 82 Statutory Guideline 01/12: *Making and amending local planning instruments* [p4-5].
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- 83 Statutory Guideline 01/12: *Making and amending local planning instruments* [p7: para 2.1; p10: para 4.18; p12: para 5.1].
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- 84 Statutory Guideline 01/12: *Making and amending local planning instruments* [p7: para 2.2].
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- 85 The Queensland Reconstruction Authority Guideline *Planning for stronger, more resilient floodplains: Part 1 - Interim measures to support floodplain management in existing planning schemes* [p12].
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- 86 Statement of Brendan Nelson, 30 November 2011 [p3: para 395].
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- 87 Submission of Local Government Association of Queensland, September 2011; Submission of Local Government Association of Queensland, 7 April 2011; Second Submission of Gold Coast City Council, undated; Submission of Ipswich City Council, 28 April 2011; Brisbane City Council submission, 'Land Planning B – Indemnity', undated.
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- 88 Submission of Local Government Association of Queensland, 7 April 2011 [p4: para 2.16].
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- 89 Second Submission of Gold Coast City Council, undated [p2].
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- 90 Exhibit 962, Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p7: para 10(g)].
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- 91 Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 Recommendation 24 [p70].
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- 92 Submission of Local Government Association of Queensland, September 2011 [p3: para 2.9]; Submission of Local Government Association of Queensland, 7 April 2011 [p4-5: para 2.17]; Second Submission of Gold Coast City Council, undated [p3].
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- 93 Brisbane City Council submission, 'Land Planning B – Indemnity', undated.
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- 94 See also section 149, *Environmental Planning and Assessment Act 1979* (NSW) and clause 279 and schedule 4, *Environmental Planning and Assessment Regulation 2000* (NSW).
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- 95 Bob Carr, Minister for Planning and Environment, New South Wales Legislative Assembly, *Parliamentary Debates*, 16 April 1985 [6025].
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- 96 Transcript, Gary White, 19 September 2011, Brisbane [p2755: line 27].
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- 97 Second Submission of Gold Coast City Council, undated [p2].
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- 98 Transcript, Robert Savage, 11 October 2011, Bundaberg [p3932: line 52].
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- 99 Exhibit 772, Increasing Queensland's resilience to inland flooding in a changing climate: Final report on the Inland Flooding Study, 2010; Exhibit 773, Increasing Queensland's resilience to inland flooding in a changing climate: Policy options for incorporating climate change into the flood risk management framework in Gayndah (North Burnett Regional Council), November 2010.
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- 100 Transcript, Robert Savage, 11 October 2011, Bundaberg [p3934: line 22 – p3935: line 21].
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- 101 Exhibit 683, Statement of Bryan Ottone, 6 September 2011, copies of council resolutions [p3].
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- 102 Transcript, Bryan Ottone, 29 September 2011, Emerald [p3432: lines 10-25].
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- 103 Exhibit 683, Statement of Bryan Ottone, 6 September 2011, copies of council resolutions [p1]
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- 104 The following exceptions apply to this blanket resolution: where the applicant provides a flood study prepared by a hydrologist or other suitably qualified professional, where the development is considered 'low risk' or where the application is for a negotiated decision or permissible change in relation to an existing approval that does not impact upon minimum approved floor height or any other flood condition: Exhibit 683, Statement of Bryan Ottone, 6 September 2011, copies of council resolutions [p9].
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- 105 Exhibit 683, Statement of Bryan Ottone, 6 September 2011, copies of council resolutions [p9]
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- 106 Exhibit 983, Statement of Ian Flint, 3 November 2011, Annexures ICF1 and ICF3.
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- 107 Exhibit 983, Statement of Ian Flint, 3 November 2011, Annexure ICF1.
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- 108 Exhibit 983, Statement of Ian Flint, 3 November 2011, Annexure ICF3.
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- 109 Exhibit 917, Submission of State of Queensland, 4 November 2011 [p9].
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- 110 Previously called 'injurious affection' in earlier legislation.
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- 111 Transcript, Gary White, 7 November 2011, Brisbane [p4632: line 1].
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- 112 Brisbane City Council submission, 'Land Planning B – Indemnity', undated.
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- 113 Correspondence from Clayton Utz (Ipswich City Council), 6 January 2012, Statutory Indemnity; Brisbane City Council submission, 'Land Planning B – Indemnity', undated.
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- 114 Correspondence from Clayton Utz (Ipswich City Council), 6 January 2012, Statutory Indemnity.
- 
- 115 Submission of Ipswich City Council, 28 April 2011 [p3-4: para 1.4; p30: para 11.2; p51: para 18.5].
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- 116 Transcript, John Adams, 28 October 2011, Brisbane [p4585: lines 3-15].
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- 117 Exhibit 962, Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p7: para 10(g)]; Exhibit 964, *Building Controls for Flood Hazard Areas*, Steve Reynolds, 7 November 2011 [p7: para 10].

- 118 Correspondence from Clayton Utz (Ipswich City Council), 6 January 2012, Statutory Indemnity; Exhibit 912, Statement of John Adams, 25 October 2011 [p14: para 41].
- 
- 119 Brisbane City Council submission 'Land Planning B - Indemnity', undated.
- 
- 120 Second Submission of Gold Coast City Council, undated [p3].
- 
- 121 Transcript, Gary White, 7 November 2011, Brisbane [p4631: line 9].
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# 6

## 6 Satellite planning systems

Most development in Queensland is regulated by the *Sustainable Planning Act 2009*. However, there is a number of ‘satellite’ planning systems, created and regulated by separate legislation, and operating independently of the *Sustainable Planning Act*.

In particular, the Commission has considered evidence about the planning and development assessment systems governed by the *Urban Land Development Authority Act 2007*, the *South Bank Corporation Act 1989* and the *State Development and Public Works Organisation Act 1971*.

### 6.1 *Urban Land Development Authority Act 2007*

The *Urban Land Development Authority Act* was introduced as part of the Queensland Housing Affordability Strategy in 2007. The strategy and the Act aim to improve housing affordability by improving the efficiency of the planning and development, land supply, and infrastructure funding systems.<sup>1</sup> The Urban Land Development Authority planning system is designed to ensure that affordable land is brought to the market quickly, by removing inefficiencies in the approval of development applications and by providing a range of housing options for low to moderate income households.<sup>2</sup>

Once the Minister for Local Government and Planning declares an area to be an ‘urban development area’, the operation of the *Sustainable Planning Act* is ousted and development proposals are processed under the planning system provided for in the *Urban Land Development Authority Act*.<sup>3</sup>

The planning and co-ordination of development of land in declared urban development areas is the responsibility of the Urban Land Development Authority, established under the *Urban Land Development Authority Act*. For those declared areas, it is the authority, not the local government, which:

- makes the development schemes that regulate development
- assesses development applications.

The *Urban Land Development Authority Act* sets out the process for making the development schemes which regulate development. It involves a process of consultation but, unlike the procedure for making planning schemes under the *Sustainable Planning Act*,<sup>4</sup> does not entail mandatory referrals to Queensland Government departments.<sup>5</sup> In making a scheme the Urban Land Development Authority must consider, but is not bound by, the requirements of State Planning Policy 1/03.<sup>6</sup>

Development applications are assessed against a limited set of criteria.<sup>7</sup> The criteria require the authority to consider the relevant scheme but do not refer to State Planning Policy 1/03; flood risk is not a relevant criterion in the *Urban Land Development Authority Act*.

## 6.2 South Bank Corporation Act 1989

The South Bank Corporation was created by the *South Bank Corporation Act* to manage the development of a riverside area on the south bank of the Brisbane River opposite the central business district that was formerly occupied by World Expo '88.<sup>8</sup>

The *South Bank Corporation Act* empowers the corporation to:

- prepare a development plan,<sup>9</sup> which effectively operates as the planning scheme for the area
- implement the development plan, which includes regulating development within the area covered by the Act.<sup>10</sup>

The *South Bank Corporation Act* sets out the procedure for making a development plan.<sup>11</sup> It involves consultation with Brisbane City Council, but not with Queensland Government departments. A development plan is not required to reflect State Planning Policy 1/03 or to address flooding as a consideration.

There is also no requirement to consider the possible impacts of flood in implementing the development plan or in assessing development applications. South Bank Corporation's obligations, with respect to carrying out and regulating development, are:

- to ensure the development is carried out in accordance with the approved development plan<sup>12</sup>
- in deciding a development application, to consult with Brisbane City Council in the way the corporation considers appropriate.<sup>13</sup>

## 6.3 State Development and Public Works Organisation Act 1971

The original *State Development and Public Works Organisation Act* was passed in 1938 as a post-Depression measure to encourage public works and generate employment.<sup>14</sup> The current Act is administered by the Minister for State Development and Trade and the Coordinator-General.<sup>15</sup> The Act regulates a range of development types; those of most interest to the Commission are state development areas, significant projects and prescribed projects.

### 6.3.1 State development areas

The Governor in Council, on recommendation by the Minister, may declare a state development area when satisfied that it is required by the public interest or for the general welfare of Queensland residents.<sup>16</sup> To determine this, consideration may be given to any relevant matter, including the need to establish or relocate a population, industry or essential services.<sup>17</sup>

A state development area may be declared to promote economic development or address market failure.<sup>18</sup> Recently approved state development areas include the Queensland Children's Hospital State Development Area, which is intended to consolidate health services for children and young people, and the Abbot Point State Development Area, which provides for industrial development, including infrastructure corridors and essential services.<sup>19</sup>

For a state development area, the Coordinator-General:

- prepares a development scheme for the area which identifies land use precincts and specifies the purpose of those precincts; it overrides any planning scheme applicable to the land<sup>20</sup>
- assesses land use applications for a material change of use under the provisions of the development scheme to the extent provided in the scheme.<sup>21</sup>

The process for making a development scheme for a state development area is not prescribed by the Act. The Coordinator-General's evidence to the Commission is that he releases the draft development scheme for public and government comment and that he considers all submissions received.<sup>22</sup>

The Act does not require the Coordinator-General to consider State Planning Policy 1/03, or flooding more generally, when making a scheme for a state development area or assessing an application against a state development area scheme.

### 6.3.2 Significant projects

The Coordinator-General may declare a project to be a significant project under section 26 of the *State Development and Public Works Organisation Act*. A significant project typically involves:

- complex approval requirements involving all levels of government
- a capital investment of more than \$100 million
- potential effects on infrastructure or the environment
- the provision of substantial employment opportunities
- ‘strategic significance’ to a locality, region or the state.<sup>23</sup>

Recently declared significant projects include the Australia Pacific Curtis Liquefied Natural Gas and the Wandoan Coal Mine projects.

The assessment process for a significant project differs from the other processes discussed in this part.

The declaration of a significant project does not exclude the *Sustainable Planning Act* provisions; its assessment process continues to apply, but is modified for different development types.

For example, an application for a material change of use for a significant project, although assessed under the *Sustainable Planning Act*, does not undergo mandatory referral to Queensland Government departments and is not the subject of public notice given under the *Sustainable Planning Act*. Instead, before the application is made:

- the Coordinator-General may (but is not required to) refer the project to Queensland Government departments under the *State Development and Public Works Organisation Act*<sup>24</sup>
- the applicant<sup>25</sup> must ‘publicly notify’ the environmental impact statement for the project.<sup>26</sup>

After these steps take place, the Coordinator-General evaluates the material and prepares a report that acts as a concurrence agency response for the application under the *Sustainable Planning Act*.<sup>27</sup> Any properly made submission received by the Coordinator-General (in response to the public notification) is also taken to be a properly made submission about the application under the *Sustainable Planning Act* assessment process.<sup>28</sup> The Coordinator-General’s report may, but will not necessarily, address flooding.

In determining the application, the assessment manager must also take into account State Planning Policy 1/03 in the usual way.

### 6.3.3 Prescribed projects

A prescribed project generally has state or regional economic, social or environmental significance.<sup>29</sup>

The Coordinator-General’s powers in respect of prescribed projects enable intervention in the statutory approvals process for development to ensure timely decision-making.

A recently prescribed project which has been the subject of evidence before the Commission is the Ensham Mine Flood Recovery Project, declared in April 2008 following the inundation of the mine and surrounding areas in January 2008.<sup>30</sup>

Once a prescribed project is declared, the Coordinator-General may issue a notice requiring the usual decision-maker to proceed with the decision-making process or to decide a development.<sup>31</sup> If the usual decision-maker does not comply with the notice, the Coordinator-General becomes the approval authority for the relevant application.<sup>32</sup> The Coordinator-General’s decision making process and powers in respect of a prescribed project are prescribed by the statute applicable to the usual decision-maker<sup>33</sup> (usually the *Sustainable Planning Act*); thus, the planning and development assessment process for a prescribed project is not strictly an alternative system. For this reason, the Coordinator-General’s decision-making (including consideration of flooding) for prescribed projects is not further discussed.

## 6.4 Consideration of flooding as part of satellite planning systems

### 6.4.1 Satellite planning systems generally

The alternative planning and development assessment systems established by the *Urban Land Development Authority Act*, the *South Bank Corporation Act*, and, for state development areas, by the *State Development and Public Works Organisation Act*, are not subject to the provisions of the *Sustainable Planning Act*.

Of the relevant entities (the authority, the corporation and the Coordinator-General), only the Urban Land Development Authority is required to consider State Planning Policy 1/03 in the preparation of a development scheme,<sup>34</sup> and none of the entities is required to consider the policy in the assessment of development applications<sup>35</sup> or to comply with the policy.

It follows that any improvements made to the way the planning systems under the *Sustainable Planning Act* deal with flood, for example through revision of State Planning Policy 1/03 or the Queensland Planning Provisions, will not flow through to these alternative planning systems.<sup>36</sup>

The Commission acknowledges that there may be legitimate reasons for different planning systems to apply in certain circumstances. For example, the goal of the *Urban Land Development Authority Act*, of streamlining the development application process to deliver more affordable housing, is a laudable one. And the Commission also recognises that, although neither South Bank Corporation nor the Coordinator-General is required to address flood, even generally, the relevant planning systems do not preclude consideration of flooding. All planning agencies established under satellite legislation do in fact consider issues associated with flooding, but to varying extents.

To illustrate, the chief executive officer of the Urban Land Development Authority indicated that the authority's typical practice, although not mandated by legislation,<sup>37</sup> is to:

- consider the susceptibility to flood of the land being investigated as an urban development area as part of a review of site characteristics<sup>38</sup>
- undertake 'assessment of flood impacts' and consider the need for additional flood information for an urban development area when preparing a development scheme<sup>39</sup>
- include in development schemes for urban development areas where flooding is identified as a risk, criteria requiring that development take place in a way that ensures people and property are safe from potential flooding hazards<sup>40</sup>
- require development applications to identify whether the site is flood affected and to demonstrate that the proposed development does not adversely affect flooding conditions on other land. To this end, the Urban Land Development Authority has prepared Draft ULDA Guideline No. 15: Protection from Flood and Storm Tide Inundation which refers to State Planning Policy 1/03 and sets out the authority's requirements to ensure development is adequately protected from flood.<sup>41</sup>

By way of comparison, South Bank Corporation:

- in its development plan, only deals with the potential impact of flooding on infrastructure and property in relation to the Melbourne Street Precinct<sup>42</sup>
- consults the Brisbane City Council when developing, or making amendments to, the approved plan of development and in many (but not all) instances adopts the council's suggestions<sup>43</sup>
- as a matter of practice, often (but not always) adopts the Brisbane City Council's suggested development conditions, although it is not required to do so<sup>44</sup>
- as a matter of practice, for developments in close proximity to the Brisbane River, imposes conditions requiring minimum floor levels for habitable rooms<sup>45</sup>
- does not otherwise consider the 'mitigation of adverse flood impacts' in determining land use, as it is not required to do so when assessing development applications under the *South Bank Corporation Act*.<sup>46</sup>

The Coordinator-General's process for preparing a development scheme for a state development area may identify flood impacts:

- during the planning assessment undertaken to determine the general location of a state development area<sup>47</sup>
- during land use studies undertaken for the purpose of identifying land use precincts within a state development area<sup>48</sup>
- if they are raised in submissions received from the public and from government in response to the publication of the draft development scheme for a state development area.<sup>49</sup>

Even though it is apparent that the planning agencies under the satellite legislation do consider the issue of flood, the Commission considers that the planning and development process should be open and explicit.

## *Recommendation*

- 6.1 The Queensland Government should consider amending the *Urban Land Development Authority Act 2007*, the *South Bank Corporation Act 1989*, the *State Development and Public Works Organisation Act 1971* insofar as it governs state development areas, and other legislation which establishes alternative planning systems that operate independently of the *Sustainable Planning Act 2009*,<sup>50</sup> to require that:
- any planning scheme, interim or otherwise, appropriately reflects any state planning policy with respect to flood
  - flood risk be considered in the assessment of any development application.

### **6.4.2 Significant projects under the *State Development and Public Works Organisation Act 1971***

The Coordinator-General's process for declaring a significant project and assessing a significant project is set out in Part 4 of the *State Development and Public Works Organisation Act*. Generally speaking as part of that process the following occurs:

- An applicant makes an application to the Coordinator-General for the declaration of a project as a significant project. The application includes an initial advice statement which should be prepared in accordance with guidelines set by the Coordinator-General.<sup>51</sup>
- The Coordinator-General considers the application and, if it is approved, declares the project to be a significant project.<sup>52</sup>
- At the time of declaring a significant project, the Coordinator-General decides whether an environmental impact statement is required for the project.<sup>53</sup>
- If an environmental impact statement is required, the Coordinator-General prepares terms of reference, using a generic draft document, which set out the requirements which the applicant must address in preparing the environmental impact statement.<sup>54</sup>
- Once an environmental impact statement has been prepared to the satisfaction of the Coordinator-General, it is released for public and government agency comment.<sup>55</sup>

The Coordinator-General then evaluates the environment impact statement and takes into account all relevant materials, including submissions received during the consultation process, and uses this information to complete its report for the significant project.<sup>56</sup> Although the assessment manager who ultimately decides whether a development approval is granted for a significant project is able to refuse the application or impose additional conditions on the development approval, the Coordinator-General's report to some extent determines development rights and obligations. For instance, the Coordinator-General's report may:

- impose conditions for undertaking the project under the *State Development and Public Works Organisation Act*

- state conditions that must attach to development approvals under other legislation, including the *Sustainable Planning Act*
- make recommendations for approvals under other legislation, including the *Sustainable Planning Act*
- state that a development approval under the *Sustainable Planning Act* must be for part of the development only
- state that a development approval under the *Sustainable Planning Act* must be for a preliminary approval only.<sup>57</sup>

The Coordinator-General may have regard to flood risk at various stages during the process outlined above. The Coordinator-General has agreed that his office could improve its assessment of flooding issues for significant projects at the time of seeking an initial advice statement from the applicant.<sup>58</sup>

The Coordinator-General's guideline for the preparation of an initial advice statement does not explicitly require an applicant to address flood risk.<sup>59</sup> As a result, an applicant's initial advice statement may, conceivably, omit reference to relevant flooding considerations.<sup>60</sup> The Coordinator-General has accepted that amending the pro forma guideline to make direct reference to flooding is a sensible suggestion.<sup>61</sup>

The Coordinator-General's office also provides applicants with draft terms of reference for an environmental impact statement. That document, in its generic form, requires an environmental impact statement to:

- describe the vulnerability of the project area to natural hazards (which includes flood)<sup>62</sup>
- assess the possible impacts of the project on 'water resource environmental values', such as impacts on downstream environments<sup>63</sup> and propose mitigation strategies.<sup>64</sup>

The document directs an applicant to complete, where applicable 'due to the [project's] location', a comprehensive flood study.<sup>65</sup>

The Coordinator-General gave evidence that although his office has some internal expertise available to determine whether a project location might be subject to flooding, he relies on advice from agencies (such as the Department of Environment and Resource Management (DERM) and councils in the area concerned) and from affected landholders.<sup>66</sup>

The Commission considers that requiring an applicant to provide information about a project's flood risk at the time of submitting an initial advice statement would place the Coordinator-General in a better position to determine, at the time of preparing the terms of reference, whether a project should be supported by a comprehensive flood study.

## *Recommendation*

- 6.2 The Coordinator-General should amend the guideline for preparing an 'initial advice statement' for a significant project under the *State Development and Public Works Organisation Act 1971* so that it specifically requires an applicant to consider and provide information about the project's flood risk.

## (Endnotes)

- 1 Urban Land Development Authority Bill 2007, Second Reading Speech, 22 August 2007.
- 2 Urban Land Development Authority Bill 2007, Second Reading Speech, 22 August 2007.
- 3 Section 40, *Urban Land Development Authority Act 2007*.
- 4 See section 5.4 *Amending planning schemes*.

- 5 The Urban Land Development Authority must consult with the relevant council before preparing a scheme. It must also make reasonable attempts to consult with other authorities which might likely be affected. After preparing a draft scheme, the Urban Land Development Authority must publish the scheme on its website, in a gazette notice and in a local newspaper inviting anyone to make submissions, which the authority must then consider.

- 6 Section 23(5), *Urban Land Development Authority Act 2007*.
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- 7 Section 57, *Urban Land Development Authority Act 2007*.
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- 8 Transcript, Malcolm Snow, 26 September 2011, Brisbane [p3161: line 48].
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- 9 Sections 32-35, *South Bank Corporation Act 1989*.
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- 10 Section 36 and Part 7, *South Bank Corporation Act 1989*.
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- 11 Sections 32-35, *South Bank Corporation Act 1989*.
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- 12 Section 36, *South Bank Corporation Act 1989*.
- 
- 13 Section 60, *South Bank Corporation Act 1989*.
- 
- 14 State Development and Public Works Organisation Amendments Bill 1999, Explanatory Notes [p1].
- 
- 15 *Administrative Arrangements Order (No 2) 2011*; Section 3, *State Development and Public Works Organisation Act 1971*.
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- 16 Section 77, *State Development and Public Works Organisation Act 1971*.
- 
- 17 Sections 77(3) and 82(1), *State Development and Public Works Organisation Act 1971*.
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- 18 Department of Employment, Economic Development and Innovation, State Development Areas, [www.deedi.qld.gov.au/cg/state-development-areas.html](http://www.deedi.qld.gov.au/cg/state-development-areas.html).
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- 19 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1A [p3: para 7-8]; The Coordinator-General, Development Scheme for the Queensland Children's Hospital State Development Area, June 2008 [p6].
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- 20 Section 84, *State Development and Public Works Organisation Act 1971*.
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- 21 See, for example, The Coordinator-General, Development Scheme for the Abbot Point State Development Area, June 2008 [p12-21: section 9]; The Coordinator-General, Development Scheme for the Queensland Children's Hospital State Development Area, June 2008 [p9-16: section 9].
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- 22 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1A [p2: para 3-4].
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- 23 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1B-1 [p1].
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- 24 Section 31, *State Development and Public Works Organisation Act 1971*.
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- 25 Under the *State Development and Public Works Organisation Act 1971* and the relevant, corresponding provisions of the *Sustainable Planning Act 2009*, the person who proposes a significant project is called 'the proponent'. For simplicity's sake, the word 'applicant' is used in this part.
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- 26 Section 33, *State Development and Public Works Organisation Act 1971*.
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- 27 Section 37(1), *State Development and Public Works Organisation Act 1971*.
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- 28 Section 37(1)(c), the *State Development and Public Works Organisation Act 1971*.
- 
- 29 Section 76E, *State Development and Public Works Organisation Act 1971*.
- 
- 30 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 3 [p1: para 3; p2: para 7, 8].
- 
- 31 Sections 76I and 76J, *State Development and Public Works Organisation Act 1971*.
- 
- 32 Sections 76K and 76L, *State Development and Public Works Organisation Act 1971*.
- 
- 33 Section 76N, *State Development and Public Works Organisation Act 1971*.
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- 34 Section 23(5), *Urban Land Development Authority Act 2007*. It is noted, however, that the Assistant Director-General of the Strategic Policy Division of the Department of Community Safety (the lead agency for ensuring the application of State Planning Policy 1/03) gave evidence that the Urban Land Development Authority had not sought the department's advice in relation to the policy. See: Transcript, Gary Mahon, 19 September 2011, Brisbane [p2783: line 28].
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- 35 Although the Urban Land Development Authority will obviously consider State Planning Policy 1/03 in the assessment of a development application, to the extent to which the policy is reflected in the planning scheme against which the application is assessed, by reason of section 57, *Urban Land Development Authority Act 2007*.
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- 36 This was accepted by the Queensland Government Planner. See Transcript, Gary White, 7 November 2011, Brisbane [p4634: line 5].
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- 37 Transcript, Paul Eagles, 21 September 2011, Brisbane [p2936: lines 1-14, 30-40; p2937: lines 3-32].
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- 38 Exhibit 579, Statement of Paul Eagles, 9 September 2011 [p2: para 7]; Transcript, Paul Eagles, 21 September 2011, Brisbane [p2936: line 1-14].
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- 39 Exhibit 579, Statement of Paul Eagles, 9 September 2011 [p4: para 11]; Transcript, Paul Eagles, 21 September 2011, Brisbane [p2937: line 3-32].
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- 40 Exhibit 579, Statement of Paul Eagles, 9 September 2011 [p9: para 28].
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- 41 Exhibit 579, Statement of Paul Eagles, 9 September 2011 [p5: para 15 – p6: para 17] and Attachment PE2; Transcript, Paul Eagles, 21 September 2011, Brisbane [p2939: line 10-15].
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- 42 Exhibit 623, Statement of Malcolm Snow, 16 September 2011 [p2: para 13]; Transcript, Malcolm Snow, 26 September 2011, Brisbane [p3164: line 42-53].
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- 43 Transcript, Malcolm Snow, 26 September 2011, Brisbane [p3167: line 1-3] and Brisbane City Council, Bundle of correspondence between the council and South Bank Corporation regarding 'Proposed Amendments to Approved Development Plan – Site 3F' between 11 November 2008 and 27 January 2009 and regarding 'Approved Development Plan Site 3A' between 21 April 2009 and 9 November 2009.
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- 44 Exhibit 623, Statement of Malcolm Snow, 16 September 2011 [p3: para 23, 24]; Transcript, Malcolm Snow, 26 September 2011, Brisbane [p3164: lines 32-40; p3165: lines 28-35]; Brisbane City Council, Letter from South Bank Corporation to SW1 Joint Venture dated 26 August 2008 and letter from South Bank Corporation to the council dated 19 April 2010.
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- 45 Transcript, Malcolm Snow, 26 September 2011, Brisbane [p3166: lines 18-30].
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- 46 Exhibit 623, Statement of Malcolm Snow, 16 September 2011 [p5: para 31].
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- 47 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1A [p1: para 2(b), (c)].
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- 48 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1A [p2: para 2(d); p3: para 6].
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- 49 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1A [p2: para 3].
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- 50 For example, *Integrated Resort Development Act 1987, Sanctuary Cove Resort Act 1985, Townsville City Council (Douglas Land Development) Act 1993* and *Transport Infrastructure Act 1994*.
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- 51 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1B [p1: para 3(a)].
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- 52 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1B [p2: para 3(b)].
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- 53 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1B [p2: para 3(b)].
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- 54 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1B [p2: para 3(c)].
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- 55 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1B [p3: para 3(d)].
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- 56 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1B [p3: para 3(e)].
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- 57 Sections 35 and 39, *State Development and Public Works Organisation Act 1971*.
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- 58 Transcript, Keith Davies, 7 November 2011, Brisbane [p4674: line 36].
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- 59 Transcript, Keith Davies, 7 November 2011, Brisbane [p4672: line 40].
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- 60 Transcript, Keith Davies, 7 November 2011, Brisbane [p4672: lines 40-57].
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- 61 Transcript, Keith Davies, 7 November 2011, Brisbane [p4673: line 24].
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- 62 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1B-2 (section 5.1) [p19-20].
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- 63 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1B-2 (section 5.4.2) [p39].
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- 64 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1B-2 (section 5.4.2) [p38-39].
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- 65 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 1B-2 (section 5.1.1) [p19].
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- 66 Transcript, Keith Davies, 7 November 2011, Brisbane [p4673: lines 28-34, 46-58].
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# 7

## 7 Development and flood considerations

In this chapter, the Commission deals with the flood considerations relevant to various types of development including: residential uses, community infrastructure, commercial development, industrial development (considering hazardous materials in particular), river architecture, filling in the floodplain and levees. One flood consideration, the problem of isolation or hindered evacuation, which is relevant to many types of development, is given particular attention.

In the course of the chapter, the Commission refers to evidence of particular sites flooding during the 2010/2011 floods. The fact that a particular site or development did flood during the 2010/2011 floods should not be taken to indicate that there was a deficiency in the development assessment process. The results of the Commission's scrutiny of the development assessment process are contained in chapter 8 *Development assessment in practice*.

### 7.1 Residential uses

The Commission has heard a great deal of evidence from individuals whose homes were inundated by floodwaters during the 2010/2011 floods. Experiences varied widely: floodwaters lapped at floorboards, or left homes completely submerged. For some, the waters rose slowly; for others, like the people of Grantham, the torrent swept away homes with little or no warning, and lives were lost.

What follows is a brief discussion of how the planning system regulates future residential development and the limitations of land planning in protecting existing residential uses.

#### 7.1.1 Existing residential uses

Many existing uses have been established historically without regard to flood or by reference to what was accepted wisdom at an earlier point in time. For example, Brisbane City Council estimates that almost 90 per cent of the residential properties in Brisbane that were affected by the 2010/2011 floods were in areas predominantly developed prior to 1978, the year in which the council adopted a defined flood level as a planning tool.<sup>1</sup>

Planning systems do not operate retrospectively. Improvements in land planning regulation are only realised when development applications are assessed against the improved regulation. Where residential uses have been established historically, there is little the planning system can do to mitigate their risk of flooding.

Councils can, however, take steps to limit further residential development occurring in areas that flood. Generally, this involves 'down-zoning' such areas so that the planning scheme provisions discourage future approvals for residential development. For example, Ipswich City Council, in response to the January 2011 floods, considered which parts of its region should be rezoned, having been affected by flooding in January 2011.<sup>2</sup> Ipswich City Council's temporary local planning instrument also contains 'special opportunity areas', in which the council is encouraging

the transition of existing residential precincts to ‘low impact, non-residential uses’.<sup>3</sup> This is not a zone change, but rather involves reducing the level of assessment for certain non-residential uses, making it easier to obtain a development approval. For a more detailed discussion of temporary local planning instruments see section 5.2.

However, land planning measures, such as those used by Ipswich City Council, can present some difficulties. Councils may be concerned that changing their planning schemes in response to flooding – by ‘rezoning’ or ‘down-zoning’ certain areas – will result in claims for liability under the *Sustainable Planning Act 2009*. (For a detailed discussion, see section 5.5 *Compensation*.) In addition, existing residential communities in flood-affected areas may, understandably, be resistant to the introduction of non-residential land uses, with the prospect of losing the amenity of their neighbourhoods.<sup>4</sup>

There will be circumstances which warrant more concerted measures: when homes are frequently damaged by flooding, a government (local or state) may offer to buy the properties from their owners. This is known as a property buy-back program or a voluntary purchase scheme.<sup>5</sup> Buying back residential property does not stop flooding: instead, it puts an end to the land being used for residential purposes. With similar intent, the Lockyer Valley Regional Council recently undertook a large scale land swap for the Grantham area, enabling certain eligible land owners to relocate their homes on land above the level of flooding experienced in the January 2011 floods.<sup>6</sup> A description of both these programs is contained in chapter 11 *Buy-backs and land swaps*.

Existing residential development located in areas that flood will, inevitably, remain vulnerable to flood damage. This raises the question of what can be done to minimise the impact of flooding on existing residential uses. Some of the options examined by the Commission include:

- installing backflow prevention devices to prevent stormwater rising out of drains and flooding residential properties, see section 10.2 *Stormwater*
- sealing electricity conduits to prevent floodwaters entering residential buildings through basements, see section 10.3 *Electrical infrastructure*
- providing protection from flooding by way of flood mitigation levees, see section 7.7 *Levees*.

Another option (which is beyond the Commission’s terms of reference and hence is not further explored in this report) is retrofitting existing houses in areas at risk of flooding to reduce their vulnerability to flood impact. This might include renovating a house to incorporate water resistant building materials or to raise its ground floor level: a costly solution, which is not appropriate for every location or every house type and does not guarantee immunity from all floods.<sup>7</sup> The use of appropriate building materials to guard against some of the damage caused by flooding is examined in more detail in chapter 9 *Building controls*. Ensuring that homeowners are provided with information about the risk of flood to their property or residence is a first step in enabling them to make decisions about whether the use of resilient building materials is necessary and useful. The communication of information about flooding to purchasers of property is discussed in section 2.9.2 *Flood information for dealing with property*.

## 7.1.2 An acceptable level of risk for proposed residential uses

The Standing Committee on Agriculture and Resource Management report, *Floodplain Management in Australia: Best Practice Principles and Guidelines*, states that residential development should be located in areas of low hazard, or medium hazard where justified by careful planning, design and construction which takes account of the potential flood damage and provides safe evacuation.<sup>8</sup> The ‘hazard’ referred to is the loss of life, injury and economic loss which may be caused by future floods.<sup>9</sup>

This standard is given effect, at least in part, in State Planning Policy Guideline 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, which provides that planning schemes should discourage residential development in areas of high or medium hazard, unless the scheme includes a clear requirement that people and property be protected from the relevant hazard.<sup>10</sup> It contains proposed solutions in support of this aim. In particular, the guideline suggests that houses be located so that habitable floor levels are above the defined flood event level.<sup>11</sup>

These solutions are mirrored in planning schemes across Queensland (and throughout Australia): flood related planning controls typically require that residential buildings be constructed so that their habitable floor levels are located at or above the level of a 1% AEP flood. An additional freeboard of (usually) between 300 millimetres and 500 millimetres may also be required.<sup>12</sup>

But whether the 1% AEP flood constitutes an acceptable level of risk for development, and in particular residential development, is a vexed issue.<sup>13</sup> The consequences of flooding are likely to be at their most disastrous for residents and homeowners.<sup>14</sup> *Floodplain Management in Australia* recognises this: according to it, the community must play a role in determining what level of flood risk it is prepared to live with.<sup>15</sup>

The history of Bundaberg Regional Council's 2004 planning scheme is instructive. Prior to 2004, the scheme stipulated that the floor level of residential premises be at least as high as the level of the 1942 flood in Bundaberg, which was lower than the level of a 2% AEP flood.<sup>16</sup> The 1942 flood level was widely accepted by the community.<sup>17</sup> When, in 2000, the council sought to introduce a new planning scheme adopting a 2% AEP flood level, the public's reaction was decidedly negative. The council's director of infrastructure and planning services reported that there were demonstrations and a 'fiery' public meeting in response to the 2% AEP flood map.<sup>18</sup> The council has since introduced the level of the 2% AEP flood into its planning scheme to regulate development proposals affected by Burnett River flooding.<sup>19</sup> State Planning Policy 1/03 generally proposes that a 1% AEP flood level be adopted, although it accepts that the local circumstances may warrant the use of a different level. A key feature of the Bundaberg Regional Council's justification of choosing the lower, 2% AEP level is the community's willingness to accept the concomitant higher risk of flooding.<sup>20</sup>

The current review of State Planning Policy 1/03 is considering this particular issue in more detail. The Inland Flood Study – a joint project of the Queensland Government and the Local Government Association of Queensland – recommended that, as part of the review of State Planning Policy 1/03, criteria be developed to determine the circumstances in which a council should be able to adopt a defined flood event of a greater or lesser magnitude than a 1% AEP flood to regulate residential development.<sup>21</sup>

The Commission endorses consideration being given to this issue. To determine what amounts to an acceptable level of risk for residential development, it is necessary to understand the consequences associated with floods across the full range of probabilities.<sup>22</sup> Only once this understanding has been gained is it appropriate to canvas what level of risk from flooding the community is prepared to tolerate.<sup>23</sup> To this end, the public notification period required for all major planning scheme amendments is particularly important. (For a discussion of the planning scheme amendment process see *4.1.4 State interest review of planning schemes*. In chapter 2 *Floodplain management*, the Commission has outlined, in detail, the way in which government can conduct flood studies to measure the full range of floods, in terms of likelihood and behaviour, and how such studies can be used in floodplain management.)

## 7.2 Community infrastructure

Community infrastructure is development that provides services vital to the wellbeing of the community.<sup>24</sup>

Under the *Sustainable Planning Act 2009*, a Minister<sup>25</sup> or a council may designate land for community infrastructure.<sup>26</sup> The kinds of development which are identified as community infrastructure for the purposes of the *Sustainable Planning Act* are contained in Schedule 2 of the *Sustainable Planning Regulation 2009*.

Much of the development which falls under the community infrastructure designation, whether so designated by the Minister or a council, is exempt development which does not require approval under a planning scheme and is not required to meet any scheme requirements.<sup>27</sup> However, development under a community infrastructure designation must comply with the requirements of the designation, which may specify, for instance, the height and location of the works on land.<sup>28</sup>

Where a Minister is responsible for making the designation, he or she must consider relevant state planning policies, which include State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, before designating the land.<sup>29</sup>

State Planning Policy 1/03 also applies where a council:

- designates land for community infrastructure under the *Sustainable Planning Act*
- assesses a development application for community infrastructure under the *Sustainable Planning Act* or
- allocates land for community infrastructure in a planning scheme.<sup>30</sup>

State Planning Policy 1/03 lists, in Annex 1, the types of community infrastructure development to which it applies. They are:

- police and emergency services facilities, including emergency shelters

- hospitals and associated infrastructure
- facilities for the storage of valuable records or items of cultural or historic significance
- State-controlled roads
- railway lines, stations and associated facilities
- aeronautical facilities
- communication network facilities
- works of an electricity entity under the *Electrical Safety Act 2002*
- water cycle management infrastructure.<sup>31</sup>

There is both overlap and divergence between the types of development identified as community infrastructure in Schedule 2 of the *Sustainable Planning Regulation* and those specified in Annex 1 of State Planning Policy 1/03. Some of the uses which are identified as community infrastructure under the *Sustainable Planning Regulation*, but which are absent from the list of community infrastructure uses in the State Planning Policy 1/03, are:

- child care facilities
- aged-care facilities
- cemeteries and crematoriums
- correctional facilities
- educational facilities
- parks and recreational facilities
- operating works under the *Electricity Act 1994*
- various types of transport infrastructure and waste management facilities.

For those types of development which are identified as community infrastructure by the *Sustainable Planning Regulation* but which are not included in the State Planning Policy 1/03 list, there is no requirement that regard be had to the policy when a Minister or council considers the suitability of the development for the proposed location.

State Planning Policy 1/03 aims to ensure that, where practicable, community infrastructure to which it applies is located and designed so as to function effectively during and immediately after floods of a 'specified level of risk'.<sup>32</sup> The policy applies to the listed types of development anywhere in Queensland (not only within natural hazard management areas for flood).<sup>33</sup> If it is proposed to locate community infrastructure within a natural hazard management area for flood, its compatibility with the flood hazard of the land is assessed against Outcomes 1 and 2 of State Planning Policy 1/03.<sup>34</sup> These outcomes are discussed in chapter 4.1 *State Planning Policy 1/03*.

State Planning Policy 1/03 acknowledges that it would be unrealistic to locate and design community infrastructure so as to withstand any conceivable flood.<sup>35</sup> Accordingly, the policy, when read together with the State Planning Policy 1/03 Guideline, recommends appropriate levels of risk for specific types of infrastructure.<sup>36</sup> For example, the guideline suggests that emergency shelters be located above the level of a 0.5% annual exceedance probability flood, while hospitals and associated facilities should be located above the level of a 0.2% AEP flood.<sup>37</sup> The policy also says that the steps needed by way of design and location to enable the infrastructure to withstand flood should be weighed against the need for the infrastructure to serve the community effectively in normal circumstances, when there is no flooding.<sup>38</sup>

The types of community infrastructure to which State Planning Policy 1/03 applies are those which the community needs to continue to function, notwithstanding flood. An example of such infrastructure is the Wesley Hospital, located in Auchenflower, Brisbane, and constructed in 1976. In January 2011, it was surrounded by floodwaters.<sup>39</sup> All vehicle access, including access by ambulances, to and from the hospital was cut during an almost two day period from early Wednesday, 12 January, to late Thursday, 13 January.<sup>40</sup> The hospital became fully operational again from Monday 17 January.<sup>41</sup> (The difficulties the hospital experienced are discussed in greater detail in section 7.8 *Anthills: Properties isolated by flooding of low-lying access routes*.)

Not all of the development identified as community infrastructure under Schedule 2 of the *Sustainable Planning Regulation* is of the kind which the community needs to continue to function during and immediately after flood. An obvious example is parks and recreational facilities. However, some of the identified forms of infrastructure provide services important to community well-being.

The special characteristics of child care centres make the use a suitable one to be assessed against criteria requiring centres to be located and designed, wherever practicable, so as to function effectively during and immediately after floods of a specified level of risk. The closure of a child care centre is likely to cause considerable inconvenience and, possibly, expense (loss of wages or the cost of substitute casual child care) to parents using its service. In any assessment it is relevant that many of the occupants of child care centres are likely to be too young to evacuate on foot, or even to be evacuated in a motor vehicle unless fitted with appropriate car seats, increasing the required evacuation time. An ideal evacuation would likely involve children being collected by their parents or carers, but that is dependent on there being flood free evacuation routes.

The Queensland Government Planner's opinion, given in response to the description of a case where a child care centre was served by a flood free evacuation route and was required to have a flood evacuation plan in place as a term of its development approval, was that it was, nonetheless, preferable that it be located outside a flood 'risk area'.<sup>42</sup> His opinion reinforces the Commission's view that child care centres should be assessed against the standard State Planning Policy 1/03 as it applies to community infrastructure, given the 'specified level[s] of risk' for community infrastructure prescribed by the State Planning Policy 1/03 Guideline tends to be set very low, generally between the 0.2% AEP and 0.5% AEP flood levels.

During hearings held at Ipswich, a witness gave evidence about the inundation of a child care centre in Goodna. The development of the centre was approved by the Ipswich City Council in August 2006, on a site which was inundated during the 1974 floods and is located within the council's '1 in 100 flood line', adjacent to an overland flow path and close to the council's '1 in 20 development line'.<sup>43</sup> The centre is able to accommodate approximately 115 children per day, including eight babies (under 15 months in age) and 20 toddlers (aged 15 months to two and a half years); on any given day about 25 staff are employed at the centre.<sup>44</sup> On the morning of 11 January 2011, the centre manager decided to evacuate the centre because of concern about flooding.<sup>45</sup> By 1.00 pm that day, all children had been collected by their parents or carers and the staff had evacuated.<sup>46</sup> By 5.00 am on Wednesday 12 January 2011, the water levels at the centre exceeded six feet.<sup>47</sup> The centre remained closed for 45 days.<sup>48</sup>

Notwithstanding that child care facilities are not within the compass of the State Planning Policy 1/03 definition, the council assessed the development application against criteria under the Ipswich Planning Scheme 2004's community use code requiring the use (in this case, the child care centre) to be able to function effectively during and immediately after a flood.<sup>49</sup> This standard was plainly not achieved by the centre during the January 2011 flood. This aspect of the development approval is considered in detail in section 8.3.1 *Conditions going to acceptability of use*.

Arguably, aged-care facilities should also be assessed against criteria requiring them to be located and designed so as to function effectively during and immediately after flood. The Standing Committee on Agriculture and Resource Management report *Floodplain Management in Australia: best practice principles and guidelines* states that housing for the aged is best sited in flood-free areas because of the additional time likely to be involved in evacuation, and the dangers of slower evacuation.<sup>50</sup>

The Commission heard some evidence about the evacuation of residents of a Yeronga retirement complex (providing aged-care, assisted living and independent living facilities)<sup>51</sup> during the January 2011 flooding.<sup>52</sup> The evacuation, for the most part, ran smoothly, but was described as being very stressful for some of the residents.<sup>53</sup> The flood inundated the basement carpark and reached a level approximately one metre above ground.<sup>54</sup> Only those residents fit enough to climb the fire escape stairs were permitted to return to the complex two weeks later to collect additional personal items.<sup>55</sup> Residents were not able to return to living in the complex until approximately two months after the inundation of the property.<sup>56</sup> For a fuller discussion of this example, see section 7.8 *Anthills: Properties isolated by flooding of low-lying access routes*.

A third kind of development which is identified as community infrastructure under Schedule 2 of the *Sustainable Planning Regulation*, but which is absent from the list of development which constitutes community infrastructure in State Planning Policy 1/03, is operating works under the *Electricity Act 1994*. Elsewhere in this report, the Commission recommends that the Queensland Government should consider measures to include requirements in the designation of land for community infrastructure under the *Sustainable Planning Act* to ensure that critical infrastructure for operating works under the *Electricity Act* is built to remain operational during and after a flood of a particular magnitude, with that magnitude being determined by an appropriate risk assessment. This proposition is discussed in detail in section 10.3.3 *Shared network infrastructure*.

The Commission's investigation as to the kinds of development which are included in the definition of community infrastructure under Schedule 2 of the *Sustainable Planning Regulation* but excluded from State Planning Policy 1/03 is, plainly, not comprehensive. Even this selective review, however, establishes a case for the Queensland Government to give consideration to extending the application of a state planning policy which deals with flood to the types of community infrastructure which are identified in the *Sustainable Planning Regulation* and which the community needs to continue functioning, notwithstanding flood.

The Commission otherwise endorses the criteria set by State Planning Policy 1/03 for determining the compatibility of proposed community infrastructure with a specific level of flood risk and supports the incorporation of criteria in these terms in model flood planning controls and planning schemes.

## *Recommendations*

- 7.1 The Queensland Government should consider extending the application of a state planning policy dealing with flood to the types of community infrastructure which are identified in the *Sustainable Planning Regulation 2009* and which the community needs to continue functioning, notwithstanding flood.
- 7.2 The Queensland Government should draft assessment criteria to be included in the model flood planning controls that require community infrastructure (including the types of community infrastructure which are identified in the *Sustainable Planning Regulation 2009* and which the community needs to continue functioning, notwithstanding flood) to be located and designed to function effectively during and immediately after a flood of a specified level of risk.
- 7.3 If the Queensland Government does not include such assessment criteria in model flood planning controls, councils should include assessment criteria in their planning schemes that require community infrastructure (including the types of community infrastructure which are identified in the *Sustainable Planning Regulation 2009* and which the community needs to continue functioning, notwithstanding flood) to be located and designed to function effectively during and immediately after a flood of a specified level of risk.

## 7.3 Commercial uses

This part considers the location of commercial uses on land liable to flood. Industries that involve the processing or storage of dangerous goods and substances are considered separately; see *7.4 Industrial uses and hazardous materials*.

The location of commercial uses, such as shops and offices, in areas susceptible to flood carries the risk of damage to goods, property and equipment. Many businesses across Queensland experienced such damage during, and as a consequence of, the 2010/2011 floods, as well as temporary closures and loss of power.

Nevertheless, commercial uses within the floodplain may be more appropriate than other uses.<sup>57</sup> The personal safety of a commercial building's occupants may still be at risk, but generally to a lesser degree than would be the case for residential or certain community infrastructure uses. Commercial buildings may also be better able to withstand flood damage because they have the advantage, in many cases, of being more structurally robust than houses, and are required to be designed to withstand other hazards such as fire.<sup>58</sup>

Business owners may become aware of the susceptibility of a location to flood by undertaking a general flood search. The site-specific flood information which some councils make available to all members of the community is discussed in chapter *2 Floodplain management*.

Businesses may willingly establish a commercial use in an area which floods because the location offers other commercial benefits. A Gympie real estate agent gave evidence that the company for which she worked as licensee and office manager did just that: it elected to lease a property knowing that the vicinity flooded, because of its cheaper rent.<sup>59</sup> The premises were completely flooded by the rising Mary River in January 2011. The real estate agency, in collaboration with the business' landlord, has refurbished with an eye to future inundation, using flood-resilient or readily removed materials and furniture: a front desk easily moved; floor tiles laid, not glued, in place of carpet; removable ceiling tiles; and corrugated iron, rather than plaster, dividing walls.<sup>60</sup>

However, although a proprietor may be willing to balance flood risk against other advantage in establishing his or her business, councils need to consider the appropriateness of commercial development in areas liable to flooding.

A development approval granted for a car and dog wash on land approximately 600 metres from the Mary River in Gympie and below the ‘1 in 40 flood level’ provides an example.<sup>61</sup>

The car and dog wash comprises four manual car cleaning and vacuum bays, one automated drive-through car wash and two manual dog washing bays.<sup>62</sup> The buildings are permanent steel and concrete structures and the site infrastructure involved a complex plumbing network and extensive plant and equipment.<sup>63</sup> The business was inundated during the 2010/2011 floods, causing it to become inoperable for a period of eight weeks and to incur substantial financial losses through damage to the buildings and equipment and loss of trade.<sup>64</sup>

The council’s considerations, when assessing the owners’ development application for a material change of use, were dictated by the assessment criteria of the Cooloola Shire Council planning scheme. Of the codes applicable, only one, the Gympie Planning Area Code, contained a provision requiring flooding to be taken into account.<sup>65</sup> Development within the commercial zone of the Gympie planning area is assessed against a requirement to maintain the safety of people from floods.<sup>66</sup> There is no requirement that seeks to protect property used for commercial purposes from the impacts of floods.<sup>67</sup> Nor does the scheme contain a provision which requires the potential for flood damage to commercial property to be mitigated. The council also did not consider, because it was not required to by the terms of the planning scheme, the frequency with which the site has been affected by flood, the site’s proximity to the Mary River or the effects of stormwater runoff.<sup>68</sup>

The Gympie Regional Council’s manager of development and compliance agreed that the Cooloola Shire Council planning scheme’s provisions could be made more detailed in regards to flooding.<sup>69</sup>

The Council’s director of planning and development gave evidence of an anomaly in the Cooloola Shire Council planning scheme’s code for reconfiguring a lot, relevant to the subdivision of land. (That code did not apply to assessment of the car and dog wash development application, which involved no subdivision.) The reconfiguration of a lot code:

- requires that ‘new lots intended for non-residential use maintains [sic] the safety of people and minimises [sic] the potential damage to property from flood’
- states that this specific outcome can be achieved, for example, if each lot contains a safe refuge.<sup>70</sup>

Thus, a development could meet the criterion which requires the potential damage to property from flooding to be minimised by providing a ‘safe refuge’; in other words, without doing anything to ensure the preservation of buildings or equipment.<sup>71</sup> The planning director said that the hiatus would be addressed in the preparation of the council’s new planning scheme. He regarded the resilience of non-residential buildings to flood as ‘an important and a laudable outcome’ in development assessment.<sup>72</sup>

Councils should be required to consider the impact of flood on commercial property when assessing a development application for a commercial use on land at risk of flood. This could be achieved by including in planning schemes assessment criteria (overall outcomes, performance outcomes and acceptable outcomes) that require the impact of flood on property to be minimised. Including assessment criteria of this kind in planning schemes may also carry the incidental benefit of alerting business owners to the risks associated with establishing a commercial use on the floodplain.

## *Recommendations*

- 7.4 The Queensland Government should draft assessment criteria to be included in the model flood planning controls that require the impact of flood on commercial property to be minimised.
- 7.5 If the Queensland Government does not include such assessment criteria in the model flood planning controls, councils should include assessment criteria in their planning schemes that require the impact of flood on commercial property to be minimised.

## 7.4 Industrial uses and hazardous materials

After the January 2011 floods, the Oxley Creek, and other nearby tributary creeks in Brisbane's south, were slick with contaminants and littered with industrial debris.<sup>73</sup> Much of this pollution was discharged from the many industrial and commercial facilities located within the Oxley Creek catchment.<sup>74</sup>

Brisbane City Council quickly commenced the process of cleaning up. Due to the large amount of hazardous material discharged onto nearby land and spilled into local waterways, the council needed assistance from DERM, which was duly provided.<sup>75</sup>

The scale of the post-flood clean up of the Oxley Creek catchment highlights what can happen when industrial premises flood. This prompted the Commission to examine the way in which the storage and manufacture of hazardous materials are regulated, and in particular whether the risk of flooding is adequately considered.

### Hazardous materials

Hazardous materials were defined in the *Dangerous Goods Safety Management Act 2001* as materials that can cause harm to people, property and the environment,<sup>76</sup> and that definition was adopted by State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*. (The *Dangerous Goods Safety Management Act* has been repealed; the *Work Health and Safety Act 2011* now applies to the storage of dangerous goods, even if they are not in a workplace or used in the course of work.<sup>77</sup>) In addition, the term 'hazardous materials' may have a specific meaning in council planning schemes.

Hazardous materials are often stored, used or manufactured on land associated with industrial uses. Such materials are also associated with rural land uses, such as agriculture, which can involve, for example, the use of fertilisers and petrol products. It is generally more appropriate for industrial or rural land uses to be located on land at risk from flooding, as compared to more sensitive land uses, such as residential or community infrastructure.<sup>78</sup>

However, when floodwaters inundate land on which dangerous chemicals and other hazardous materials are located, those substances can be discharged, causing harm to people, property and the environment. Given this, it is important that regulation of the storage and location of hazardous materials takes into account the risk of flooding on sites at which these products will be stored.

### 7.4.1 Regulation

In Queensland, the principal state level instruments that regulate the storage and use of dangerous chemicals and hazardous materials are the *Work Health and Safety Act 2011*, the *Environmental Protection Act 1994*, and State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*. At a local government level, the storage and use of hazardous materials is addressed in planning scheme provisions.

#### *Work Health and Safety Act 2011*

Dangerous goods are defined in the *Work Health and Safety Act 2011* as meaning asbestos or anything defined under the Australian Code for the Transport of Dangerous Goods by Road and Rail as dangerous goods or goods to dangerous to be transported.<sup>79</sup> The Act imposes duties of safe storage of substances and design of structures.<sup>80</sup>

Protocols for the storage of hazardous materials are also informed by the Safe Storage and Handling of Dangerous Goods: Guidelines for Industry,<sup>81</sup> which provide practical guidance on meeting the requirements of the (now repealed) legislation previously governing dangerous goods, the *Dangerous Goods Safety Management Act 2001* and its associated Regulation. The guidelines describe specific engineering controls for the storage and handling of dangerous goods and recommend that dangerous goods be stored as far as practicable above 'recorded flood levels', although no advice is provided as to the meaning of this term.<sup>82</sup> Where this is not practicable, the guidelines suggest dangerous goods be stored in closed containers that are 'appropriately restrained' and impervious to the intrusion of floodwaters.<sup>83</sup>

#### *Environmental Protection Act 1994*

##### *Environmentally relevant activities*

The *Environmental Protection Act 1994* regulates 'environmentally relevant activities': generally speaking, activities which may cause environmental harm through the release of contaminants.

There are four broad categories of environmentally relevant activities:

- agricultural activities which affect the Great Barrier Reef (regulated by chapter 4A of the Act)
- mining activities (regulated by chapter 5 of the Act)
- petroleum and greenhouse gas activities (regulated by chapter 5A of the Act)
- activities which are not agricultural, mining or petroleum activities, but which will, or may, cause harm as a result of contaminants being released into the environment.<sup>84</sup>

Activities in the last category are ‘chapter 4 activities’<sup>85</sup> and are listed in Schedule 2 of the *Environmental Protection Regulation 2008*,<sup>86</sup> this list includes activities such as chemical manufacturing,<sup>87</sup> boilermaking,<sup>88</sup> motor vehicle workshop operation,<sup>89</sup> meat processing<sup>90</sup> and textile manufacturing.<sup>91</sup> The chapter 4 activities listed in Schedule 2 are of particular relevance to this section of the Commission’s report: they are commonly associated with industrial land uses in urban areas and tend to involve the storage and manufacture of hazardous materials. The following discussion relates to chapter 4 activities alone. Mining activities are discussed at length in chapter 13 *Mining*.

Unlike other environmentally relevant activities, such as mining or agriculture, chapter 4 activities are assessable development under the *Sustainable Planning Act 2009*.<sup>92</sup> A development applicant must make an application for a material change of use in order to: start a new chapter 4 activity; increase the threshold of a chapter 4 activity; re-establish an abandoned chapter 4 activity; or materially increase the intensity or scale of a chapter 4 activity.<sup>93</sup>

All chapter 4 activities are assessed by DERM, except where they have been devolved to local government for assessment and enforcement.<sup>94</sup> Devolved chapter 4 activities include: poultry farming; asphalt manufacturing; motor vehicle workshop operation and printing; and certain other activities, such as chemical storage, which are devolved to councils if they meet specific thresholds prescribed in the regulation.<sup>95</sup>

#### *The ‘standard criteria’*

All environmentally relevant activities are assessed against the standard criteria<sup>96</sup> as defined in the *Environmental Protection Act 1994*.<sup>97</sup> The standard criteria comprise a list of general considerations, such as ‘any applicable environmental protection policy’. They make no express reference to flooding, although in some cases such a reference may be inferred. For example, one of the criteria – ‘any applicable Commonwealth, state or local government plans, standards, agreements or requirements’ – may encompass flood related provisions in council planning schemes. Notwithstanding, the current criteria provide no basis for specific consideration of flood when assessing applications for environmentally relevant activities. They offer little guidance to Queensland Government or council officers about whether, and how, flooding should be taken into account in that assessment process.<sup>98</sup>

The Commission reviewed ten approved applications for environmentally relevant activities in four local government areas. Each approval was granted in respect of land that flooded in 2010/2011 floods. This review disclosed that none of the assessments explicitly considered whether flooding might occur at the site, or what effects flooding would have, should it eventuate.<sup>99</sup>

The risk of flooding, and its potential effects, should be taken into account in the assessment of environmentally relevant activities. The Commission considers that, to achieve this, a specific direction to consider the issue of flooding should form part of the assessment process under the *Environmental Protection Act 1994*.<sup>100</sup>

## Recommendation

- 7.6 The Queensland Government should ensure that the criteria under the *Environmental Protection Act 1994* that apply to the assessment of development applications for material change of use for environmentally relevant activities include consideration of the risk of flooding at the site on which the activity is proposed to occur.

### *DERM information sheets and assessment reports templates*

Template documents used in the assessment of applications for environmentally relevant activities could be improved so as to promote proper consideration of the issues associated with flooding.

DERM makes available an ‘information sheet’ for use by those applying to conduct an environmentally relevant activity.<sup>101</sup> The information sheet does not suggest the provision of information about flood risk, except for applications that concern activities where discharges to the environment are anticipated.<sup>102</sup> According to an officer of the department, information about flooding is rarely provided with development applications.<sup>103</sup> This, of course, makes it difficult for the risk of flooding to be considered as part of the decision making process. A practical solution to this problem would be for DERM to amend its information sheet to indicate that information regarding flood risk (including confirmation, if it be the case, that there is none) should be provided routinely with development applications concerning environmentally relevant activities.

DERM officers use an assessment report template when assessing applications for environmentally relevant activities.<sup>104</sup> The template contains a development approval assessment checklist, which contains no specific reference to flooding.<sup>105</sup> This checklist could be amended to invite consideration of flooding as part of the assessment process for environmentally relevant activities.

However, checklists will not always ensure that adequate thought is given to the matter of flooding. DERM reviewed a number of completed assessments for environmentally relevant activity assessments. That review revealed that, even with the assessment report template checklist, there were inconsistencies in the approaches taken by department officers.<sup>106</sup> After completing the review exercise, DERM resolved to revise the template report to minimise divergence amongst the approaches taken.

The Commission considers that while a checklist may not ensure reference to flooding issues, a more comprehensive document would, at the very least, encourage their consideration during the assessment of environmentally relevant activities.

## *Recommendations*

- 7.7 The Department of Environment and Resource Management should amend its information sheet about applications for a material change of use for environmentally relevant activities so that applicants are prompted to include information (if any) about the risk of flooding at the site where the activity is proposed to occur.
- 7.8 The Department of Environment and Resource Management should amend the template assessment report used to assess applications for a material change of use for environmentally relevant activities so that it prompts departmental officers to give specific consideration, as part of the assessment process, to the risk of flooding at the site where the activity is proposed to occur.

### *Information sharing between the Queensland Government and councils*

When a decision to approve an environmentally relevant activity is made by a Queensland Government officer, the council within whose boundaries the activity is being conducted may not have automatic access to details about the location and nature of the proposed activity.<sup>107</sup> Council officers would benefit from this information: it is relevant to any subsequent decisions about land use at or near sites at which environmentally relevant activities occur.

As noted above, certain chapter 4 activities are also devolved to councils for assessment.<sup>108</sup> There appears to be no obligation for councils approving devolved environmentally relevant activities to provide DERM with the details of such approvals.

An assessment officer in the Brisbane City Council expressed the view that it would be quite simple for such an information sharing arrangement to be established between a council and DERM.<sup>109</sup> It would also seem prudent for any agency which assesses applications for environmentally relevant activities to keep a register of such activities and include in that register the details of environmentally relevant activities assessed by other agencies.

## Recommendations

- 7.9 The Department of Environment and Resource Management should ensure that, when applications for a material change of use for an environmentally relevant activity are approved by the department, the details of those activities, including their nature and location, are provided to the council within whose area the activity will be conducted.
- 7.10 Councils should ensure that, when applications for environmentally relevant activities are approved by a council, the details of those activities, including their nature and location, are provided to the Department of Environment and Resource Management.

## State Planning Policy 1/03

State Planning Policy 1/03 applies to certain development which involves the manufacture or storage of hazardous materials in bulk.

Hazardous materials ‘in bulk’, as defined in the State Planning Policy 1/03, are hazardous materials in quantities that:

- are equal to or exceed the threshold amounts which determine a ‘large dangerous goods location’ under the (now repealed) *Dangerous Goods Safety Management Regulation 2008*, or
- require a licence, granted under the *Explosives Regulation 1955*, for the storage of explosives.<sup>110</sup>

The application of State Planning Policy 1/03 to individual development proposals is only enlivened where the development is proposed on land which is identified as a natural hazard management area for flood, and where the council planning scheme does not appropriately reflect the policy.<sup>111</sup> State Planning Policy 1/03 requires that development which involves the manufacture or storage of hazardous materials in bulk should be compatible with the nature of the natural hazard management area for flood.<sup>112</sup> Compatibility exists where public safety and the environment are not adversely affected by the detrimental impacts of floodwater on hazardous materials manufactured or stored in bulk.<sup>113</sup>

The State Planning Policy 1/03 Guideline offers two solutions for achieving this outcome:<sup>114</sup>

- the manufacture or storage in bulk of hazardous materials takes place above the defined flood event flood level<sup>115</sup>
- structures used for the manufacture or storage of hazardous materials in bulk are designed to prevent the intrusion of floodwaters.<sup>116</sup>

The first solution contemplates the possibility that a site which is susceptible to flooding during a defined flood event might contain locations, such as the highest part of the site or the second storey of a building, which remain flood free.

The solutions proposed in the State Planning Policy 1/03 Guideline are alternatives; applicants can choose to locate hazardous materials above the defined flood event flood level *or* store or manufacture them in a way that prevents the intrusion of floodwaters.<sup>117</sup> Framing the solutions as alternatives allows a more flexible approach to be adopted for industrial development involving the storage or manufacture of hazardous materials on land at risk from flooding.

This flexibility is important. Placing stringent restrictions on the location of industrial uses that involve hazardous materials – for example, to areas outside the 1% AEP flood extent only – may have consequences, particularly economic ones, which are not ascertainable in the absence of a proper risk based analysis. For example, parts of Brisbane that are susceptible to flooding also house large industrial precincts. If industrial development were to be restricted in these areas, the economic disadvantages might outweigh the benefits gained from reducing the risk of floodwaters discharging hazardous materials associated with such development.

The Commission agrees generally with the solutions proposed by State Planning Policy 1/03 Guideline for determining whether the storage or manufacture of hazardous materials in bulk is compatible with the natural hazard management area for flood. However, determination of the level above which hazardous materials must be located is best determined through a risk based assessment, not simply by reference to the defined flood event nominated by a council in its planning scheme.

## 7.4.2 Planning schemes

### Planning scheme provisions

There is variation among planning schemes as to the way in which the manufacture and storage of hazardous materials are regulated. Bundaberg City Council (under the Bundaberg and Burnett planning schemes only<sup>118</sup>), Gympie Regional Council (under the Cooloola and Tiaro planning schemes only<sup>119</sup>) and the Sunshine Coast Regional Council (under the Maroochy and Noosa planning schemes only<sup>120</sup>) include both of the solutions proposed in the current Guideline to State Planning Policy 1/03. All three planning schemes managed by the Moreton Bay Regional Council, and the Kilcoy planning scheme (administered by Somerset Regional Council) include only the first proposed solution: that materials be stored above the defined flood level.<sup>121</sup>

Brisbane City Council's planning scheme does not directly regulate development involving hazardous materials. Instead, regulation is achieved by the operation of the Subdivision and Development Guidelines, which are arrived at after consideration of several different codes.<sup>122</sup>

Ipswich City Council's planning scheme requires, where industrial sites are located below the 1 in 20 development line, the 1 in 100 flood line or within the Urban Stormwater Flow Path areas, that any materials stored on site:

- are readily able to be moved in a flood event
- are not hazardous or noxious or comprise materials that may cause a deleterious effect on the environment if discharged in a flood event, and
- where capable of creating a safety hazard by being shifted by floodwaters, are contained in order to minimise movement in times of flood.<sup>123</sup>

The elements of this provision are not drafted as alternatives; the effect is that materials which are hazardous, noxious or that may cause a deleterious effect on the environment, should not be located on land below the 1 in 100 flood line or in areas subject to overland flow.

Other planning schemes provide no specific guidance for the assessment of land uses involving the use or storage of hazardous materials on the floodplain.<sup>124</sup> For instance, the Esk Shire planning scheme (now administered by the Somerset Regional Council) contains no standards or controls relating to the storage of hazardous materials on land at risk from flooding.<sup>125</sup> The Central Highlands Regional Council relies on the regulatory framework provided by the previously applicable *Dangerous Goods Safety Management Act*, and the *Environmental Protection Act* (discussed above), to make decisions about the storage and use of hazardous materials.<sup>126</sup> Beyond these regulatory instruments, the planning scheme appears to contain no additional restrictions.

It is important that all Queensland planning schemes address the storage and manufacture of hazardous materials on land that is susceptible to flooding. The Queensland Government Planner agreed that the Queensland Planning Provisions should include an outcome, similar to that prescribed in the Guidelines to State Planning Policy 1/03 (discussed above).<sup>127</sup> This could be achieved by including assessment criteria in the model flood planning controls, which are intended to apply to land identified by a council as being susceptible to flooding. The model flood planning controls are discussed in detail in section 5.1 *Planning schemes*.

## Recommendations

- 7.11 The Queensland Government should draft assessment criteria to be included in the model flood planning controls that require that:
- the manufacture or storage of bulk hazardous materials (as defined in State Planning Policy 1/03) take place above a certain flood level, determined following an appropriate risk based assessment, or
  - structures on land susceptible to flooding and used for the manufacture or storage of bulk hazardous materials (as defined in State Planning Policy 1/03) be designed to prevent the intrusion of floodwaters.
- 7.12 If the Queensland Government does not include such assessment criteria in the model flood planning controls, councils should include assessment criteria in their planning schemes that require that:
- the manufacture or storage of bulk hazardous materials (as defined in State Planning Policy 1/03) take place above a certain flood level, determined following an appropriate risk based assessment, or
  - structures on land susceptible to flooding and used for the manufacture or storage of bulk hazardous materials (as defined in State Planning Policy 1/03) be designed to prevent the intrusion of floodwaters.

## Conditions on development approval

Where the manufacture or storage of hazardous materials *is* addressed in a planning scheme, some councils impose additional conditions on development approvals,<sup>128</sup> while others do not.<sup>129</sup> Where conditions are imposed, the approach differs among councils. For instance, the Gympie Regional Council (under the Cooloola Planning Scheme only) requires contingency plans for hazardous material evacuation as well as flood management plans.<sup>130</sup> Fraser Coast Regional Council, on occasion, imposes conditions that preclude the manufacture or storage of bulk hazardous materials, at or below the adopted flood level, unless approved in writing by a council assessment manager;<sup>131</sup> it is not clear what would be taken into account by the assessment manager in deciding whether to grant approval.

Problems can arise where the condition imposed, or the outcome prescribed by the planning scheme, relies on human intervention to prevent hazardous materials escaping into floodwaters. For example, should access to a site be cut, hazardous materials could not be removed and the solution proposed would fail.<sup>132</sup> While this might be rendered less likely by the prospect of a long flood warning time, the chance that individuals will be unable to reach a property to remove hazardous materials can never be entirely eliminated. Accordingly, development approval conditions which rely on evacuation plans or some other form of human intervention should not be the sole restriction placed on the storage or manufacture of hazardous materials on land at risk from flooding.

## Recommendation

- 7.13 When approving applications for development which involve the manufacture or storage of hazardous materials, councils should not restrict the conditions imposed to ones which are solely reliant on human intervention to remove the materials in the event of flood.

## 7.5 River architecture

### 7.5.1 Brisbane's river architecture

The Commission uses the term 'river architecture' in this report as referring to structures built for public or private use in rivers and waterways, but it has focussed its attention on those structures built along the Brisbane River, such as the New Farm Riverwalk (a floating walkway), the CityCat terminals (docks for the larger catamaran ferries), the CityFerry terminals (docks for the smaller ferries) and private pontoons.

In the January 2011 floods, Brisbane's river architecture was severely damaged, and in some cases became a danger to river navigation as detached pieces became waterborne debris. This debris posed a danger to other pieces of river architecture and to the structural soundness of any bridge it collided with.

Brisbane's image as the 'River City' is built, in part, upon its impressive river architecture. The amenity provided by these facilities must be balanced against the potential for their becoming a hazard in any future flood: a risk which must be considered in the design of new structures.

### 7.5.2 Regulation of river architecture as 'prescribed tidal work'

River architecture is classified as 'prescribed tidal work' under the *Coastal Protection and Management Act 1995*<sup>133</sup> and requires a development approval for its construction.<sup>134</sup> Applications for river architecture were previously approved by the Queensland Government. On 18 November 2005, the 'code for development applications for prescribed tidal work'<sup>135</sup> was introduced, and councils became responsible for approving those development applications.<sup>136</sup>

The code has a number of purposes, one of which is to ensure prescribed tidal work is structurally sound.<sup>137</sup> It also stipulates 'specific outcomes' that need to be met by the development and 'probable solutions' that identify ways in which the 'specific outcomes' may be achieved.<sup>138</sup>

One specific outcome requires prescribed tidal work to be designed and constructed to ensure it is structurally sound, having regard to relevant engineering standards, the location of the work, the purpose of the work and the impact of flooding, tide and hydrodynamic changes.<sup>139</sup>

The code suggests that in order to satisfy this 'specific outcome', one 'probable solution' is for the development to be consistent with all relevant Australian standards;<sup>140</sup> and with relevant planning scheme standards, if they are more stringent than the relevant Australian standard.<sup>141</sup>

### 7.5.3 New Farm Riverwalk

The New Farm Riverwalk was a floating walkway that ran parallel to the bank of the Brisbane River from New Farm to the Story Bridge.<sup>142</sup> In the January 2011 flood, the walkway suffered significant damage from the impact of debris, and the downstream section of the walkway was washed away.<sup>143</sup> As the flood levels rose, other support structures that comprised the Riverwalk also failed.<sup>144</sup>

Authorities became concerned a 300 metre section of the Riverwalk that had detached and floated down the river posed a threat to the structural integrity of downstream bridges if a collision were to occur. On 13 January 2011, tug boats guided the detached section of the walkway away from bridges and other infrastructure, preventing any collision occurring.<sup>145</sup>

The force of the flooded river on the pontoon at the mid-section of the structure led to the walkway's failure.<sup>146</sup> Brisbane City Council maintenance records do not contain any evidence to suggest that any earlier incidents, such as the impact from large debris or any deterioration of the building materials before the January 2011 flood, contributed to the Riverwalk's failure.<sup>147</sup>



Flood damage to New Farm Riverwalk (photo courtesy Stephen Knight)

## Design standards

The Riverwalk was built in 2003 for Brisbane City Council by contractors, following a tender process that began in early 2001.<sup>148</sup> The Riverwalk was designed to survive at least a 1% AEP flood, which meant that although damage might be sustained in such a flood, the walkway should remain intact.<sup>149</sup>

The identification of appropriate design standards for flood resilience at the time of the Riverwalk's construction was a matter for the design engineer applying relevant Australian standards and professional judgment.<sup>150</sup> There was no requirement for the flood resilience standards and design for the Riverwalk to be assessed by any third party, and there was no evidence that any review of this kind had taken place.<sup>151</sup>

Following the January 2011 floods, a hydraulic study was undertaken to determine the velocity of the water and flood levels at the Riverwalk structure. This study found that the 1% AEP flood level for the Riverwalk was 3.52 metres, whereas the actual flood level in January 2011 reached 4.0 metres.<sup>152</sup>

A study carried out to determine the cause of the Riverwalk's failure indicated that its design standard may have been intended for use in river architecture built in a typical marina situation along a coast. In a setting such as the Brisbane River at New Farm, flood levels can be significantly greater than the tidal range.<sup>153</sup> This study recommended that an analysis of the 0.05% AEP flood be undertaken for the design of any future Riverwalk.<sup>154</sup>

## Reconstruction of the Riverwalk

Brisbane City Council has indicated that it intends to rebuild the Riverwalk, at an estimated expense of around \$70 million.<sup>155</sup> Plainly, such a structure needs to be designed and built to a higher standard than the previous one, with measures put in place to ensure that if it does fail in any future flood, all parts that detach can be quickly and effectively secured.

Given the unique character of such a project, the risk involved in any failure, and the value of the work required, it would be prudent to ensure that any design is reviewed by an independent expert.<sup>156</sup>

## 7.5.5 CityCat and CityFerry terminals

The terminals used by Brisbane's ferries, the CityCats and the CityFerries, suffered significant damage in the January 2011 flood. Of the 24 CityCat and CityFerry terminals across Brisbane:

- ten terminals were categorised as useable with minor works (they could be reinstated for use within a short time frame by cleaning and replacing electrical components)
- seven terminals were categorised as useable with moderate works (they required repairs to pile brackets, removal of broken balustrades, repairs to roof structures and removal of debris)
- the remaining seven terminals were categorised as requiring major repairs (they suffered extensive damage to, or destruction of, piles, pontoons, gangways and/or waiting areas).<sup>157</sup>

The terminals in the minor and moderate damage categories were reinstated relatively quickly after the flood event (except one, River Plaza, which was subsequently reclassified as requiring major repairs). Brisbane City Council decided to reinstate the terminals that suffered major damage (including River Plaza) on a temporary basis, pending their replacement with new terminals constructed to different flood design standards. The temporary replacement of the West End terminal was not carried out, as there were pre-existing plans to replace the entire terminal.<sup>158</sup>

In 1995 and 1996, the CityFerry terminals<sup>159</sup> were upgraded to accept CityCat vessels. These terminals were originally designed and built between the early 1920s and 1996. Brisbane City Council was not able to tell the Commission whether they were originally constructed in accordance with the relevant Australian standards or what, if any, standards and policies were used for their design and construction.<sup>160</sup> Nor was the council able definitively to inform the Commission as to what flood the terminals were built to withstand during the upgrade.<sup>161</sup>

In 1995 and 1996, four new CityCat terminals were also built.<sup>162</sup> Brisbane City Council was able to indicate with more certainty that these terminals were designed to withstand a 1% AEP flood.<sup>163</sup> From 2001, a number of the terminals were upgraded progressively to withstand a 1% AEP flood.<sup>164</sup>

All of the works undertaken to repair the damage caused to the terminals in the January 2011 floods are now complete. Brisbane City Council indicated that it intends to replace the terminals that suffered major damage<sup>165</sup> with new structures built using design criteria developed in light of what was learnt from the January 2011 flood and using more advanced three dimensional modelling.<sup>166</sup> The new designs will incorporate a deflection structure at the upstream end of the pontoon and the pontoon itself will be streamlined to reduce drag forces. They will include a retractable gangway that can be removed from the path of the flood flow.<sup>167</sup> The new designs are expected to result in terminals that are more resilient to flood than the previous designs.<sup>168</sup>

## 7.5.6 Private pontoons

During the January 2011 floods, over four hundred private pontoons in the Brisbane River were dislodged from their moorings, including the floating restaurant 'Drift'. These pontoons ultimately ended up in the lower reaches of the river, creating serious navigational hazards for boats and shipping in the river and at the Port of Brisbane. On their journey down the river some of these pontoons may have caused damage to other infrastructure in the river, including Brisbane City Council's CityCat and CityFerry terminals.<sup>169</sup>

## 7.5.7 Response to the floods

Ordinarily, the repair or replacement of damaged structures in tidal areas requires a development approval from council. However, following the 2010/2011 floods, DERM granted an exemption (which applies between 14 February 2011 and 31 January 2013) to allow the repair of structures, without further approval, provided they are replaced on a like-for-like basis and in the same location.<sup>170</sup> The exemption was issued to allow for faster reconstruction of previously approved maritime structures.<sup>171</sup>

For private pontoons rebuilt under this exemption, Brisbane City Council has, in conjunction with DERM and Marine Queensland, developed a voluntary code of practice setting out the design, construction and maintenance standards that should be applied. The code is only intended to apply during the exemption period.<sup>172</sup>

Brisbane City Council believes that the code for development applications for prescribed tidal work in the *Coastal Protection and Management Regulation 2003* should be reviewed to ensure the design and construction provisions for all river architecture are adequate.<sup>173</sup> The Commission agrees that the Queensland Government and councils

having responsibility for river architecture such as that in the Brisbane River should review development standards to ensure the most up to date and appropriate standards are applied.

## Recommendations

- 7.14 The Queensland Government should review the code for development applications for prescribed tidal work in the *Coastal Protection and Management Regulation 2003* to consider whether the design and construction standards should be made more stringent than the existing standards.
- 7.15 Councils (particularly Brisbane City Council) should consider including in their planning schemes more stringent standards for the design and construction of prescribed tidal work than those in the code for development applications for prescribed tidal work in the *Coastal Protection and Management Regulation 2003*.

## 7.6 Placement of fill and development in a floodplain

Most towns and cities in Queensland are built on floodplains. A common solution to this constraint has been to import fill onto low-lying land, to build it up and reduce its flood risk. That measure can result in the diversion of floodwater to properties up and downstream, and can exacerbate flooding of those properties. Compensatory earthworks are often needed to prevent or minimise these consequences.<sup>174</sup>

The following diagram from the ‘Compensatory Earthworks Planning Scheme Policy’ in Brisbane’s planning scheme depicts compensatory earthworks.<sup>175</sup>

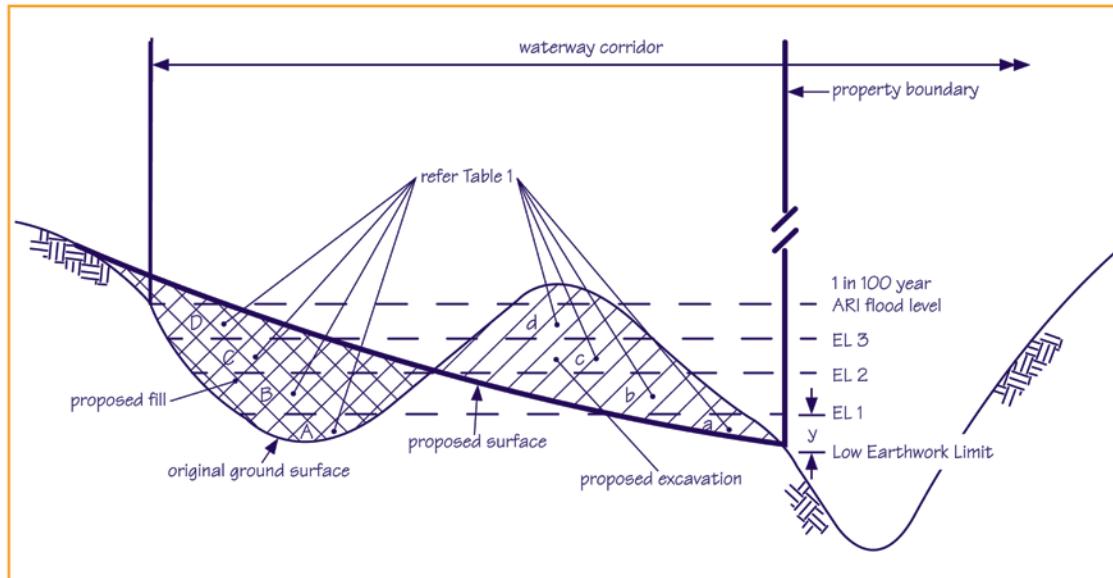


Figure a Calculating Compensatory Cut and Fill Volumes – Cross Section

Source: Compensatory Earthworks Planning Scheme, Brisbane City Plan 2000, Volume 2, Appendix 2: Planning Scheme Policies

In some limited circumstances, filling in the floodplain does not adversely affect surrounding properties, even without compensatory earthworks; for example, placing fill in backwater or low flow velocity areas may not have any consequence for properties up or downstream.<sup>176</sup>

A number of witnesses expressed their concern to the Commission that development in their areas exacerbated the flooding of their properties. Although the Commission is not in a position to determine whether or not the fill did worsen flooding in any particular instance, it is useful to refer to some cases which demonstrate public concern about the adverse flooding effects that filling in the floodplain can have.

## Graceville

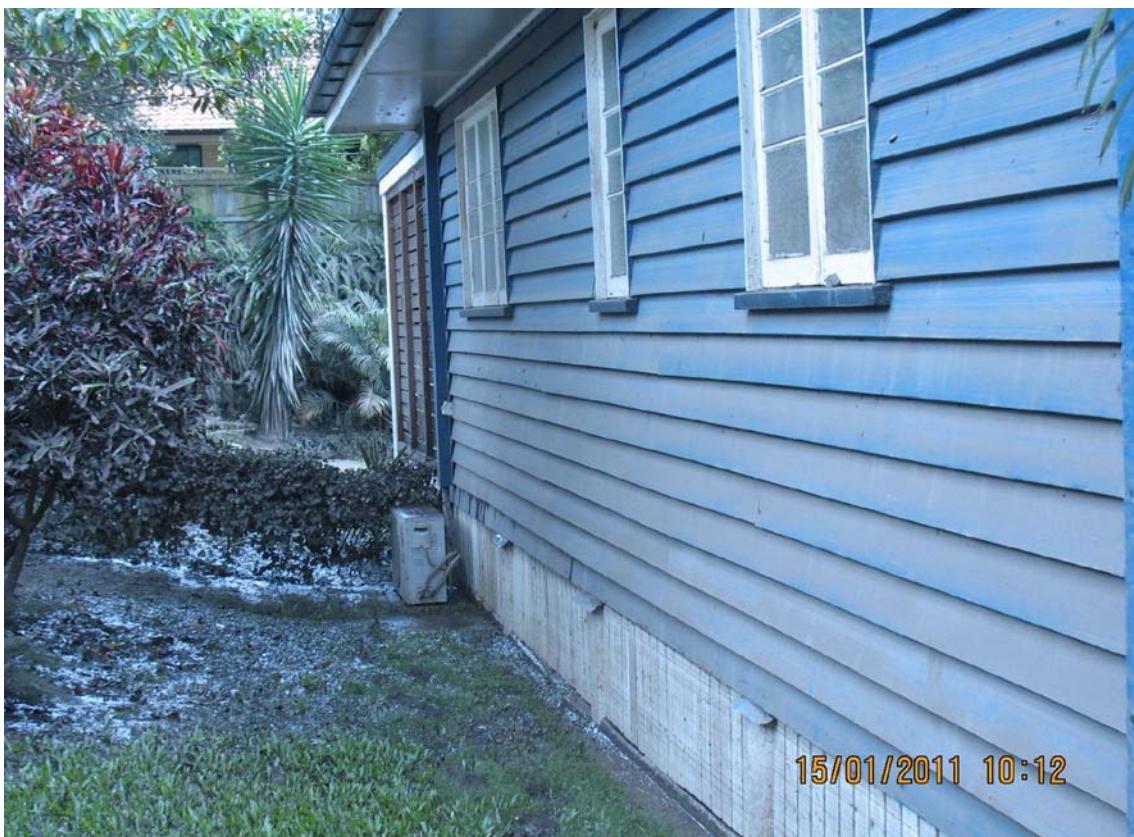
One of the clearest examples of the issue was raised by two witnesses, one residing at, and one near, Graceville Park, a multi-level complex containing 90 townhouses. The land on which the development was built is low lying, part of the Oxley Creek and Brisbane River floodplains, and traverses a natural waterway.<sup>177</sup> Prior to development, the site was a horse paddock with a creek running through the middle.<sup>178</sup> Images depicting the 1974 flood level at the site show that water covered most of the land upon which the townhouse complex is now located.<sup>179</sup>

In January 2011, 81 of the 90 townhouses on site were flooded; 60 of these suffered total inundation.<sup>180</sup> Nearby residences were also heavily affected. A neighbouring land owner, whose property is bordered on one side and at the rear by the townhouses of Graceville Park,<sup>181</sup> gave evidence that the floodwaters reached the eaves of his house.<sup>182</sup> He expressed concerns that the Graceville Park development changed the topography of the land and, given its proximity to his residence, increased the potential for his property to flood.<sup>183</sup>

A number of approvals were required from Brisbane City Council before construction on Graceville Park could begin, including a rezoning approval, a town planning consent permit, and two group title subdivision approvals.<sup>184</sup>

In 1991, the land was officially rezoned to a residential use, following the submission and approval of a rezoning application.<sup>185</sup> The rezoning did not itself authorise the construction of town houses; a town planning consent permit was required for this purpose.<sup>186</sup> When the town planning consent permit application was initially submitted, the developer was advised that the topographical features and drainage problems of the site rendered it unsuitable for the development of town houses at the proposed density.<sup>187</sup>

Council records indicate that the resolution of flood issues proved difficult.<sup>188</sup> Problems were identified with the hydraulic study provided in support of the town planning consent permit application; before approval was granted, the developer made several attempts at providing a flood study that was satisfactory to the council.<sup>189</sup> The study had contained insufficient information to enable the council to assess the possible impacts of the proposal on adjacent land in terms of flooding, ponding of water and overland flow.<sup>190</sup> The developer undertook to recalculate the flood levels of the site using more accurate information.<sup>191</sup> Ultimately, the various issues identified were resolved to the satisfaction of the council, and approval was granted.<sup>192</sup>



*Flood damage in Graceville back yard, neighbouring Graceville Park complex visible over fence (photo courtesy Rob Clements)*

For the developer to achieve compliance with some of the conditions of the development approval, filling was required. The precise amount of filling undertaken is not known, although it appears as though it must have been at least 0.8 metres across the site.<sup>193</sup>

The planner responsible for assessment of the rezoning application and the town planning consent permit application indicated that if the development were assessed under today's standards, some aspects of the approval would be different. This is unsurprising; the application was made under an earlier planning scheme and before the State Planning Policy had been adopted. By way of example, the witness indicated that fill levels on the site would likely have been increased to allow higher floor levels, with a greater distance required between the townhouses and adjoining properties; the number of townhouses would probably have been reduced by five or ten units; and access roads into the site might have been required to be built to a higher level.<sup>194</sup>

## **Emerald**

An Emerald resident whose house, built in 2004, was inundated in the 2010/2011 floods told the Commission that she was concerned about the possible impact of future developments approved nearby. Two new businesses have been approved to be built on land filled up to and above the 2008 flood level; one is a concrete batching plant to be located 60 metres from her home.<sup>195</sup> The resident's view was that such developments would affect drainage for the area, restrict water movement and increase the depth of floodwater.<sup>196</sup>

## **Karalee**

Residents of Karalee in Ipswich have expressed concerns about the extent of fill deposited on the Citiswick Industrial Estate, a large scale development (315 hectares in size) located approximately seven kilometres east of the Ipswich central business district.<sup>197</sup> The developer has chosen to undertake the project in seven stages, or areas, of construction and development work.<sup>198</sup>

A Karalee resident informed the Commission that, although she was not personally affected by the January 2011 flood, several houses in her neighbourhood were inundated.<sup>199</sup> When she moved into her present home in 1993, the land on the opposite side of the Bremer River was pasture with cattle grazing and the natural floodplain was unaltered.<sup>200</sup> At the time of purchasing her property, she checked the 1974 flood maps for the area and saw that her house had not been inundated.<sup>201</sup> Because of this, she was surprised at the level the 2011 floodwaters had reached in her area.<sup>202</sup>

This Karalee resident said that during the past decade, the land on the opposite side of the Bremer River has been progressively developed as part of the Citiswick development.<sup>203</sup> Over the last three years there had been dramatic increases in the earthworks on the area between the Warrego Highway and the Bremer River, known as stage seven of the Citiswick project. She had observed large amounts of soil being cut away from hills and placed onto the floodplain, as well as truckloads of dirt being transported into the development site.<sup>204</sup> She and another Karalee home-owner who gave evidence said that the fill brought in for this stage of the development built the land levels up to as much as 10 metres higher than the natural ground level in the floodplain.<sup>205</sup>

The second of the Karalee witnesses said that his house was completely inundated during the January 2011 flood.<sup>206</sup> He believed that the floodwaters which immersed his property came from the direction of the Citiswick development and the Warrego Highway bridge,<sup>207</sup> that the 10 metre high earth fill on the Citiswick site acted as a dam and pushed the floodwaters back onto his property, and that the effect of the Citiswick development was to increase the height of the flood.<sup>208</sup>

The engineering and environment manager for Ipswich City Council acknowledged that infill works occurred on stage seven of the Citiswick site before the 2010/2011 floods<sup>209</sup> and that in some respects, the description provided by the residents about the extent of fill was accurate.<sup>210</sup> However, the ten metres of fill spoken of by the Karalee residents was isolated to a small depression on the site,<sup>211</sup> approximately half a hectare in size.<sup>212</sup> Most filling conducted on this stage was more likely to have been at a height of two to three metres, covering an area approximately one to two hectares in size.<sup>213</sup> He explained that some of the filling in the stage seven area at the Citiswick site was exempt development and consequently did not require a development approval.<sup>214</sup> The issue of exempt development of this kind is discussed further at section 7.6.2 *Exemption where fill is carried out by a public sector entity*.

The development application for the preliminary approval for the Citiswift site included a ‘Masterplan Flooding Investigation’, which addressed both river and local flooding concerns.<sup>215</sup> The study included a cumulative flooding impact assessment, which set out the proposed filling extent for the whole of the Citiswift site. The assessment concluded that the proposed filling would ‘not adversely impact on the flood levels external to the site’ and that ‘the flood immunity of the Warrego Highway has not been reduced’.<sup>216</sup> A preliminary approval overriding the planning scheme for operational works was granted; it had the effect that subsequent earthworks applications for filling on the Citiswift development were assessed by reference to the Masterplan Flooding Investigation.<sup>217</sup>

The Ipswich City Council did not expect there would be any impact from the exempt fill on stage 7, even though there had been no compensatory earthworks (such as excavation) to offset the volume of soil imported to the site.<sup>218</sup> This was because the amount of fill being placed on the site accorded with the Masterplan Flooding Investigation, which indicated that flood levels external to the site would not change if filling was conducted without any compensatory cut.<sup>219</sup> This perceived lack of impact was attributed to the particular floodplain characteristics at that locality, such as its location outside high flow areas.<sup>220</sup>

It is apparent from the evidence received by the Commission that the Bremer River in the vicinity of the Citiswift site was not fully contained in the waterway and did break out across the floodplain in the January 2011 floods.<sup>221</sup> The Commission makes no finding as to the extent to which the fill on the Citiswift site resulted in loss of flood storage capacity, if at all, or whether there were consequential impacts to surrounding properties.

### 7.6.1 Treatment of fill in State Planning Policy 1/03 and Guideline

Given the potential for adverse consequences to surrounding areas, the placement of fill in a floodplain should be assessed against criteria which consider its impact on surrounding land. The importance of maintaining the flood storage function of floodplains is recognised in State Planning Policy 1/03.<sup>222</sup>

Outcome 5 of the State Planning Policy, which applies when councils are making or amending a planning scheme, encourages councils to include planning strategies in planning schemes which ‘prevent development from materially increasing the extent or the severity of natural hazards’.<sup>223</sup>

In Appendix 5 to the State Planning Policy 1/03 Guideline, there are example criteria which give councils a basis for devising performance outcomes to be incorporated into a code in a planning scheme.<sup>224</sup> They include criteria that stipulate:<sup>225</sup>

2.1 Works do not involve:

- a) any physical alteration to a watercourse or floodway including vegetation clearing; or
- b) net filling exceeding 50 cubic metres.

OR

2.2 The development complies with any applicable development criteria set out in a floodplain management plan.

OR

2.3 Where a floodplain management plan does not exist, the proposed works either:

- a) avoid any reductions of on-site flood storage capacity and contain within the subject site any changes to depth/duration/velocity of floodwaters of all floods up to and including the DFE [defined flood event]; or
- b) do not change the flood characteristics at the DFE outside the subject site in ways that result in:
  - loss of flood storage;
  - loss of/changes to flow paths;
  - acceleration or retardation of flows; or
  - any reduction in flood warning times elsewhere on the floodplain.

The Commission does not have sufficient evidence to comment on whether a criterion that permits filling up to 50 cubic metres is appropriate. However, in the Commission’s view, it is essential that councils assess applications for filling or development in a floodplain against criteria which seek to protect surrounding land from any increases in flood risk, or resulting changes to flood behaviour.

## Recommendations

- 7.16 The Queensland Government should consider drafting assessment criteria to be included in the model flood planning controls which require that works in a floodplain:
- do not reduce on-site flood storage capacity
  - counteract any changes the works will cause to flood behaviour of all floods up to and including the applicable defined flood event by measures taken within the subject site (for example, use of compensatory works, detention basins or other engineering mechanisms)
  - do not change the flood characteristics outside the subject site in ways that result in:
    - loss of flood storage
    - loss of/changes to flow paths
    - acceleration or retardation of flows, or
    - any reduction in flood warning times elsewhere on the floodplain.
- 7.17 If the Queensland Government does not include such assessment criteria in the model flood planning controls, councils should consider including assessment criteria in their planning schemes which require that works in a floodplain:
- do not reduce on-site flood storage capacity
  - counteract any changes the works will cause to flood behaviour of all floods up to and including the acceptable defined flood event by measures taken within the subject site (for example, use of compensatory works, detention basins or other engineering mechanisms), and
  - do not change the flood characteristics outside the subject site in ways that result in:
    - loss of flood storage
    - loss of/changes to flow paths
    - acceleration or retardation of flows, or
    - any reduction in flood warning times elsewhere on the floodplain.

The process of assessing development applications for fill may be assisted by the creation and maintenance of a model. The Bundaberg Regional Council has developed, and maintains, a model which assists it to assess the impact of fill on local flooding from overland flow when an application is submitted. It regards the model as critical in managing stormwater issues.<sup>226</sup> The benefit of such models is dealt with in further detail in section 10.2 *Stormwater*.

### 7.6.2 Exemption where fill is carried out by a public sector entity

There is no requirement to obtain a development permit for filling if the works constitute exempt development.<sup>227</sup> Such works include ‘operational work or plumbing or drainage work (including maintenance and repair work) if the work is carried out by or on behalf of a public sector entity authorised under a state law to carry out the work’.<sup>228</sup> This could include placing fill onto a site in the floodplain. As indicated previously, some of the fill placed on the Citiswich site falls within this category of development.

In addition to fill placed on the Citiswich site, members of the public have raised concerns with Ipswich City Council about the depositing, without approval, of fill taken from the Ipswich Motorway Upgrade Project.<sup>229</sup> The project, being overseen by the Department of Transport and Main Roads, is an upgrading of the Ipswich Motorway in three locations: the Ipswich/Logan Interchange, from Wacol to Darra and from Dinmore to Goodna.<sup>230</sup> The Ipswich City Council observed that fill sourced from the project had not necessarily been placed by the Department of Transport and Main Roads, but may have been deposited by some of its contractors.<sup>231</sup> It is unclear, from the council’s perspective, whether the exemption afforded to public sector entities under the legislation protects the activity in this respect.<sup>232</sup>

Ipswich City Council provided a statement to the Commission about the difficulties experienced in Ipswich in consequence of the exemption afforded to public sector entities. The exemption can result in fill’s being placed in

stormwater flow paths and areas that are susceptible to flood without any technical assessment by council of the impacts.<sup>233</sup> There are associated difficulties in taking compliance action against receiving landowners, and problems with distinguishing what is exempt.<sup>234</sup> Ipswich City Council believes that it should have an opportunity to assess the impact of any proposed filling in a floodplain, regardless of the identity of the entity undertaking the fill.<sup>235</sup>

In the Commission's view, given the potential impact on other properties through the diversion of floodwaters, public sector entities should not be exempt from obtaining development approvals for filling where the filling is to be deposited away from the site of its extraction and in a floodplain.

## **Recommendation**

- 7.18 The Queensland Government should consider amending the *Sustainable Planning Regulation 2009* so that operational work or plumbing or drainage work (including maintenance and repair work) carried out by or on behalf of a public sector entity authorised under a state law to carry out the work is not exempt development under the *Sustainable Planning Act 2009* if the development has the potential to reduce floodplain storage.

### **7.6.3 Examples of problems from fill associated with infrastructure**

In addition to the evidence concerning fill placed in commercial development projects and fill extracted from major infrastructure projects and deposited elsewhere, the Commission heard evidence from members of the public who expressed concerns about the impact of public infrastructure on flooding.

An Emerald resident believed that the railway line running parallel to the Capricorn Highway caused floodwaters to back up in the 2010/2011 floods.<sup>236</sup> His opinion was based on the facts that the flood peaked at different levels and times on each side of the railway line; the southern side was approximately 600 millimetres higher than the northern side;<sup>237</sup> and the rail line has only a limited number of small culverts where water can drain away.<sup>238</sup>

Concerns about the effect of local railway lines on flood behaviour were also raised by the Jondaryan District Residents Association. The association expressed the view that the Western Railway line raised water levels in homes on the northern side of the line at Jondaryan during floods, and that this was a consequence of lack of adequate drainage points under the railway.<sup>239</sup> According to the association, the resulting pressure build-up caused the railway line to 'blow out' at points between Doctor's Creek and Jondaryan, washing ballast from the line onto the Warrego Highway.<sup>240</sup>

One resident of Male Road in Caboolture raised concerns that the Bruce Highway exacerbated local floodwater levels.<sup>241</sup> A report commissioned by the Moreton Bay Regional Council on the cause of regular flooding in Male Road concluded that regular flooding of the area was attributable primarily to the fact that the land is low lying and located within the floodplain of King John Creek.<sup>242</sup> The Bruce Highway was found to contribute to the increase in upstream flood levels at Male Road, although it was not possible to state with certainty how this increase affected the flooding of houses in the area.<sup>243</sup>

Upgrades to the Ipswich Motorway, in particular the Monash overpass construction works, were also the subject of evidence heard by the Commission. Residents of a nearby townhouse complex believed these works created a damming effect which increased the height of floodwaters.<sup>244</sup> The Department of Transport and Main Roads acknowledged that the Monash overpass construction works involved a significant road embankment which would remove the existing overland flow path for the catchment, and accordingly required the construction of a culvert.<sup>245</sup>

It is not appropriate or feasible for the Commission to undertake the factual and technical investigations necessary to reach a conclusive view in each of these cases about whether the construction of the infrastructure worsened the flooding conditions experienced by nearby residents. However, the examples provided serve to identify that there is community concern about the effects of infrastructure development on flood levels. The possibility of impact on flooding should be considered by the Queensland Government when designing and constructing infrastructure. (See also section 10.5 Roads and rail.)

## 7.7 Levees

A levee is a raised embankment.<sup>246</sup> Flood mitigation levees are located so as to provide protection from water breaking out of rivers and creeks. An embankment built, for example, alongside a river to protect a town on the floodplain will mitigate flooding, up to a point, in that town. It might, though, increase flood heights on the other side of the river. By protecting the town, the levee removes a portion of the storage volume on the floodplain; logically, the water that would have inundated the town must go elsewhere. On some floodplains and for some levees, the effect may be minimal. In other places, it may be significant.

Levees have other drawbacks: if they are overtapped, the damage caused by the water's breakout can be considerable. A levee may hold floodwater at a damaging height for longer by constraining its escape. There is also a risk that individuals or a community protected by a levee will become complacent, assuming that the levee will protect against all floods:<sup>247</sup> a dangerous mindset.

The Commission has not set out to establish whether any particular levee caused harm in the 2010/2011 floods; individual hydraulic studies would be required to form such conclusions and are beyond the scope of the Commission's investigation. What has attracted the Commission's attention are systemic questions of inconsistency in the approach to the control of the development of levees and disputes as to who should impose that control. The potential impact of levees on flooding means that those issues should be resolved.

### 7.7.1 Levees in the 2010/2011 floods

The Commission heard evidence about towns with levees in the Goondiwindi and Balonne Regional Council areas. In Goondiwindi, an 11 metre high embankment<sup>248</sup> built in 1957 successfully protected the town from the 2010/2011 floods;<sup>249</sup> the highest floods on record.<sup>250</sup> A temporary levee constructed in St George prior to flooding protected most of the town in 2010/2011: the flood peak of 13.2 metres was more than a metre below the crest of the embankment.<sup>251</sup> Thallon, Mungindi and Dirranbandi also employ levee banks which successfully protected those towns from the nearby Balonne River during the 2010/2011 floods.<sup>252</sup>

Evidence was received of various types of levees used to protect rural properties during the 2010/2011 floods. In the St George region, channel irrigation systems on cotton farms, primarily used to deliver water to the farms,<sup>253</sup> acted as levee banks to protect properties from the floodwaters of the Balonne River.<sup>254</sup> In north-east Emerald, a large levee, kilometres long, had been built along the side of two creeks.<sup>255</sup> In Bundaberg, small dirt banks had been constructed on a farm.<sup>256</sup> Owners of properties near each of those levees raised concerns that their effect was to worsen the flooding nearby.<sup>257</sup>

Possibly the largest levee banks in Queensland are those at the Ensham mine near Emerald, built 30 metres high to withstand the level that would be reached by a flood with an average recurrence interval of 1000 years.<sup>258</sup> Those levees were built after previous, smaller banks were overtapped<sup>259</sup> by flooding in 2008, leading to inundation of mine pits and a loss of production.<sup>260</sup> The current levee banks were approved in 2009 and withstood the major flooding of the Nogoa River in 2010/2011.<sup>261</sup>

### 7.7.2 Post-flood consideration of levees in urban areas

Following the 2010/2011 floods, Brisbane and Ipswich city councils have taken steps to explore using levees as a flood mitigation measure in high density urban areas.<sup>262</sup>

There are currently no levees within the Ipswich City Council boundaries.<sup>263</sup> The council engaged external consultants to investigate the feasibility and cost effectiveness of levees in specific areas that were seriously affected by the 2010/2011 floods. Particular attention is being given to an area of the central business district where inundation was the result of water's making its way through a railway underpass from the Bremer River.<sup>264</sup>

Brisbane City Council engaged experts to prepare a report identifying engineering options that could provide flood mitigation for Brisbane;<sup>265</sup> it listed a number of possible structural flood mitigation measures for Brisbane, including levees.<sup>266</sup> The report acknowledged the complexity of assessing whether levees would be suitable in such an urban environment, and suggested that they would not be suitable along waterways. However, the report considered that levees might be a feasible solution to protect critical infrastructure such as the cold stores at the Brisbane Markets at Rocklea.<sup>267</sup>

These considerations have been taken into account by Brisbane City Council in developing an interim framework for the management of levees in areas of strategic importance as part of its Flood Action Plan of January 2011.<sup>268</sup> The framework is designed for assessing levees' prospects of success, with specific criteria to assist the council or private owners considering the building of a levee.<sup>269</sup> It remains for this framework to be given legal effect, either by a local law or an amendment to the Brisbane planning scheme.<sup>270</sup>

### 7.7.3 Controlling the construction of levees

#### Current regimes

##### *Planning schemes*

Councils can control the conditions under which levees are built through their planning schemes. For example, the construction of levee banks in the Ipswich City Council area requires development approval under the council's planning scheme.<sup>271</sup> However, the construction may be exempt from requiring development approval under the Ipswich planning scheme if the levee bank is insignificant; for example, if it is not greater than 1000 square metres in area or more than 50 centimetres in height.<sup>272</sup>

##### *Local laws*

During the 2010/2011 floods, seven councils<sup>273</sup> had local laws<sup>274</sup> concerning levees. Two councils let their local laws expire on 31 December 2011;<sup>275</sup> three councils have indicated their intention to repeal them<sup>276</sup> and one council has provided no indication as to the future of its local laws.<sup>277</sup> The seventh council, Goondiwindi Regional Council, is considering the inclusion of levees as assessable development in its next planning scheme, which would have the effect that no levee bank could be built without the approval of council.<sup>278</sup> In the interim, the council proposes to enact a local law for the regulation of levee banks for the whole council region.<sup>279</sup>

##### *A catchment wide floodplain board*

The former Emerald and Peak Downs shire councils formed the Nogoa River Flood Plain Board in 1996,<sup>280</sup> with authority to assess levees within the boundaries of a defined floodplain area.<sup>281</sup> The board was empowered as a 'joint local government' under the *Local Government Act 2009*.<sup>282</sup> It followed an assessment process outlined in the relevant local law.<sup>283</sup> On receiving an application for construction of a levee, the board would invite the public and nearby landholders to make submissions on the application.<sup>284</sup> Applications were required to be accompanied by a hydraulic report advising on the impact of the levee on the catchment and neighbouring properties.<sup>285</sup> SunWater Limited<sup>286</sup> provided the board with further hydraulic analysis and advice in respect of the applications it received.<sup>287</sup>

The board voted to dissolve itself in 2011. The Central Highlands and Isaac regional councils approved its abolition. The board said it had taken such drastic action because it was unable to regulate the floodplain efficiently; its preference was for the Queensland Government to assume responsibility for floodplain regulation.<sup>288</sup> The magnitude of the issues it was dealing with, including multi-million dollar mining operations, were matters of state and national importance, and it lacked the technical and financial means to address the possible ramifications of coal mining developments on the floodplain; it was created to deal with farming levees.<sup>289</sup>

The board's concern was borne out in its dealings with Ensham Resources in 2009 regarding the latter's proposed mine levees: after Ensham complained of difficulty obtaining flood levee construction permits from the board, the Minister for Infrastructure and Planning declared the levee construction project a 'prescribed project' under Part 5A of the *State Development and Public Works Organisation Act 1971*, with the ultimate result that the Coordinator-General made the decision to issue permits for the levee banks.<sup>290</sup> An explanation of prescribed projects is provided at section 6.3.3.

#### Department of Environment and Resource Management

The Assistant Director-General of DERM gave evidence that DERM has no overarching role or responsibility in respect of flood mitigation levees,<sup>291</sup> in fact, he was not aware of any significant regulatory role of any Queensland Government department.<sup>292</sup> He outlined four narrow areas in which DERM does exercise regulatory control over levees:<sup>293</sup>

- diversion of a watercourse approved under the *Water Act 2000* as part of mining activities authorised by the *Environmental Protection Act 1994*<sup>294</sup>

- activities authorised by the *Environmental Protection Act 1994* (flood protection levees for mining activities and bunding for the containment of hazardous materials)<sup>295</sup>
- within a drainage and embankment area designated under the *Water Regulation 2002*<sup>296</sup> (only three areas have been designated drainage and embankment areas under the Regulation)<sup>297</sup>
- the construction and use of infrastructure, including dams and associated works intended to take overland flow water, including floodwater, for water supply purposes.<sup>298</sup>

There might be an argument that DERM's role in fact extends beyond those four situations. Some instances of 'taking or interfering with water' (which is likely to capture most, if not all, levees) require a development permit under the *Sustainable Planning Regulation*, while others do not.<sup>299</sup> Where a development permit is required, DERM may be the assessment manager.<sup>300</sup>

In addition to its legislative responsibilities, DERM provides information, on request, to councils to assist them to assess flood mitigation levees.<sup>301</sup> DERM does not collate or hold comprehensive information on all levees in Queensland, as it does not consider itself responsible for them.<sup>302</sup>

## Need for regulation

Structural measures, such as levees, are one of the four main threads of best practice floodplain management outlined in *Floodplain Management in Australia*;<sup>303</sup> see section 2.1 *Principles of floodplain management* above. If it is appropriate that levees form part of a council's floodplain management plan, it is also appropriate that levees be regulated. The fact that levees affect watercourses makes them a necessary part of any consideration of flooding in a catchment. It does not assist floodplain management for landholders to have, as they do in some areas of Queensland, free rein to build levees on their properties.

Levees may cause damage far from their location. As an adjustment to the natural watercourse, they can affect the entire catchment in which they are located. That propensity to cause damage to other property supports the argument for consistent and state-wide regulation.

The patchwork of DERM and council approvals, and in some areas, a complete absence of regulation, is not conducive to consistent decision-making. Uniform regulation of the construction of levee banks would ensure that applications to build them are judged against the same standards, no matter where they are built and for what purpose. Mining levees in Central Queensland assessed by DERM would be required to meet the same criteria as farming levees near the New South Wales border. Consistency holds advantages for landholders who wish to build a levee, or who live near a proposed one.

## Options for controlling the building of levees

The Commission considered two options for controlling the construction of levee banks within the land use planning regime: the designation of levees as assessable development, or local laws. If the former is chosen, either councils or the Queensland Government could act, in effect, as regulator; if the latter, the regulators must be councils.

Levees are a type of development under the *Sustainable Planning Act 2009*.<sup>304</sup> They are not specifically designated, by name, as 'assessable development' in the *Sustainable Planning Regulation 2009*, although they may be assessable as 'interfering with water': see the section *Department of Environment and Resource Management* above. The regulation of levees in a planning scheme prepared under the *Sustainable Planning Act 2009* is not compulsory. Levees are not dealt with in regional plans, state planning regulatory provisions, any state planning policy or the Queensland Planning Provisions.

The Queensland Government could, by legislation, ensure that building a levee requires a development permit by:

- designating it as assessable development in Schedule 3 of the *Sustainable Planning Regulation 2009*, or
- requiring, by way of a state planning policy or mandatory provision in the Queensland Planning Provisions,<sup>305</sup> that councils nominate the construction of a levee as 'assessable development' in their planning schemes.<sup>306</sup>

If a council's current planning scheme is not made under the *Sustainable Planning Act 2009*, and does not regulate levees, the council can make a local law for that purpose.<sup>307</sup> The Queensland Government could encourage councils in that position to adopt such a local law by proposing a suitable model local law. But any such local law will only

apply until the time that a council decides to prepare its next planning scheme under the *Sustainable Planning Act 2009*; after that, the council may only regulate levees through its planning scheme. Consequently, this option would be an interim measure at best.

The Queensland Government should consult councils to determine the most effective way to regulate the construction of levees consistently across Queensland.

### The appropriate regulator

The two candidates to regulate levees are the Queensland Government and councils.

Many councils, and their representative body, the Local Government Association of Queensland, submitted that the Queensland Government should be responsible for regulating all levees.<sup>308</sup> (In New South Wales and Victoria, floodplains are managed at a state government level.<sup>309</sup>) They maintain that councils do not have the necessary technical expertise and financial means to conduct the scientific studies necessary for proper assessment of a proposal to build a levee bank,<sup>310</sup> and refer to the catchment wide implications of levees<sup>311</sup> and interstate issues in the border region as reasons for the Queensland Government to be in charge.<sup>312</sup>

The Queensland Government does not consider it is best placed to consider applications to build levee banks. It points to council expertise in approving development applications under planning legislation, and the importance of local knowledge of the area in which a levee is proposed. The government suggests that it could assist councils by providing expert advice as a referral agency during the assessment process.

Both arguments have merit. The evidence is that neither councils nor the Queensland Government are immediately capable of assessing applications for permits to build levee banks: both would require the devotion of more resources to that task.<sup>313</sup> Depending on the method of regulation chosen, both could be involved, in different capacities, in assessing applications. The Queensland Government and councils should reach a decision as to which will regulate the construction of levee banks. The Commission's concern is that a state-wide, consistent process be put in place for that regulation.

## Recommendations

- 7.19 Levees should be regulated.
  - 7.20 The Queensland Government should consult with councils to determine an effective method for the regulation of the construction of levees in Queensland.
- In particular, the Queensland Government should consider:
- requiring a development permit for the construction of a levee by designating levees as assessable development in the *Sustainable Planning Regulation 2009*, or
  - requiring, by way of a state planning policy or mandatory provision in the Queensland Planning Provisions, that councils nominate the construction of a levee as assessable development in their planning schemes.

### 7.7.4 Types of levees to be regulated

A uniform definition is essential to consistency of decisions about where and how levees are built across Queensland. There is no widely accepted definition of 'levee' as a term for the purpose of regulation. There are, however, a number of definitions in Australian, and indeed Queensland, literature on the subject, which could be considered in determining how best to define the term so as to identify what is to be regulated.<sup>314</sup> One matter that should be considered in defining 'levees' is whether some embankments are so small, or have such insignificant effect, that they should be excluded from regulation. Another is whether any definition should extend to emergency works carried out to protect properties against an immediate threat of flooding.

## *Recommendation*

- 7.21 The Queensland Government should consult with councils to formulate a definition of ‘levee’ to identify what should be regulated.

### 7.7.5 Process and criteria for approving the construction of a levee

There is no common process or agreed list of relevant considerations used in different areas where levees are regulated. Having common standards would assist in a uniform approach across Queensland.

In terms of process, it is important that any decision about a levee be made after public consultation and obtaining relevant scientific studies.

One important factor in assessing a proposed levee is its effects across the whole catchment in which it is located, which may include effects across local government or state borders.<sup>315</sup> The assessor must determine whether the proposal strikes the appropriate balance between the persons and property it seeks to protect and those it may adversely affect. Increased flood risk in neighbouring properties may be justified if the levee protects infrastructure vital to the whole community, such as a hospital or a state emergency service shed. The adverse impacts of a levee which protects a significant part of a community might be mitigated by setting higher minimum floor levels or building new evacuation routes for affected areas. Structural measures, including other levees and detention basins, could also be considered to offset the impact of a proposed levee.

The considerations applicable in determining whether to allow the building of a proposed levee should be set out in publicly available documentation. Guidance might be gained from Floodplain Management in Australia and other publications.<sup>316</sup> If it is decided that councils will grant development permits for the construction of levees, these considerations might usefully form part of model flood planning controls: see section 5.1 *Planning schemes*.

## *Recommendations*

- 7.22 There should be a consistent process for the determination of applications to build levees. That process should include:
- consulting landholders who may be affected by the proposed levee
  - obtaining or commissioning appropriate hydrological and hydraulic studies to assess the impacts of the proposed levee.
- 7.23 There should be a common set of considerations in the decision whether to approve an application to build a levee, including:
- the impacts of the proposed levee on the catchment as a whole
  - the benefits of the proposed levee to the individual or entity applying to build the levee and to any nearby community as a whole
  - any adverse impacts on other landholders, including the risk of levee failure
  - the implications of the proposed levee for land planning and emergency management procedures
  - whether any structural, land planning or emergency management measures can be taken to mitigate the adverse impacts of the proposed levee.

## 7.8 Anthills: Properties isolated by flooding of low lying access routes

Some properties did not suffer inundation during the 2010/2011 floods, but were isolated by rising floodwaters. This problem largely occurred where properties were developed on land higher than access roads. That circumstance caused difficulties of two kinds: evacuation became necessary, but routes were cut; or evacuation was not necessary, but people were isolated from essential services.<sup>317</sup>

The Commission heard evidence about a number of properties that suffered such difficulties in the 2010/2011 floods. One of the clearest examples was in the Brisbane suburb of Bellbowrie. Three properties situated at Allard Close were built on land filled to a height above the 1% AEP flood level, which was separated from the rest of the suburb by a former golf course to the east and a low-lying gully to the west.<sup>318</sup>

On 11 January 2011, some residents of Allard Close were isolated from the suburban road network because their shared driveway across the gully was covered by a metre of floodwater.<sup>319</sup> One of those residents described how, unable to get his vehicle across the water, he could not drive his family to safety or remove belongings from his house.<sup>320</sup> On 12 January 2011, the Brisbane River filled up the gully, creating a body of water approximately 150 metres wide between his house and the rest of Bellbowrie.<sup>321</sup> His family had to evacuate that day by walking across the former golf course behind their house to Weekes Road, from where the SES ferried them across floodwaters.<sup>322</sup>

The construction of housing in an area susceptible to isolation in floodwaters creates a number of risks for its occupants. The artificial peninsula on which the Allard Close resident's house was constructed provided little opportunity for conventional evacuation once the floodwaters began to rise. While he was aware of the risk that his property would be isolated,<sup>323</sup> by the time he realised that he might need to evacuate, the evacuation route was cut.<sup>324</sup>

The Wesley Hospital in the Brisbane suburb of Auchenflower also experienced a serious loss of access during the January 2011 floods. Situated on a steep hill (and very close to the Brisbane River), the hospital is bordered on two sides by the low lying Moorlands Park and Coronation Drive.



*Wesley Hospital, January 2011 (photo courtesy The Courier-Mail)*

Floodwaters closed all usual forms of access to the hospital from the early hours of Wednesday 12 January 2011 to late on 13 January 2011.<sup>325</sup> Any patients who could be discharged safely were advised to leave before the hospital became isolated, if their personal circumstances allowed.<sup>326</sup> All elective, non-acute services were cancelled for the remainder of the week and patients who would normally have been admitted to the hospital were directed to other hospitals.<sup>327</sup> A large number of staff members volunteered to remain on site to maintain patients' care.<sup>328</sup> Linen, pharmacy and food supplies had to be delivered using the nearby Auchenflower Railway Station pedestrian overpass; staff either carried or pushed the supplies to the hospital.<sup>329</sup> This remained the only access route for the hospital until late on Thursday 13 January 2011. No ambulances were able to reach the hospital, although ambulance officers were able to transfer emergency patients, on foot, across the railway station overpass bridge.<sup>330</sup> One patient was moved across the bridge on an ambulance trolley, with great difficulty.<sup>331</sup> At one point, the electricity supply to the hospital was at risk of being cut, which would have necessitated the evacuation of all patients.<sup>332</sup> Fortunately this did not occur, and the hospital was able to perform most fundamental services.

Since the January 2011 flood, the hospital executive has reviewed the question of access to the hospital during flood and is considering investing in a helicopter pad. It has also reviewed the hospital's communications with the State Health Emergency Control Centre and the local district disaster management group, with a view to obtaining better information during a crisis about the availability of access routes and the supply of essential services, particularly electricity.<sup>333</sup>

The fact that such an important piece of community infrastructure was effectively isolated for two days is of concern. Planning considerations for community infrastructure generally are discussed elsewhere in the Commission's report (see section 7.2 *Community infrastructure*).

The issue of access roads was also highlighted in the suburb of Yeronga, in south Brisbane. 'The Village', a multi-level aged care facility situated at Cansdale Street, was built on land zoned as a light industrial area, and developed in 2007 and 2008. The Brisbane City Council considered that the site presented a number of attractive features for aged care accommodation: its proximity to services and public transport, the uncontaminated nature of the site, its amenity (with parkland on three sides) and the fact that it enabled elderly residents to remain in the community, rather than having to move to the outer suburbs of Brisbane.<sup>334</sup>

It was apparent from an early stage of the assessment process for this development that the site had flood-related constraints. The preliminary development assessment for the facility included a series of pre-lodgement meetings in late 2004 and early 2005 where issues relevant to flooding on the site were identified by the developer and Brisbane City Council.<sup>335</sup> One such issue was the location of the site in a waterway corridor.<sup>336</sup> Throughout the development application assessment process, the Brisbane City Council raised concerns with the developer regarding the management of floodwaters from both the Brisbane River and overland flow.<sup>337</sup> The developer's initial hydraulic reports required extensive re-analysis<sup>338</sup> before the Brisbane City Council eventually approved the development, with conditions, on 3 October 2006.<sup>339</sup>

Although the site was known to be affected by flooding from two sources (a 1% AEP flood from the Brisbane River, or a 1% AEP overland flow flood<sup>340</sup>), no conditions were imposed on the development in relation to access or evacuation routes in the event of flooding.<sup>341</sup> The driveway crossover into 'The Village' is at the 1% AEP flood level;<sup>342</sup> however, the heights of the two access roads relevant to the site, Cansdale Street and Venner Road, have lower flood immunity levels. Cansdale Street is built to withstand floods with an average recurrence interval of 50 years, whereas Venner Road is built to withstand floods with an average recurrence interval of 20 years.<sup>343</sup> When the aged care use was approved by Brisbane City Council, these road heights were seen as acceptable, because they accorded with the specified flood immunity levels for existing roads contained in the Subdivision and Development Guidelines in force at the time.<sup>344</sup>

During the January 2011 flood, the entire site was surrounded by floodwaters. On 11 January 2011, the residents of 'The Village' had to evacuate in order to escape the imminent flooding.<sup>345</sup> Evacuation was carried out prior to the floodwaters reaching the premises. The basement of the building was flooded and the ground floor was submerged in approximately one metre of floodwater.<sup>346</sup> Access roads to and around the site were inundated.<sup>347</sup>

There are obvious difficulties in residents of advanced age with mobility problems having to evacuate when surrounding roads are flooded. In some circumstances, there may not be enough warning time available for evacuation to occur before access roads begin to flood. Currently, the Brisbane City Council Subdivision and

Development Guidelines require that existing access roads be built to a height that will withstand floods with an average recurrence interval of 50 years.<sup>348</sup> They do not require access above the height of the 1% AEP flood level.<sup>349</sup> Nor is there any express requirement that in assessing applications for developments where the intended residents are likely to experience difficulty in evacuating quickly, regard be had to the height of the access roads into the site. The Regional Manager of the Development Assessment South Team in Brisbane City Council, expressed the view that there ought to be criteria requiring consideration of the site's proposed occupants, as well as the particular characteristics of the proposed use.<sup>350</sup>

In Maryborough, residents of Granville experienced loss of access to essential services as a consequence of the closure of the Granville Bridge and the major thoroughfares leading into the city. The bridge crosses the Mary River, providing the only entry point to the Maryborough central business district for the residents of Granville and other suburbs.<sup>351</sup> Problems also arose when low lying sections of the access roads leading off the bridge (Kent Street, Tiger Street and Mary Street) were inundated by floodwaters. The combination of the closure of these roads and of the Granville Bridge effectively closed off Granville residents' access into Maryborough from the morning of 8 January 2011 to the evening of 14 January 2011.<sup>352</sup> Similar problems were experienced by residents of Bellbowrie when that suburb was isolated and its main shopping centre inundated.<sup>353</sup>

Residents of the Tennyson Reach development also lost road access during the January 2011 flood. Situated on the banks of the Brisbane River, the ground floors of the residential towers at Tennyson Reach are built to a height above the level of the 1% AEP flood. However, problems arose during the flood when access roads to the Softstone and Lushington buildings were inundated by floodwater well before the buildings were affected. One witness estimated that the main access road on the site, King Arthur Terrace, was cut off approximately six hours before the units began to flood.<sup>354</sup> Residents attempting to evacuate had to wade or swim through water to reach their vehicles.<sup>355</sup>

### 7.8.1 Current provisions in State Planning Policy 1/03

Outcome 1 of State Planning Policy 1/03 requires that in the assessment of applications for development within specified<sup>356</sup> natural hazard management areas, regard must be had to the compatibility of the development with the nature of the natural hazard, except where the development proposal is a development commitment; or where there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal.<sup>357</sup>

Under Outcome 2, if the development is not compatible with the nature of the natural hazard, but there is an overriding need for it in the public interest (and no other site is suitable and reasonably available), the aim is to minimise as far as practicable the adverse impacts from natural hazards, and to ensure the development does not result in unacceptable risk to people or property.<sup>358</sup> The policy specifies that Outcome 2 will be achieved when the development is brought as near as practicable to the level required to comply with the specific outcomes in Annex 4, and does not result in an unacceptable risk to people or property.<sup>359</sup> The specific outcomes in Annex 4 are:

1. Development maintains the safety of people on the development site from all floods up to and including the DFE [defined flood event].
2. Development does not result in adverse impacts on people's safety or the capacity to use land within the floodplain.
3. Development minimises the potential damage from flooding to property on the development site.
4. Public safety and the environment are not adversely affected by the detrimental impacts of floodwater on hazardous materials manufactured or stored in bulk.
5. Essential services infrastructure (for example, on-site electricity, gas, water supply, sewerage and telecommunications) maintains its function during a DFE.

Assessment of 'unacceptable risk' requires consideration of on-site and external impacts of the proposed development.<sup>360</sup> Annex 5 specifies that the minimum required to avoid an unacceptable risk is achievement of 1, 2 and 4 above.<sup>361</sup> But State Planning Policy 1/03 does not expressly require consideration of:

- the potential for land not susceptible to flooding to be adversely affected by flood through isolation

- the impact of isolation: this may involve consideration of characteristics of the flood such as the rate of rise and duration, and how those characteristics affect a proposed use, having regard to factors such as warning times, evacuation routes and access to essential services during periods of isolation.<sup>362</sup>

The examples provided earlier in this section demonstrate the utility of such considerations.

## Recommendations

- 7.24 The Queensland Government should draft assessment criteria to be included in the model flood planning controls that address:
- the prospect of isolation or hindered evacuation
  - the impact of isolation or hindered evacuation.
- 7.25 If the Queensland Government does not include such assessment criteria in the model flood planning controls, councils should consider including assessment criteria in their planning schemes that address:
- the prospect of isolation or hindered evacuation
  - the impact of isolation or hindered evacuation.

## (Endnotes)

- 1 Exhibit 506, Flood Response Review Board, Brisbane Flood January 2011: Independent Review of Brisbane City Council's Response 9-22 January 2011, May 2011 [p3].
- 2 Second submission of Ipswich City Council, 28 April 2011 [p68: para 23.1].
- 3 Exhibit 911, Statement of John Adams, 2 September 2011, JA-10 [p2: para 7.3].
- 4 Second submission of Ipswich City Council, 28 April 2011 [p63: para 20.8].
- 5 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p7: para 2.3.2.1].
- 6 Exhibit 602, Lockyer Valley Regional Council, Grantham Relocation Policy, 11 May 2011 [p2: para 1.1].
- 7 See, for example: Exhibit 561, Statement of Peita McCulloch, 15 September 2011 [p7: para 21].
- 8 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p19: para 3.6.2]; State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p 22: para 7.9].
- 9 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p97].
- 10 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p22: para 7.9].
- 11 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p55 and 58].
- 12 Exhibit 666, Statement of Glen Brumby, 15 September 2011, Attachment 19, Annexure 4; Exhibit 666, Statement of Glen Brumby, 15 September 2011, Attachment 5 [p7].
- 13 Exhibit 967, Managing Flood Risk through Planning Opportunities: Guidance on Land Use Planning in Flood Prone Areas, June 2006 [p69]; Exhibit 1007 Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p4: para 1.8].
- 14 Exhibit 967, Managing Flood Risk through Planning Opportunities: Guidance on Land Use Planning in Flood Prone Areas, June 2006 [p50, 53].
- 15 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia:

- best practice principles and guidelines, SCARM Report 73, 2000 [p4: para 1.8].
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- 16 Exhibit 766, First statement of Andrew Fulton, 1 September 2011 [p10-11: para 3.1.1.2].
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- 17 Exhibit 766, First statement of Andrew Fulton, 1 September 2011 [p10: para 3.1.1.2].
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- 18 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3911: line 10].
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- 19 Exhibit 766, First statement of Andrew Fulton, 1 September 2011 [p11: para 3.1.1.2.2 – 3.1.1.2.3]; Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3912: line 21].
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- 20 Exhibit 534, Statement of Gary Mahon, 2 September 2011, Attachment GLM-21 [p5-6].
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- 21 Exhibit 534, Statement of Gary Mahon, 2 September 2011, GLM-39 [p2]; Transcript, Gary White, 19 September 2011, Brisbane [p2761: line 18].
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- 22 Exhibit 966, Paul Grech, *Report to Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, 15 October 2011 [p7: para 7.3]; Exhibit 968, Floodplain Development Manual: the management of flood liable land, April 2005 [p2].
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- 23 Exhibit 966, Paul Grech, *Report to Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, 15 October 2011 [p7: para 7.3]; Exhibit 968, Floodplain Development Manual: the management of flood liable land, April 2005 [p2].
- 
- 24 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p13: para A1.2].
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- 25 For section 200 of the *Sustainable Planning Act*, ‘Minister’ includes any Minister, see: Schedule 3, *Sustainable Planning Act 2009*.
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- 26 Section 200, *Sustainable Planning Act 2009*.
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- 27 Section 203, *Sustainable Planning Act 2009*.
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- 28 Section 202, *Sustainable Planning Act 2009*. Use of designated land contrary to a requirement is an offence under section 582(b)(ii) of the *Sustainable Planning Act 2009*.
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- 29 Section 207(2)(d), *Sustainable Planning Act 2009*.
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- 30 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p19: para 6.39].
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- 31 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p13: para A1.2].
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- 32 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p5: para 5.2; p8: Outcome 3]. Throughout this section, including in the recommendations, the phrase ‘specified level of risk’ should be construed to have the same meaning as the phrase does in Outcome 3 of State Planning Policy 1/03.
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- 33 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p3: para 2.2; p13: Annex 1].
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- 34 In brief, Outcome 1 requires, subject to some exceptions, such as where there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal, that a development be compatible with the severity of the flood hazard. Outcome 2 provides that, where a proposed development is not compatible with the severity of the flood hazard, it must minimise as far as practicable the adverse impacts from flood and not result in an unacceptable risk to people or property. See State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p6-7].
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- 35 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p8: para 6.15].
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- 36 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p8: para 6.15]; State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p38].
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- 37 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, Appendix 9 [p70].
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- 38 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p8: para 6.15].
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- 39 Transcript, Luis Prado, 21 September 2011, Brisbane [p2946: line 19 and p2946: line 39].
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- 40 Transcript, Luis Prado, 21 September 2011, Brisbane [p2946: line 44].
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- 41 Exhibit 580, Statement of Luis Prado, 8 September 2011, Annexure 1 [p4].
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- 42 Transcript, Gary White, 7 November 2011, Brisbane [p4639: line 37].
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- 43 Exhibit 858, Statement of Timothy Foote, 7 October 2011, TCF-10; Exhibit 830, Major Flood Information Map 42 marked to show 45 Alice Street, Goodna; Exhibit 831, PD Online Map of 45 Alice Street, Goodna.
- 44 Transcript, Krystal Wilson, 18 October 2011, Ipswich [p4101: line 47; p4102: line 24].
- 45 Exhibit 829, Statement of Krystal Wilson, 14 October 2011 [p2: para 8 – p3: para 9].
- 46 Transcript, Krystal Wilson, 18 October 2011, Ipswich [p4104: line 30].
- 47 Transcript, Krystal Wilson, 18 October 2011, Ipswich [p4104: line 54].
- 48 Transcript, Krystal Wilson, 18 October 2011, Ipswich [p4105: line 32].
- 49 Exhibit 858, Statement of Timothy Foote, 7 October 2011, TCF-1, JB Goodwin Midson & Partners Assessment Report – 45 Alice Street Goodna [p17].
- 50 Exhibit 1007, Standing Committee for Agriculture and Resource Management (SCARM), Floodplain Management in Australia: best practice principles and guidelines SCARM Report 73, 2000 [p20].
- 51 Exhibit 639, Seventh statement of Rory Kelly, 21 September 2011, Attachment RJK-106 [p BCC.061.4797].
- 52 Transcript, Kenneth Smith, 21 September 2011, Brisbane [p2886: line 40].
- 53 Transcript, Kenneth Smith, 21 September 2011, Brisbane [p2886: line 49]; Exhibit 567, Statement of Kenneth Smith, 13 September 2011 [p2: para 6].
- 54 Transcript, Kenneth Smith, 21 September 2011, Brisbane [p2887: line 17].
- 55 Transcript, Kenneth Smith, 21 September 2011, Brisbane [p2887: line 35].
- 56 Transcript, Kenneth Smith, 21 September 2011, Brisbane [p2887: line 47].
- 57 Hawkesbury-Nepean Floodplain Management Steering Committee, Managing Flood Risk through Planning Opportunities: Guidance on Land Use Planning in Flood Prone Areas, April 2007 [p113].
- 58 See generally: Hawkesbury-Nepean Floodplain Management Steering Committee, Managing Flood Risk through Planning Opportunities:
- Guidance on Land Use Planning in Flood Prone Areas, April 2007 [p119]. For the fire safety requirements which apply to commercial building in Queensland, see *Building Fire Safety Regulation 2008*.
- 59 Exhibit 815, Statement of Emily Lang, 2 September 2011 [p5: para 21].
- 60 Exhibit 815, Statement of Emily Lang, 2 September 2011 [p5: para 20].
- 61 Transcript, Rosleys Blaich, 13 October 2011, Gympie [p4014: line 39; p4023: line 34]; Exhibit 804, Statement of Rosleys Blaich, 27 September 2011 [p1: para 1; p3: para 4]; Exhibit 806, Property Search for 34 Violet Street, Gympie, 29 March 1996.
- 62 Exhibit 804, Statement of Rosleys Blaich, 27 September 2011 [p2: para 2].
- 63 Exhibit 804, Statement of Rosleys Blaich, 27 September 2011 [p5: para 9].
- 64 Exhibit 804, Statement of Rosleys Blaich, 27 September 2011 [p3: para 4].
- 65 Transcript, Tania Stenholm, 13 October 2011, Gympie [p4028: line 44; p4031: line 36].
- 66 Exhibit 811, Statement of Tania Stenholm, 28 September 2011 [p3: para 15].
- 67 Transcript, Tania Stenholm, 13 October 2011, Gympie [p4030: line 42].
- 68 Transcript, Tania Stenholm, 13 October 2011, Gympie [p4031: line 17].
- 69 Transcript, Tania Stenholm, 13 October 2011, Gympie [p4031: line 9].
- 70 Transcript, Michael Hartley, 13 October 2011, Gympie [p4071: lines 1-56]; Exhibit 820, Statement of Michael Hartley, 25 August 2011 [p 3: para 6], see SO-18 and PS-18f.
- 71 Transcript, Michael Hartley, 13 October 2011, Gympie [p4071: lines 46-56].
- 72 Transcript, Michael Hartley, 13 October 2011, Gympie [p4072: line 21].
- 73 Exhibit 545, Memorandum Brisbane City Council to DERM, Department of Community Safety and Department of Infrastructure and Planning, 25 January 2011 [p2: para 1].
- 74 Exhibit 545, Memorandum Brisbane City Council to DERM, Department of Community Safety and Department of Infrastructure and Planning, 25 January 2011 [p1]; Exhibit 546,

- Brisbane City Council Internal Memorandum, 27 January 2011 [p1].
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- 75 Exhibit 546, Brisbane City Council Internal Memorandum, 27 January 2011 [p1]; Exhibit 546, Brisbane City Council Internal Memorandum, 27 January 2011 [p3].
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- 76 Section 12, *Dangerous Goods Safety Management Act 2001*.
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- 77 The *Work Health and Safety Act 2011* replaced the repealed *Dangerous Goods Safety Management Act 2001* from 1 January 2012. For storage of dangerous goods, see Section 12, *Work Health and Safety Act 2011*; Schedule 1, section (1)(1).
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- 78 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p11]. See, for example, State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p38: para A2.31].
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- 79 Section 12, *Work Health and Safety Act 2011*; Schedule 1, section (1)(6).
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- 80 Sections 19(3)(a) and 22(2), *Work Health and Safety Act 2011*.
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- 81 Department of Emergency Services, Safe Storage and Handling of Dangerous Goods: Guidelines for Industry, March 2002.
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- 82 Department of Emergency Services, Safe Storage and Handling of Dangerous Goods: Guidelines for Industry, March 2002 [p96].
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- 83 Department of Emergency Services, Safe Storage and Handling of Dangerous Goods: Guidelines for Industry, March 2002 [p96].
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- 84 Section 18, *Environmental Protection Act 1994*.
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- 85 Schedule 4, *Environmental Protection Act 1994*.
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- 86 Section 17, *Environmental Protection Regulation 2008*; Schedule 2, *Environmental Protection Regulation 2008*.
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- 87 Schedule 2, Section 7, *Environmental Protection Regulation 2008*.
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- 88 Schedule 2, Section 18, *Environmental Protection Regulation 2008*.
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- 89 Schedule 2, Section 21, *Environmental Protection Regulation 2008*.
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- 90 Schedule 2, Section 25, *Environmental Protection Regulation 2008*.
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- 91 Schedule 2, Section 40, *Environmental Protection Regulation 2008*.
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- 92 Section 10, *Sustainable Planning Act 2009*.
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- 93 Section 10, *Sustainable Planning Act 2009*.
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- 94 Section 101, *Environmental Protection Regulation 2008*. DERM has also delegated responsibility to the Department of Employment, Economic Development and Innovation for the administration of two particular environmentally relevant activities: intensive animal feedlotting and pig keeping. The activities administered by the Department of Employment, Economic Development and Innovation are not generally associated with industrial land uses, and are not addressed further in this section.
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- 95 Section 101, *Environmental Protection Regulation 2008*.
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- 96 Section 73A, *Environmental Protection Act 1994*.
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- 97 *Environmental Protection Act 1994*, Schedule 4 definition of ‘Standard Criteria’, para (c).
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- 98 Exhibit 624, Statement of Jonathan Womersley, 19 September 2011 [p12: para 74, and 75]; Transcript, Rory Kelly, 27 September 2011, Brisbane [p3249: line 40].
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- 99 Exhibit 624, Statement of Jonathan Womersley, 19 September 2011, Annexures JCW-10 – JCW-14.
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- 100 Transcript, Rory Kelly, 27 September 2011, Brisbane [p3249: line 21].
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- 101 Exhibit 624, Statement of Jonathan Womersley, 19 September 2011, Annexure JCW-03.
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- 102 Exhibit 624, Statement of Jonathan Womersley, 19 September 2011, Annexure JCW-03 [p2-3: para 3.1].
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- 103 Transcript, Jonathan Womersley, 26 September 2011, Brisbane [p3172: line 54].
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- 104 Exhibit 624, Statement of Jonathan Womersley, 19 September 2011 [p14: para 85].
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- 105 Exhibit 624, Statement of Jonathan Womersley, 19 September 2011, Attachment JCW-09.
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- 106 Transcript, Jonathan Womersley, 26 September 2011, Brisbane [p3173: line 27].
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- 107 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3491: line 21].
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- 108 Section 101, *Environmental Protection Regulation 2008*.
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- 109 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3491: line 48].
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- 110 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, 2003 [p11]; Annexure 1 [p13: para A1.1].
- 111 State Planning Policy 1/03, *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p4: para 3.3]; Annexure 1 [p13: para A1.1]. For the purpose of State Planning Policy 1/03, the definition of hazardous materials in the *Dangerous Goods Safety Management Act* applies, excepting radioactive and infectious substances.
- 112 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p6].
- 113 State Planning Policy 1/03, *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, Annexure 4 [p18: para A4.2].
- 114 State Planning Policy 1/03, *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p59].
- 115 State Planning Policy 1/03, *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p59: para 4.1].
- 116 State Planning Policy 1/03, *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p59: para 4.2].
- 117 State Planning Policy 1/03, *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p59].
- 118 Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p18: para 5.1 – p19: para 5.4].
- 119 Exhibit 820, Statement of Michael Hartley, 25 August 2011 [p10: para 27, 29].
- 120 Statement of Julie Edwards, undated [p10: para 4.6-4.7].
- 121 Statement of Christopher Warren, 12 September 2011 [p11: para 5.8]; Exhibit 1005, Statement of Bradley Sully, 7 September 2011 [p2: para 5].
- 122 Specifically the Industrial Design Code and the Industrial Amenity and Performance Code. These codes ‘call up’ the Stormwater Management Code. With respect to flooding, the Stormwater Management Code lists, as an acceptable solution, compliance with the Subdivision and Development Guidelines. The Subdivision and Development Guidelines prescribe minimum floor levels for certain types of building, and certain types of flooding (that is, Brisbane River flooding, local flooding, waterway flooding, and storm tide). The Guidelines also allow a risk management approach to be applied, in lieu of compliance with prescribed minimum floor levels.
- 123 Statement of John Adams, 2 September 2011 [p25: para 54].
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- 124 Exhibit 1005, Statement of Bradley Sully, 7 September 2011 [p3: para 1]; Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p19-20: para 5.4-5.7]; Exhibit 796, Statement of Michael Ellery, 29 August 2011 [p5: para 31]; Statement of Hendrik Christian du Plessis, 6 October 2011 [p11: para 17]; Statement of Luke Lankowski [p5: para 5.2]; Exhibit 820, Statement of Michael Hartley, 25 August 2011 [p10: para 28].
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- 125 Exhibit 1005, Statement of Bradley Sully, 7 September 2011 [p3: para 1].
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- 126 Statement of Luke Lankowski, 1 September 2011 [p5: para 5.1 – p6: para 5.6].
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- 127 Transcript, Gary White, 19 September 2011, Brisbane [p2751: line 57].
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- 128 Exhibit 820, Statement of Michael Hartley, 25 August 2011 [p11: para 30]; Statement of Christopher Warren, 12 September 2011 [p12: para 6.3]; Exhibit 796, Statement of Michael Ellery, 29 August 2011 [p5: para 32-33]; Exhibit 544, Statement of Martin Reason, 1 September 2011 [p26: para 84]; Exhibit 1005, Statement of Bradley Sully, 7 September 2011 [p3-4]; Statement of John Adams, 2 September 2011 [p25: para 55].
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- 129 Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p20: para 6.1]; Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3921: line 14]; Statement of Hendrik Christian du Plessis, 6 October 2011 [p11: para 17]; Statement of Julie Edwards [p11: para 5.2]; Exhibit 770, Statement of Robert Savage [p9: para 36-37].
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- 130 Exhibit 820, Statement of Michael Hartley, 25 August 2011 [p11-12: para 30].
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- 131 Exhibit 796, Statement of Michael Ellery, 1 September 2011 [p5: para 32-33].
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- 132 Transcript, Rory Kelly, 27 September 2011, Brisbane [p3245: line 40].
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- 133 ‘Prescribed tidal work’ is defined in sections 14 and 15 of the *Coastal Protection and Management Regulation 2003*.
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- 134 See Schedule 3, *Sustainable Planning Regulation 2009*.
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- 135 Schedule 4A, *Coastal Protection and Management Regulation 2003*.

- 136 See Schedule 6, *Sustainable Planning Regulation 2009*. The Department of Transport and Main Roads, the Department of Employment, Economic Development and Innovation and DERM may also be involved in the assessment of prescribed tidal work as referral agencies (see schedule 7, *Sustainable Planning Regulation 2009*).
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- 137 Schedule 4A, Part 1, Clause 2(b), *Coastal Protection and Management Regulation 2003*.
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- 138 ‘Specific outcomes’ and ‘probable solutions’ work in a similar way to ‘performance outcomes’ and ‘acceptable outcomes’ which are described in section 4.3 *Queensland Planning Provisions*.
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- 139 Part 3, Item 12.1, Schedule 4A, *Coastal Protection and Management Regulation 2003*.
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- 140 For example, Australian Standard (AS 4997-2005) *Guidelines for the design of maritime structures* and Australian Standard (AS 3962-2001) *Guideline for the design of marinas*.
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- 141 Part 3, Item 12.1, Schedule 4A, *Coastal Protection and Management Regulation 2003*.
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- 142 The floating pontoon section of the Riverwalk was between Howard Smith Wharves and Merthyr Road. This floating pontoon comprised one section of the Riverwalk which also includes ground and elevated walkways, which run parallel to both sides of the Brisbane River. These other sections of the Riverwalk performed well (apart from localised damage) in the January 2011 flood and remain in service (see Exhibit 535, Statement of Christopher Beckley, 9 September 2011 [p3: para 8]).
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- 143 Exhibit 535, Statement of Christopher Beckley, 9 September 2011, Attachment CJB-9 [p11].
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- 144 Exhibit 535, Statement of Christopher Beckley, 9 September 2011, Attachment CJB-9 [p11].
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- 145 Exhibit 376, Statement of Captain Richard Johnson, 18 April 2011 [p12].
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- 146 Exhibit 535, Statement of Christopher Beckley, 9 September 2011, Attachment CJB-9 [p11].
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- 147 Exhibit 535, Statement of Christopher Beckley, 9 September 2011, Attachment CJB-9 [p11].
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- 148 Exhibit 535, Statement of Christopher Beckley, 9 September 2011 [p3: para 9].
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- 149 The 1% AEP flood loads were adjusted to obtain an anticipated 0.05% AEP flood load applying a load factor of 1.4 (see Exhibit 535, Statement of Christopher Beckley, 9 September 2011 [p7: para 14]). The data to determine the 1% AEP flood was supplied by Brisbane City Council to the design consultant by supplying one and two dimensional modelling information and the consultant then used three dimension modelling to give a more specific answer (Transcript, Christopher Beckley, 20 September 2011, Brisbane [p2855: lines 1-10]).
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- 150 As far as Brisbane City Council is aware, while there were at the time statutory requirements relating to authorisation of the carrying out of works like the New Farm Riverwalk in tidal areas, the standards for flood resilience for structures were a matter for the design engineer applying professional judgment in the design, and relevant Australian standards to the extent they applied (see Exhibit 535, Statement of Christopher Beckley, 9 September 2011 [p7: para 15]).
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- 151 Exhibit 535, Statement of Christopher Beckley, 9 September 2011 [p7: para 16].
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- 152 Exhibit 535, Statement of Christopher Beckley, 9 September 2011, Attachment CJB-9 [p15].
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- 153 Exhibit 535, Statement of Christopher Beckley, 9 September 2011, Attachment CJB-9 [p12, 13].
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- 154 Exhibit 535, Statement of Christopher Beckley, 9 September 2011, Attachment CJB-9 [p18].
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- 155 Brisbane City Council, Riverwalk Replacement Project, [www.brisbane.qld.gov.au/traffic-transport/roads-infrastructure-bikeways/bikeway-and-pathway-projects/Riverwalk-replacement/index.htm](http://www.brisbane.qld.gov.au/traffic-transport/roads-infrastructure-bikeways/bikeway-and-pathway-projects/Riverwalk-replacement/index.htm), accessed 17 January 2012.
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- 156 Transcript, Christopher Beckley, 20 September 2011, Brisbane [p2856].
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- 157 Exhibit 556, Statement of Ashley Horneman, 9 September 2011 [p7: para 30].
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- 158 Exhibit 556, Statement of Ashley Horneman, 9 September 2011 [p7:para 32 – p8: para 34].
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- 159 The terminals were: Apollo Road, Bulimba; Brett’s Wharf, Hamilton; Commercial Road, Teneriffe; Oxford Street, Bulimba; Hardcastle Park, Hawthorne; Merthyr Road, New Farm; Wynnum Road, Norman Park; New Farm Park, New Farm; Park Avenue, Mowbray Park; Sydney St, New Farm; Eagle Street/Riverside, Brisbane City; Holman Street, Kangaroo Point; Thornton Street, Kangaroo Point; QUT-Gardens Point, Brisbane City; Cultural Centre/Southbank, South Brisbane; Orleigh Park, West End; University of Queensland, St Lucia; and TJ Doyle Memorial

- Drive, Dutton Park (see Exhibit 556, Statement of Ashley Horneman [p3: para 11]).
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- 160 Exhibit 556, Statement of Ashley Horneman, 9 September 2011 [p3-4: para 12]. Australian Standard AS 3962-2001 *Guidelines for the Design of Marinas*, which contains standards relevant to the design of ferry terminals, was first published in 1992 and therefore ferry terminals designed prior to this would not have used this Australian Standard as a basis for design: Exhibit 556, Statement of Ashley Horneman, 9 September 2011 [p4: para 13].
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- 161 The design notes for the terminal upgrades state the flood velocity adopted was 2.5 metres per second. However, the design notes do not indicate to what flood event the flood velocity applies: Exhibit 556, Statement of Ashley Horneman, 9 September 2011 [p4: para 15].
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- 162 The terminals were: a new site at University of Queensland; Guyatt Park, St Lucia; North Quay, Brisbane City; and South Bank, South Brisbane: Exhibit 556, Statement of Ashley Horneman, 9 September 2011 [p4: para 16].
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- 163 Brisbane City Council indicated the design velocity for these new terminals was 3 metres per second, which, Brisbane City Council told the Commission, is 'almost certainly' a velocity that would be experienced in a 1% AEP flood: Exhibit 556, Statement of Ashley Horneman, 9 September 2011 [p4: para 15; p5: para 17].
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- 164 Exhibit 556, Statement of Ashley Horneman, 9 September 2011 [p5: para 20 – p6: para 26].
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- 165 These seven terminals are: University of Queensland; Regatta; North Quay; Queensland University of Technology; Maritime Museum (formerly River Plaza); Holman Street; and Sydney Street (see Exhibit 556, Statement of Ashley Horneman, 9 September 2011 [p7-8: para 33]).
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- 166 Exhibit 556, Statement of Ashley Horneman, 9 September 2011 [p7: para 36].
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- 167 Exhibit 556, Statement of Ashley Horneman, 9 September 2011 [p9: para 40-43]. See also Brisbane City Council's Ferry Terminal Design Specification: Exhibit 556, Statement of Ashley Horneman, 9 September 2011, Attachment ASH-11.
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- 168 Exhibit 556, Statement of Ashley Horneman, 9 September 2011 [p9: para 44].
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- 169 Exhibit 535, Statement of Christopher Beckley, 9 September 2011, Attachment CJB-12.
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- 170 The repair must comply with the conditions of DERM Exemption Certificate (permit no. CSCE019518811) dated 14 February 2011.
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- 171 See section 120C, *Coastal Protection and Management Act 1995*. There is also provision within section 585 of the *Sustainable Planning Act 2009* to allow for construction of tidal work without approval if the council is of the view that the works are necessary to ensure public safety or to protect the structural integrity of an existing structure. However, a development application for the works would need to be made as soon as reasonably practicable following commencement of the emergency work.
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- 172 Correspondence from Brisbane City Council, 18 January 2012 [p2].
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- 173 Transcript, Christopher Beckley, 20 September 2011, Brisbane [p2857]; Exhibit 535, Statement of Christopher Beckley, 9 September 2011, Attachment CJB-12.
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- 174 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4260: line 26]; Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p57: para G.5.2]; Report of Tony Loveday, Flood Commission – Review of Evidence – Citiswiche Development, 7 November 2011 [p5].
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- 175 Brisbane City Plan, Appendix 2 [p64c].
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- 176 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4259: line 22]; Report of Mr Neil Collins, Response Report to Floods Commission – Review of Evidence Report on Citiswiche Development by Tony Loveday (Bremer Business Park Masterplan) [p6-3, para 7(c)].
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- 177 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3517: line 20].
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- 178 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3517: line 27]; Statement of Neil Fitzpatrick, 13 September 2011 [para 10].
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- 179 Exhibit 647, Statement of Robert Clements, 13 September 2011 [p7: para 29]; Transcript, Robert Clements, 27 September 2011, Brisbane [p3266: line 5].
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- 180 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3518: line 33]; Exhibit 647, Statement of

- Robert Clements, 13 September 2011 [p7: para 29; p8: para 31]; Annexure 1 [p6].
- 181 Exhibit 647, Statement of Robert Clements, 13 September 2011 [p7: para 29]; Transcript, Robert Clements, 27 September 2011, Brisbane [p3262: line 57].
- 182 Transcript, Robert Clements, 27 September 2011, Brisbane [p3262: line 5].
- 183 Transcript, Robert Clements, 27 September 2011, Brisbane [p3265: line 48]; Exhibit 647, Statement of Robert Clements, 13 September 2011 [para 29-30]; Annexure 1 [p6].
- 184 Further approvals for building works and operational works may have also been required; however the Commission did not conduct an examination of these applications. See Exhibit 638, Sixth Statement of Rory Kelly, 21 September 2011 for a description of the approval process.
- 185 Exhibit 638, Sixth Statement of Rory Kelly, 21 September 2011 [p6: para 13].
- 186 Exhibit 638, Sixth Statement of Rory Kelly, 21 September 2011 [p6: para 14].
- 187 Exhibit 638, Sixth Statement of Rory Kelly, 21 September 2011 [p9: para 16(b)]; Annexure RJK-77. The initial application was for 110 townhouses, a shop and a caretakers flat: Exhibit 638, Sixth Statement of Rory Kelly, 21 September 2011 [p7: para 15].
- 188 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3526: line 2].
- 189 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3525: line 39].
- 190 Exhibit 638, Sixth Statement of Rory Kelly, 21 September 2011 [p8: para 16(b)]; Annexure RJK-77.
- 191 Exhibit 638, Sixth Statement of Rory Kelly, 21 September 2011 [p9: para 16(c)]; Annexure RJK-78.
- 192 Further information was provided to address drainage concerns and the proposed density of the development was reduced from 110 townhouses and a shop down to 90 townhouses. See Exhibit 638, Sixth Statement of Rory Kelly, 21 September 2011 [p8: para 16(a) – p12: para 16(p)].
- 193 A memorandum from the Acting Director of the Planning Branch of the Department of Works to the Manager of that Department observes that the surrounding properties had ground levels ‘ranging from RL 4.5 to RL 10 m AHD and drain towards the subject site.’ The effect of the conditions imposed were such as ‘to set fill levels for access and building sites at R.L 5.3m AHD’ at Exhibit 638, Sixth Statement of Rory Kelly, 21 September 2011, Annexure RJK-69; Annexure RJK-73 [second schedule: p2].
- 194 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3520: line 8 – p3522: line 26; p3523: line 56 – p3525: line 30].
- 195 Transcript, Cresta Richardson, 29 September 2011, Emerald [p3368: line 42]. Exhibit 673, Statement of Cresta Richardson, 15 September 2011 [p4: para 17].
- 196 Exhibit 673, Statement of Cresta Richardson, 15 September 2011 [p4: para 17].
- 197 Exhibit 860, Statement of Natalie Plumbe, 12 October 2011 [p3: para 12]; Transcript, Natalie Plumbe, 19 October 2011, Ipswich [p4231: line 1].
- 198 Exhibit 860, Statement of Natalie Plumbe, 12 October 2011, Annexure NP-16; Transcript, Natalie Plumbe, 19 October 2011, Ipswich [p4232: line 23].
- 199 Exhibit 862, Statement of Carol Richards, 29 August 2011 [para 6].
- 200 Exhibit 862, Statement of Carol Richards, 29 August 2011 [para 12].
- 201 Exhibit 862, Statement of Carol Richards, 29 August 2011 [p1: para 9].
- 202 Exhibit 862, Statement of Carol Richards, 29 August 2011 [p3: para 33].
- 203 Exhibit 862, Statement of Carol Richards, 29 August 2011 [p2: para 13; p3: para 29].
- 204 Exhibit 862, Statement of Carol Richards, 29 August 2011 [p3: para 29-30].
- 205 Exhibit 862, Statement of Carol Richards, 29 August 2011 [p3: para 30]; Exhibit 842, Statement of Julian Chambers, 20 September 2011 [p2: para 4].
- 206 Exhibit 842, Statement of Julian Chambers, 20 September 2011 [p2: para 5]; Transcript, Julian Chambers, 18 October 2011, Ipswich [p4142: line 2].
- 207 Exhibit 842, Statement of Julian Chambers, 20 September 2011 [p2: para 6].

- 208 Exhibit 842, Statement of Julian Chambers, 20 September 2011 [p2: para 7]; Transcript, Julian Chambers, 18 October 2011, Ipswich [p4140: line 18; p4141: line 1].
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- 209 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4258: line 42].
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- 210 Transcript, Gary Ellis, 19 October 2011, Brisbane [p4258: line 6].
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- 211 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4258: line 12].
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- 212 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4258: line 32].
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- 213 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4258: line 37].
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- 214 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4261: line 13, p4258: line 42]. Transcript, Natalie Plumbe, 19 October 2011, Ipswich [p4236: line 52].
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- 215 Exhibit 861, Statement of Gary Ellis, 13 October 2011 [p12: para 22(b)].
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- 216 Exhibit 861, Statement of Gary Ellis, 13 October 2011 [p13: para 22(g)]; Annexure GE-4 [p14].
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- 217 Exhibit 861, Statement of Gary Ellis, 13 October 2011 [p14: para 24]; Transcript, Gary Ellis, 19 October 2011, Ipswich [p4255: line 29].
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- 218 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4259: line 1].
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- 219 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4259: line 17].
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- 220 Transcript, Gary Ellis, 19 October 2011, Brisbane [p4259: line 17].
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- 221 Exhibit 844, Queensland Reconstruction Authority Map of Disaster Affected Properties, Drawing Number LGA3960-0015-2, May 2011 [Citiswitch marked].
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- 222 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p9: para 7.5].
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- 223 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p9].
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- 224 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p53: para A5.5].
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- 225 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p57].
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- 226 Transcript, Andrew Fulton, Bundaberg, 11 October 2011 [p3916: line 49].
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- 227 Section 235, *Sustainable Planning Act 2009*.
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- 228 Section 231(2), *Sustainable Planning Act 2009*; Regulation 10 and Schedule 4, Table 4, Item 1 of the *Sustainable Planning Regulation 2009*.
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- 229 Exhibit 912, Statement of John Adams, 25 October 2011 [p7: para 10].
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- 230 For more information, see the Department of Transport and Main Roads website: [www.tmr.qld.gov.au/Projects/Name/I/Ipswich-Motorway-Upgrade.aspx](http://www.tmr.qld.gov.au/Projects/Name/I/Ipswich-Motorway-Upgrade.aspx).
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- 231 Transcript, John Adams, 28 October 2011, Brisbane [p4594: line 25; p4600: line 1].
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- 232 Transcript, John Adams, 28 October 2011, Brisbane [p4602: line 51; p4603: line 1].
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- 233 Exhibit 912, Statement of John Adams, 25 October 2011 [p7: para 12].
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- 234 Exhibit 912, Statement of John Adams, 25 October 2011 [p7: para 12]; Transcript, John Adams, 28 October 2011, Brisbane [p4602: line 51; p4603: line 1].
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- 235 Transcript, John Adams, 28 October 2011, Brisbane [p4594: line 41]; Transcript, Natalie Plumbe, 19 October 2011, Ipswich [p4239: line 4].
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- 236 Exhibit 685, Statement of Geoffrey Jago, 17 August 2011 [p2: para 4].
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- 237 Transcript, Geoff Jago, 29 September 2011, Emerald [p3426, line 40].
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- 238 Exhibit 685, Statement of Geoffrey Jago, 17 August 2011 [p2: para 4].
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- 239 Submission of Jondaryan District Residents Association Inc, 7 July 2011 [p1].
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- 240 Submission of Jondaryan District Residents Association Inc, 7 July 2011 [p1].
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- 241 Exhibit 610, Statement of Lola Worthington, 24 August 2011 [p2: para 9.3].
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- 242 Statement of Anthony Martini, 2 December 2011 Annexure AM-2 [p19].
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- 243 Statement of Anthony Martini, 2 December 2011, Annexure AM-2 [p19].
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- 244 Transcript, Sharron Campbell, 5 October 2011, Brisbane [p3684: line 10]; Exhibit 718, Statement of Sharron Campbell, 7 September 2011 [p9: para 27]; Transcript, Jeanenne Wilkinson,

- 5 October 2011, Brisbane [p3725: line 42]; Exhibit 733, Statement of Matthew Morgan, 11 September 2011 [p2]; Transcript, Matthew Morgan, 5 October 2011, Brisbane [p3722: line 16].
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- 245 Exhibit 920, Statement of Derek Millar, 17 October 2011 [p4: para 21].
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- 246 The Commission's interim report included the following definition of 'levee': 'Levee is a raised embankment or earthworks along the floodplain that reduce the frequency of inundation of areas adjacent to the waterway. They are designed to withstand certain river heights, and will be overtapped if floodwaters exceed this level (Office of the Chief Scientist, 2011, Understanding floods: questions and answers [p viii]).' This definition serves only to lend a certain context to the structures that are being discussed in this chapter; the question of what is a levee for the purpose of regulation is an issue that is not settled and is discussed at section 7.7.4 *Types of levees to be regulated*.
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- 247 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p23: para 3.10].
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- 248 Transcript, Gregory Morrow, 3 May 2011, Goondiwindi [p1140: line 19].
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- 249 Transcript, Gregory Morrow, 3 May 2011, Goondiwindi [p1162: line 20]; Transcript, Gregory Morrow, 3 May 2011, Goondiwindi [p1140: line 16].
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- 250 Bureau of Meteorology, 'Flood Summary for the Macintyre River at Goondiwindi – December 2010 and January 2011' accessed 28 December 2011, [www.bom.gov.au/hydro/flood/qld/fld\\_reports/goondiwindi\\_fact\\_sheet\\_2011.pdf](http://www.bom.gov.au/hydro/flood/qld/fld_reports/goondiwindi_fact_sheet_2011.pdf).
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- 251 Exhibit 270, Statement of Scott Norman, 1 April 2011 [p2: para 2(a)].
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- 252 Exhibit 270, Statement of Scott Norman, 1 April 2011 [p2: para 2].
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- 253 Transcript, Cleave Rogan, 4 May 2011, St George [p1238: line 47].
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- 254 Transcript, Cleave Rogan, 4 May 2011, St George [p1239: line 5].
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- 255 Exhibit 676, Submission of Robert Anderson, 24 May 2011 [p1].
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- 256 Exhibit 752, Statement of Neville Cayley, 31 August 2011 [p3: para 8].
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- 257 Transcript, Kylie Kilroy, 4 May 2011, St George [p1254: line 46]; Transcript, Robert Anderson, 29 September 2011, Emerald [p3396: line 47]; Transcript, Robert Anderson, 29 September 2011, Emerald [p3399: line 20]; Exhibit 676, Submission of Robert Anderson, 24 May 2011 [p1]; Exhibit 752, Statement of Neville Cayley, 31 August 2011 [p3: para 8].
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- 258 Exhibit 941, Statement of Pier Westerhuis, 2 November 2011 [p8: para 19].
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- 259 For a definition of overtopping, refer to *Appendix 6, Glossary*.
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- 260 Exhibit 1018, Statement of Pier Westerhuis, 12 May 2011 [p2: para 9].
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- 261 Exhibit 1018, Statement of Pier Westerhuis, 12 May 2011 [p1: para 6].
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- 262 Transcript, Colin Jensen, 10 November 2011, Brisbane [p4911: line 29]; Transcript, Carl Wulff, 19 October 2011, Ipswich [p4194: line 22].
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- 263 Transcript, Carl Wulff, 19 October 2011, Ipswich [p4194: line 18].
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- 264 Transcript, Carl Wulff, 19 October 2011, Ipswich [p4194: line 28].
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- 265 Exhibit 954, Statement of Colin Jensen, 8 September 2011 [p2: para 2.1].
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- 266 Exhibit 954, Statement of Colin Jensen, 8 September 2011 [p2: para 2.1; CDJ-51: p11].
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- 267 Exhibit 954, Statement of Colin Jensen, 8 September 2011 [CDJ-51: p11].
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- 268 Exhibit 954, Statement of Colin Jensen, 8 September 2011 [p5: para 2.7].
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- 269 Transcript, Colin Jensen, 10 November 2011, Brisbane [p4911: line 30].
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- 270 Transcript, Colin Jensen, 10 November 2011, Brisbane [p4911: line 51].
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- 271 Exhibit 911, Statement of John Adams, 2 September 2011 [p28: para 64 – p29: para 66]; Ipswich City Council, Ipswich Planning Scheme, Part 12, Division 15, Earthworks; Ipswich City Council, Ipswich Planning Scheme, Schedule 8 - Exempt Earthworks.
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- 272 Ipswich City Council, Ipswich Planning Scheme, Schedule 8 – Exempt Earthworks.
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- 273 Central Highlands Regional Council, Goondiwindi Regional Council, Lockyer Valley Regional Council, South Burnett Regional Council, Toowoomba Regional Council, Western Downs Regional Council and Paroo Regional Council.
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- 274 The means of regulating through local laws is discussed further at section 7.7.3 *Controlling the construction of levees*.
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- 275 Exhibit 976, Statement of Luke Lankowski, 2 November 2011 [p1: para 4]; Exhibit 979, Statement of Ken Gouldthorp, 2 November 2011 [p1: para 4].
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- 276 Exhibit 974, Statement of Hendrik Du Plessis, 4 November 2011 [p1: para 2]; Exhibit 981, Statement of Phil Bering, 3 November 2011 [p1]; Exhibit 983, Statement of Ian Flint, 3 November 2011 [p1: para 2].
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- 277 Exhibit 977, Statement of Mark Watt, 20 September 2011.
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- 278 Exhibit 646, Statement of Graeme Scheu, 12 September 2011 [p3: para 7].
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- 279 Exhibit 646, Statement of Graeme Scheu, 12 September 2011 [p3: para 6].
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- 280 Exhibit 680, Statement of Philip Brumley, 6 September 2011 [p1: para 1].
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- 281 Exhibit 681, Statement of Philip Brumley, 22 September 2011 [p2: para 7(b)].
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- 282 It was originally empowered under the *Local Government Act 1993*, but after this legislation was repealed, its status was preserved under the *Local Government Act 2009* and *Local Government Reform Implementation Regulation 2008*; Exhibit 680, Statement of Philip Brumley, 6 September 2011 [p1: para 1, 4].
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- 283 Exhibit 681, Statement of Philip Brumley, 22 September 2011 [p1: para 3].
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- 284 Exhibit 681, Statement of Philip Brumley, 22 September 2011 [p1: para 3-4].
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- 285 Exhibit 681, Statement of Philip Brumley, 22 September 2011 [p1: para 5].
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- 286 For a description of SunWater, see: Queensland Floods Commission of Inquiry, *Interim Report*, Section 2.1.5, 2011 [p34].
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- 287 Exhibit 681, Statement of Philip Brumley, 22 September 2011 [p2: para 6].
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- 288 Exhibit 681, Statement of Philip Brumley, 22 September 2011 [p2: para 7(b); Attachment A].
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- 289 Exhibit 681, Statement of Philip Brumley, 22 September 2011 [p2: para 7(b)].
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- 290 Exhibit 921, Statement of Keith Davies, 2 September 2011, Annexure 3 [p2: para 6-8; p3: para 13; p3: para 18-19].
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- 291 Exhibit 943, Statement of Michael Birchley, 22 September 2011 [p2: para 10].
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- 292 Exhibit 943, Statement of Michael Birchley, 22 September 2011 [p3: para 12].
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- 293 Exhibit 943, Statement of Michael Birchley, 22 September 2011 [p2: para 8].
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- 294 Exhibit 943, Statement of Michael Birchley, 22 September 2011 [p2: para 8].
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- 295 Exhibit 943, Statement of Michael Birchley, 22 September 2011 [p2: para 8].
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- 296 Section 61 and Schedule 9, *Water Regulation 2002*.
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- 297 Haughton River, Major Creek and Tully/Murray Rivers; Exhibit 943, Statement of Michael Birchley, 22 September 2011 [p2: para 8].
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- 298 Exhibit 943, Statement of Michael Birchley, 22 September 2011 [p2: para 8].
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- 299 Schedule 3, Part 1, Table 4, item 3, *Sustainable Planning Regulation 2009* cf Schedule 3, Part 2, Table 4, item 1, *Sustainable Planning Regulation 2009*.
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- 300 Schedule 6, Table 3, item 3, *Sustainable Planning Regulation 2009*.
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- 301 Exhibit 943, Statement of Michael Birchley, 22 September 2011 [p8: para 35]; Transcript, Michael Birchley, 9 November 2011, Brisbane [p4806: line 8].
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- 302 Exhibit 943, Statement of Michael Birchley, 22 September 2011 [p2: para 7].
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- 303 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain Management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p8, 23].
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- 304 Sections 7 and 10, *Sustainable Planning Act 2009*.
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- 305 These two mechanisms are preferred over the use of state planning regulatory provisions or regional plans. See section 5.1 *Planning schemes*.
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- 306 It may also be necessary to amend Schedule 4, Table 5, Items 1-5, *Sustainable Planning Act 2009*, to ensure levees can be made ‘assessable development’.
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- 307 Section 37 of the *Local Government Act 2009* provides that a local law cannot duplicate a development process in the *Sustainable Planning Act*. Since levees would appear to fall within the definition of ‘operational work’ (as things constructed that allow interfering with water: section 10), carrying out their construction is ‘development’ (section 7) and is either assessable or self-assessable under the Act. Section 37(4) of *Local Government Act 2009* excludes local laws relating to levees from the prohibition on duplicating *Sustainable Planning Act* processes until such time that a local government decides to prepare its next planning scheme under the *Sustainable Planning Act*.
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- 308 Transcript, Peter Maguire, 29 September 2011, Emerald [p3458: line 18]; Exhibit 977, Statement of Mark Watt, 20 September 2011 [p2: para 7]; Exhibit 976, Statement of Luke Lankowski, 2 November 2011 [p1: para 4]; Exhibit 646, Statement of Graeme Scheu, 12 September 2011 [p2: para 5]; Supplementary Submission of the Local Government Association of Queensland, September 2011 [p3: para 2.12].
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- 309 Supplementary Submission of the Local Government Association of Queensland, September 2011 [p3: para 2.12]; Exhibit 646, Statement of Graeme Scheu, 12 September 2011 [p2: para 5].
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- 310 Exhibit 977, Statement of Mark Watt, 20 September 2011 [p2: para 7]; Transcript, Phillip Brumley, 29 September 2011, Emerald [p3416: line 21].
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- 311 Exhibit 982, Statement of Scott Norman, 6 September 2011 [p2: para 14]; Exhibit 977, Statement of Mark Watt, 20 September 2011 [p3: para 8]; Exhibit 684, Statement of Bryan Ottone, 27 September 2011 [p2: para 6]; Exhibit 681, Statement of Phillip Brumley, 22 September 2011 [p2: para 8].
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- 312 Exhibit 646, Statement of Graeme Scheu, 12 September 2011 [p1: para 3].
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- 313 Exhibit 977, Statement of Mark Watt, 20 September 2011 [p2: para 7]; Transcript, Phillip Brumley, 29 September 2011, Emerald [p3416: line 21]; Transcript, Michael Birchley, 9 November 2011, Brisbane [p4808: line 50].
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- 314 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain Management in Australia: best practice principles and guidelines, SCARM Report 73, 2000; Exhibit 238, Goondiwindi Regional Council Urban Levee Bank Policy, 23 February 2011 [p1: para 1]; Department of Sustainability and Environment, ‘Victorian floods January 2011: Levees’ (2011), [www.water.vic.gov.au/environment/floodplains/victorian-floods-january-2011/levees](http://www.water.vic.gov.au/environment/floodplains/victorian-floods-january-2011/levees).
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- 315 For example, an informal arrangement surrounded levee development in the Goondiwindi region. Landholders building new levees on one side of the Macintyre River gave notification to owners of properties where the levee was likely to affect the flow of water in the river, see: Exhibit 646, Statement of Graeme Scheu, 12 September 2011 [p1: para 3].
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- 316 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain Management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p8, 23].
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- 317 See, for example, the description of the dangers contained in: New South Wales Government, Floodplain Development Manual: the management of flood liable land, April 2005, Appendix L [para L6.8].
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- 318 Exhibit 537, Statement of Anthony Leighton, 6 September 2011 [p1: para 2]; Transcript, Anthony Leighton, 19 September 2011, Brisbane [p2793: line 56].
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- 319 Transcript, Anthony Leighton, 19 September 2011, Brisbane [p2795: line 30]; Exhibit 537, Statement of Anthony Leighton, 6 September 2011 [p2: para 71].
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- 320 Transcript, Anthony Leighton, 19 September 2011, Brisbane [p2795: line 36].
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- 321 Transcript, Anthony Leighton, 19 September 2011, Brisbane [p2796: line 57].
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- 322 Transcript, Anthony Leighton, 19 September 2011, Brisbane [p2796: line 25]; Exhibit 537, Statement of Anthony Leighton, 6 September 2011 [p2: para 9].
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- 323 Transcript, Anthony Leighton, 19 September 2011, Brisbane [p2801: line 15; p2808: line 12].
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- 324 Transcript, Anthony Leighton, 19 September 2011, Brisbane [p2808: line 27].
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- 325 Transcript, Dr Luis Prado, 21 September 2011, Brisbane [p2946: line 19; p2946: line 39].
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- 326 Exhibit 580, Statement of Dr Luis Prado, 8 September 2011, Annexure 1 [p4]; Transcript, Luis Prado, 21 September 2011, Brisbane [p2945: line 33].
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- 327 Exhibit 580, Statement of Luis Prado, 8 September 2011, Annexure 1 [p3].
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- 328 Exhibit 580, Statement of Dr Luis Prado, 8 September 2011, Annexure 1 [p1, 3-4].
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- 329 Exhibit 580, Statement of Dr Luis Prado, 8 September 2011, Annexure 1 [p2]; Transcript, Dr Luis Prado, 21 September 2011, Brisbane [p2946: line 23].
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- 330 Transcript, Luis Prado, 21 September 2011, Brisbane [p2946: line 47 – p2946: line 1].
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- 331 Transcript, Dr Luis Prado, 21 September 2011, Brisbane [p2946: line 47].
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- 332 Exhibit 580, Statement of Dr Luis Prado, 8 September 2011, Attachment 1 [p2].
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- 333 Transcript, Luis Prado, 21 September 2011, Brisbane [p2947: line 18].
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- 334 Transcript, Rory Kelly, 10 November 2011, Brisbane [p4946: line 24].
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- 335 Exhibit 639, Seventh Statement of Rory Kelly, 21 September 2011 [p3: para 9-10; p4: para 11]; Transcript, Rory Kelly, 3 October 2011, Brisbane [p3495: line 22].
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- 336 Exhibit 639, Seventh Statement of Rory Kelly, 21 September 2011 [p3: para 10(a)].
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- 337 Exhibit 639, Seventh Statement of Rory Kelly, 21 September 2011 [p6: para 17; p8: para 24; p10: para 32]; Annexure RJK-114 [p3]; Annexure RJK-120; Annexure RJK-128 [p5].
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- 338 Exhibit 639, Seventh Statement of Rory Kelly, 21 September 2011 [p5: para 13, 14; p6: para 17, 18; p7: para 22, 23; p10: para 32]; Annexure RJK-112; Annexure RJK-113 [p1]; Annexure RJK-114 [p3]; Annexure RJK-115 [p7]; Annexure RJK-120; Annexure RJK-128 [p5].
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- 339 Exhibit 639, Seventh Statement of Rory Kelly, 21 September 2011 [p11: para 34, 35]; Annexure RJK-131; Annexure RJK-132.
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- 340 Exhibit 639, Seventh Statement of Rory Kelly, 21 September 2011 [p5: para 14; p10: para 32, p11: para 37]; Annexure RJK-113 [p1]; Annexure RJK-128 [p5].
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- 341 Exhibit 639, Seventh Statement of Rory Kelly, 21 September 2011 [p12: para 41]; Transcript, Rory Kelly, 3 October 2011, Brisbane [p3512: line 12].
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- 342 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3512: line 42].
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- 343 Exhibit 639, Seventh Statement of Rory Kelly, 21 September 2011 [p16: para 45].
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- 344 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3508: line 26].
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- 345 Transcript, Ken Smith, 21 September 2011, Brisbane [p2886: line 35].
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- 346 Transcript, Ken Smith, 21 September 2011, Brisbane [p2887: line 17].
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- 347 Exhibit 566, QRA Map of Yeronga, 21 September 2011.
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- 348 Brisbane City Council, Subdivision and Development Guidelines 2008, Part A Hazard Management, Chapter 1 ‘Flood Affected Land’ [p10: Table A1.6].
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- 349 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3508: line 26].
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- 350 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3514: line 4].
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- 351 Exhibit 782, Statement of Graham Wode, 29 September 2011 [p1: para 3]; Transcript, Graham Wode, 12 October 2011, Maryborough [p3952: line 6].
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- 352 Exhibit 782, Statement of Graham Wode, 5 September 2011 [p1: para 3]; Transcript, Graham Wode, 12 October 2011, Maryborough [p3952: line 3].
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- 353 Transcript, Bruce Flegg, 5 May 2011, Brisbane [p1345: line 15].
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- 354 Exhibit 631, Statement of David Dunworth, 27 September 2011 [p3: para 8]; Transcript, David Dunworth, 27 September 2011, Brisbane [p3222: line 1; p3224: line 16].
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- 355 Transcript, David Dunworth, 27 September 2011, Brisbane [p3222: line 50]; Exhibit 572, Statement of Julie Savage, 21 September 2011 [p4: para 15]; Transcript, Julie Savage, 21 September 2011, Brisbane [p2898: line 1].
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- 356 The areas are specified in A1.1 of Annex 1 of State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p13].

- 357 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [para 6.3].
- 358 Outcome 2 of State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p7: para 6.12].
- 359 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p7: para 6.13].
- 360 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p7: para 6.13].
- 361 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p7: para 6.13].
- 362 The State Planning Policy Guidelines recognise the existence of evacuation routes as a consideration relevant to assessing flood hazard. See State Planning Policy Guidelines: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p37: para A2.28].

# 8

## Development assessment in practice

Land use planning has two key stages: the making of land use plans which specify ideal outcomes, and the development approval process, which requires the assessment of development proposals against that plan. Steps which might be factored into the making of land use plans in order to minimise flood impact are discussed in various other chapters in this report; for example, see section 5.1.1 *Model flood planning controls*. This chapter of the report considers some aspects of the development approval process.

The Commission has not conducted an exhaustive review of the operation in practice of the development approval process prescribed by the *Sustainable Planning Act 2009*; such an activity would exceed the scope of the task with which it has been charged. Neither has the Commission conducted a review of the merits of development decisions which have already been made; it has not focussed on whether particular development approvals should or should not have been granted. Instead, the Commission has examined a number of council assessment files from across Queensland, to develop an understanding of how flood issues are, in practice, considered in the assessment process. That examination did not reveal evidence of systemic failure, but it did enable the Commission to identify some aspects of the process which could be changed to better achieve the objective of minimising flood impact to property. In this chapter, some council processes are discussed in a general way. On occasion, it is useful to make specific reference to files examined by the Commission.

Whereas councils are generally responsible for approving a use in the first instance through land use planning systems, building certifiers check that building work complies with conditions of a development approval for a material change of use that relate to the built form of the use and other standards specified in legislation and building codes.<sup>1</sup> The Commission has not conducted its own investigation of the scope for improvement, if any, to be made to Queensland's building certification system, as the task is not raised by the Commission's terms of reference. The Commission does note however that the Queensland Government, through Growth Management Queensland, is reviewing Queensland's building certification system in response to calls to improve building certifiers' professional development, work practices and available resources.<sup>2</sup>

Not all development applications are assessed against flood-related development controls. This may occur for a number of reasons. For example, the application of the flood controls may be dependent on the existence of a flood map.<sup>3</sup> Another reason may be that the proposed development is exempt from assessment against a planning scheme's provisions.<sup>4</sup>

For the most part, the Commission's examination of development assessment files has been conducted for the purpose of identifying issues of process which arise at the local government level with the assessment of development applications. However, the circumstances that led to the construction of one development, which located two residential towers very close to the Brisbane River (the buildings are set back a distance of

six metres and ten metres respectively)<sup>5</sup> at Tennyson Reach, prompted the Commission to consider the role played by the Queensland Government.

In May 1996, the Department of Natural Resources commissioned a study into the use that could be made of the land on which the Tennyson power station was situated.<sup>6</sup> The report noted that the land was low-lying and susceptible to flooding; it had been flooded many times in its history.<sup>7</sup> The study concluded that the site's future use would be limited by:

- poor road access
- contamination from previous activities
- poor drainage
- the need for significant fill to raise the site level to the required 'flood immunity level' for development.<sup>8</sup>

Despite these limitations, in September 2002, Tennis Queensland made an unsolicited proposal to the Queensland Government to build a State Tennis Centre on the site.<sup>9</sup> Tennis Queensland's proposal listed six possible sites for the tennis centre, but ultimately concluded that the Tennyson power station site was the most attractive option.<sup>10</sup> Of the six sites, the proposal identified only the Tennyson site as deliverable at no cost to government.<sup>11</sup> Before presenting the proposal to the Queensland Government, Tennis Queensland granted Mirvac, a property development company, what it described as a 'mandate' to work exclusively with it to acquire and develop the Tennyson power station site.<sup>12</sup>

The Queensland Government rejected Tennis Queensland's proposal and opened the land to the market for tender. The winning developer would be required to deliver a state of the art tennis facility on the Tennyson site at no cost to the government.<sup>13</sup> The section of land not used for the State Tennis Centre would be made available to the developer for an associated development project compatible with the tennis centre and surrounding areas. It was envisaged that the developer would use the associated development to fund construction of the tennis centre.<sup>14</sup> Before the tender process began, the Queensland Government conducted due diligence investigations on the site. These investigations found that the land had a number of constraints, including problems with electricity easements, transport access and susceptibility to flooding.<sup>15</sup> The executive director of the Infrastructure Planning and Development Branch, Sport and Recreation Services of the Department of Communities gave evidence that the Queensland Government was aware when it opened the development of the land to tender that the site presented those problems.<sup>16</sup>

After expressions of interest were received, three parties were shortlisted to submit detailed development proposals. Two of the three proposals were regarded as non-conforming with the project brief and draft development agreement as they did not locate both the tennis centre and the associated residential development on the one site.<sup>17</sup> The conforming – and ultimately successful – proposal was submitted by Mirvac.<sup>18</sup> The Department of Communities witness accepted that it was plain from the concerns expressed by the other bidders about locating the tennis centre and the associated development on the available land that the site would be a tight fit.<sup>19</sup>

The Queensland Government was not prepared to locate any part of the project at another location,<sup>20</sup> and Mirvac did not consider asking the Queensland Government if the development could be built on a different site.<sup>21</sup> Its chief executive officer of development gave evidence that, provided the proposal was able to meet the council's minimum requirements on flood, Mirvac regarded the concept as 'perfectly viable'.<sup>22</sup>

Mirvac's bid was not without problems, however; it sought a number of departures from the draft development agreement, including:

- locating some of the project infrastructure over easements, due to the tight fit of the site<sup>23</sup>
- locating some of the tennis courts below the 1 in 100 flood level.<sup>24</sup>

The Queensland Government entered negotiations with Mirvac to determine whether its proposal could be altered sufficiently to meet the minimum requirements for the project as contained in the Queensland Government's project brief and draft development agreement.<sup>25</sup>

During these negotiations, Mirvac advised that it required a financial contribution of \$10 million from the Queensland Government to increase the commercial viability of the project.<sup>26</sup> This represented a significant departure from the original project requirement of no cost delivery to government; however, the state agreed to the request.<sup>27</sup> At no stage was serious consideration given to locating the project elsewhere.<sup>28</sup> On 16 June 2005, Mirvac

was appointed as the preferred developer for the Tennyson Reach development.<sup>29</sup> Subsequently, the Brisbane City Council concurrently assessed and approved preliminary approval and development permit applications for the development.<sup>30</sup> Aspects of that assessment process are discussed later in this chapter.

During the January 2011 floods, the Tennyson Reach development was inundated. The basement and ground floor levels of two of the three residential buildings suffered the most severe effects, with water filling both basement levels (nine ground floor apartments were inundated to a depth of approximately 65 centimetres).<sup>31</sup> Residents of all apartments were unable to obtain access to their properties for several weeks, due to the extensive damage caused to essential services in the building.<sup>32</sup> Ground floor residents were not able to return to their apartments until June 2011.<sup>33</sup>

The State Tennis Centre also sustained significant damage. Floodwaters inundated two grass courts, four clay courts, nine hard courts, the car park, the maintenance shed and the pump sheds. Additionally, the entire first level of the Pat Rafter Arena building was flooded to a depth of three to four metres.<sup>34</sup> Property damage totalled approximately \$6 million.<sup>35</sup>

What emerges from the circumstances described is that although the Brisbane City Council was responsible for assessing Mirvac's development application, the location for the project was essentially the choice of the Queensland Government. If the Queensland Government becomes involved in selecting land for a development, it should exercise caution when choosing a site; if it becomes apparent that the selected site presents significant flooding risks, it ought to be prepared to consider abandoning the development on that site.

This is particularly so when a residential development is proposed. Two residents of Tennyson Reach whose properties were flooded said that the involvement of the Queensland Government in the development led them to believe that the site would be a safe investment.<sup>36</sup> One of them gave evidence that he did not conduct any flood searches before purchasing the property. He believed that the combination of Queensland Government involvement, Brisbane City Council approval and a reputable developer meant that the development would have been held to stringent standards.<sup>37</sup> Members of the public are likely to regard projects like the Tennyson Reach development as being, at least in part, a Queensland Government initiative and thus having been given the imprimatur of the Queensland Government.

## 8.1 Sources of flood information for use in development assessment

Good decision-making in development assessment for land susceptible to flooding relies on decision-makers' having access to accurate data.<sup>38</sup> Councils need sufficient data to allow them to assess the effect of the development on the development site itself and on other properties. Inevitably a balance must be found between ensuring that there is sufficient information on which to make decisions and the time and cost involved in acquiring information.

There are two sources of flood information for development assessment: flood information maintained by the council itself and site-specific flood information provided to the council by the applicant. Each of these is considered below.

### 8.1.1 Flood information maintained by councils for use in development assessment

Many councils maintain information on flood and overland flow. These provide the councils with their own source of information for use in development assessments. (The importance of councils' developing these maps and models is discussed in chapter 2 *Floodplain management* and section 10.2 *Stormwater*.) By way of example, the practices of three councils are discussed below.

Brisbane City Council has prepared detailed maps of flooding and overland flow paths. These 'flood flag maps' are made publicly available and are used in the assessment of development applications, although the mapping of overland flow paths is not yet complete.<sup>39</sup> The council's development assessment team also makes use of FloodWise Property Reports for Brisbane River flooding, major creek flooding and storm surge, and a geographic information system, known as 'iBIMAP', which has layers showing flood flags, contours and stormwater drainage to identify land which may be subject to flooding.<sup>40</sup>



*Mirvac development, Tennyson, January 2011 (photo courtesy The Courier-Mail)*

Bundaberg Regional Council maintains local flooding models to help it manage stormwater flows in Bundaberg<sup>41</sup> and the surrounding areas.<sup>42</sup> It regularly uses these flood models to determine development assessment conditions.<sup>43</sup> Bundaberg Regional Council's director of infrastructure and planning commented that the use of models is vital in areas which are rapidly developing; the models must be updated regularly to reflect changed conditions caused by new development.<sup>44</sup> The council has a local flooding model for Bundaberg that is progressively updated to include data for works undertaken, so that at any particular time the model reflects the position on the ground.<sup>45</sup> The model is provided to development applicants preparing their development proposals, who adjust the model to reflect the proposal and then return the adjusted model to the council to be checked.<sup>46</sup>

The task of keeping models up to date is difficult in catchments where a significant amount of development occurs.<sup>47</sup> The process of updating the model must take account of matters such as the placement of fill, the construction of flood mitigation devices such as dams or levees, and the effect of development in the upper part of the catchment on downstream flood levels. This process is made more difficult for a council by uncertainty as to when works approved will in fact be constructed.<sup>48</sup>

Fraser Coast Regional Council, at least until recently, used maps of historical flooding in its planning scheme and in providing information in response to flood searches.<sup>49</sup> Its assessment of development applications is based in part on the assessment team members' personal knowledge of the flood and drainage history of the area in question.<sup>50</sup> A council officer explained that the council is developing models of various levels of sophistication in different areas, with hydraulic models used most in areas of high growth, such as Hervey Bay.<sup>51</sup> Where a hydraulic model is available, the potential impact of each new development is assessed in accordance with the model.<sup>52</sup>

There is an obvious advantage in councils' maintaining their own flood models. It ensures that there is uniform approach to assessing flooding and overland flow; this allows a consistent approach within a council's area. Updating the model or map regularly to reflect new developments as they occur allows the council to analyse the cumulative effects of development in its area.

## Recommendation

- 8.1 Councils should, resources allowing, maintain flood maps and overland flow path maps for use in development assessment. For urban areas these maps should be based on hydraulic modelling; the model should be designed to allow it to be easily updated as new information (such as information about further development) becomes available.

### 8.1.2 Site-specific flood information provided by an applicant

If a development application is made for an area where the council does not have a flood map or model, the council will not be able to consider the potential impacts of flood and stormwater on, or resulting from, the development unless the applicant provides information as part of the application.<sup>53</sup> A council may ask an applicant to provide a flood map<sup>54</sup> or flood study. Practically, this may pose a challenge to somebody who has no knowledge of the flood characteristics of a particular area.<sup>55</sup> The assessment of development applications where there is no flood map or model is considered in section 2.7 *Flood mapping for land planning controls*.

Even where a council has a flood map or model for an area where a development application is made, it may request the applicant to provide detailed site-specific flood information as part of the application.

The Commission considered two aspects of applicants' provision of site-specific flood information:

- applicants' use of models to generate and provide site-specific flood information to councils
- councils' guidance of applicants about what flood information in support of a development application should be provided and how it should be provided.



Tennyson in 1974 flood (Newspix)

## Flood maps and models used by the applicant

Councils need to be able to assess whether a map or model provided by an applicant is accurate.

Bundaberg Regional Council's director of infrastructure and planning services gave evidence that applicants sometimes submitted inaccurate flood reports.<sup>56</sup> When this occurred, it was the role of the council engineers to go back to the consultants, reject the report and identify the shortcomings,<sup>57</sup> if the issue was not resolved, the development was not approved.<sup>58</sup> The practice of Bundaberg Council is to provide any council developed flood map or model to the applicant for use by the applicant's consultant. The consultant adjusts the model to reflect the proposed development and returns it to the council for checking.<sup>59</sup> This is a sensible practice; it would be beneficial if it were adopted more widely.

Fraser Coast Regional Council's approach to applicant-prepared flood studies is to refer them to the council's infrastructure and environment directorate for engineering officers to conduct a first review. If that review indicates possible major problems with the data provided, the council will consider referring the review of the problems to appropriately qualified consultants for further consideration.<sup>60</sup>

There are clear advantages to councils' maintaining their own flood maps and models for use in the development assessment process. However, there may be instances where the applicant is able to provide more accurate information. Where this occurs, it is sensible for the council to use that information. For example, while Ipswich City Council generally encourages developers to use the same flood model as the council,<sup>61</sup> the council's development planning manager gave evidence of an instance where the 1% AEP flood level of a particular property derived from a flood study prepared by a developer for a development application was used even though it differed from the council identified 1% AEP flood level. The council accepted that the developer's 1% AEP flood modelling was more accurate for the specific site and used it in preference to the council's own information.<sup>62</sup>

### *Recommendation*

- 8.2 Councils should make their flood and overland flow maps and models available to applicants for development approvals, and to consultants engaged by applicants.

## Guidance from councils to applicants about the provision of flood information

If a council requires flood information from an applicant in support of a development application, the council should provide the applicant with clear guidance on what information is required and how it should be presented. This will ensure that it is apparent to the applicant what it does, and does not, need to provide and that the council receives all the information that it requires for the assessment process.

As previously mentioned, the council needs to be in a position to assess whether the map or model provided by the applicant is reliable. For this reason it is vital that any model or map, or information generated from such a model or map, is accompanied by a clear statement of the methodology used in its preparation and the assumptions upon which it is based.

Ipswich City Council, since September 2011, has had a stormwater management guideline that sets out a reporting template showing the type of information typically required in stormwater management plans submitted to the council. (For example, the plan must include a flood impact assessment.) The guideline also sets out factors to be considered in deciding which flood modelling methodology should be used, the data that should be used and how the data should be presented.<sup>63</sup> The guideline was prepared with assistance from consultants with expertise in hydrology and hydraulic modelling.<sup>64</sup> It includes a requirement for a joint probability analysis to be prepared where the flow within the local watercourse is influenced by regional flooding.<sup>65</sup> It also includes a requirement for applicants to identify the assumptions upon which any model or map submitted is based.<sup>66</sup>

An independent consultant engineer appointed by the Commission reviewed the guideline and commented that it represented current best practice among Queensland councils.<sup>67</sup>

It would be desirable for every council to provide applicants with specific guidance setting out information of this type, although, for reasons explained elsewhere in this report, it should be included in a planning scheme policy

rather than a guideline that has no legislative effect. (See section 5.3 *Planning scheme policies*.) A planning scheme policy could also indicate the type of situation where no information is required. It may be that councils with well developed overland flow information and flood models do not require much (or perhaps any) information about overland flow or flood to be provided in a development application; this too should be indicated in the policy.

The Commission recognises that some councils may have limited technical and financial resources available to prepare such guidance; the Queensland Government could support councils by preparing a template planning scheme policy to be included in the model flood planning controls.

## Recommendations

- 8.3 The Queensland Government should draft a model planning scheme policy to be included in the model flood planning controls that sets out the information to be provided in development applications in relation to stormwater and flooding. The policy should specify:
  - the type of models and maps to be provided
  - the substantive information required to be shown in the development application
  - how the assumptions and methodologies used in preparing the models and maps should be presented
  - the form in which the information on stormwater and flooding is to be presented in the application.
- 8.4 If the Queensland Government does not include such a policy in the model flood planning controls, councils should include a planning scheme policy in their planning schemes that sets out the information to be provided in development applications in relation to stormwater and flooding. The policy should specify:
  - the type of models and maps to be provided
  - the substantive information required to be shown in the development application
  - how the assumptions and methodologies used in preparing the models and maps should be presented
  - the form in which the information on stormwater and flooding is to be presented in the application.

## 8.2 Assessing flood information in development applications

A development application typically includes (in addition to mandatory forms) technical reports that are intended to advance a development applicant's case as to how the proposal will meet the requirements of the relevant planning scheme. Depending on the type of application and the constraints of the land, supporting reports may address matters such as hydrology, stormwater and engineering design. Councils must be able to interpret and evaluate the technical information provided to them about the flood risk associated with a particular site, and the flood impacts associated with a particular development proposal, in order to assess the development against the requirements of the planning scheme.

A brief description of the way Ipswich City Council and Brisbane City Council assess technical information about flood provided to them in support of a development application follows. The description of Brisbane City Council's processes is supplemented by a description of the process it undertook when assessing these aspects of Mirvac's application for the Tennyson Reach development. Other councils may follow similar or other processes. The Commission acknowledges that the process adopted by any particular council in any particular case will be determined by the scope and nature of the development application and the associated flood impacts, as well as a council's resources. The section concludes with some more general observations about matters which may limit councils' ability to adequately assess applications against the flood controls in planning schemes and is drawn from evidence given by Bundaberg Regional Council.

## 8.2.1 Ipswich City Council's assessment process

When a development application is lodged with Ipswich City Council, it is assigned to an assessment officer. That officer presents the application to an internal panel called an 'Integrated Development Assessment Panel'.<sup>68</sup>

The purpose of the panel, which meets twice a week, is to discuss the strategic principles for the assessment, to identify any obvious issues or deficiencies with the application and to decide whether the application should be referred internally to other council teams for advice.<sup>69</sup> Council engineers that assess the flood aspects of operational works development applications participate in the panel.<sup>70</sup> If the subject land is within an overland flow path or below the council's '1 in 100 flood line', the application will be referred to a hydraulic engineer within council to assess the proposal against the planning scheme provisions about flood.<sup>71</sup>

To prepare a flood study in support of an application, an applicant may make use of studies undertaken by the council, but if none are available, the applicant will need to embark on its own hydrological and hydraulic studies.<sup>72</sup> As discussed in section 8.1.2 *Site-specific flood information provided by an applicant*, since September 2011 the Ipswich City Council has had a stormwater management guideline that indicates the flood information that should be provided to the council with development applications.<sup>73</sup>

The council reviews flood studies it receives. Its normal practice for studies of a particularly complex nature is to refer them internally to the council's Works, Parks and Recreation section for further comment.<sup>74</sup> If it is considered necessary, the council may refer the flood study to a third party consultant for independent review.<sup>75</sup>

## 8.2.2 Brisbane City Council's assessment practices

A development application lodged with Brisbane City Council is considered by a team of senior town planners, who identify key issues arising from the application, determine what specialists within council are required to contribute to the development assessment process and allocate the application to an assessment manager. The need for further internal referral of the application may be identified as the assessment progresses.<sup>76</sup>

Where necessary, assessment managers at Brisbane City Council are able to refer applications to other sections of the council for advice.<sup>77</sup> Straightforward hydraulic issues are ordinarily assessed by an engineering officer within the assessment team to which an application is allocated.<sup>78</sup> More complex hydraulic issues are referred to the technical specialist team, which contains specialist engineers. When a flood report accompanying a development application is referred to the technical specialist team, a hydraulic engineer conducts an assessment against the provisions of the Brisbane city planning scheme, with reference to the Australian Rainfall and Runoff Guideline and the Queensland Urban Drainage Manual, to identify possible issues, provide advice and make recommendations to the assessment manager to approve, approve with conditions or refuse a development application.<sup>79</sup> The specialist engineer may also request that further information be provided by the applicant.<sup>80</sup>

Some development applications lodged with the Brisbane City Council are assessed pursuant to the council's RiskSmart program. The RiskSmart process is available for development applications which are regarded as having a low risk of adverse impact. For RiskSmart applications, the assessment is undertaken by a council-accredited consultant; if flood needs to be considered, a registered professional engineer assesses compliance with the relevant planning scheme provisions and planning scheme policies.<sup>81</sup>

For all applications, the person undertaking the assessment prepares a report to the council commenting on key issues, which may include flood, and recommending that the application be approved (in whole or part), approved with conditions, refused or given preliminary approval.<sup>82</sup>

The Tennyson Reach development illustrates this process in practice.

On 16 November 2005,<sup>83</sup> Mirvac lodged a development application with the Brisbane City Council for:

- a preliminary approval for a material change of use overriding the planning scheme under section 3.1.6 of the *Integrated Planning Act 1997*<sup>84</sup> for multi-unit dwellings (191 units in three buildings), and park
- a development permit for a material change of use for indoor sport and recreation (tennis centre stadium) and outdoor sport and recreation (outdoor courts) and associated uses including office, restaurant, shop and convention centre (function room)
- a development permit for a material change of use for multi-unit dwellings (114 units in buildings E & F) and park

- a development permit for material change of use for multi-unit dwellings (88 units in building D), shop, restaurant and park
- a development permit for operational works for disturbance to marine plants.<sup>85</sup>

The preliminary approval for a material change of use overriding the planning scheme was sought for a number of reasons, including the complexity of the development and the fact that the site was zoned ‘Community Use Area CU8 (Utility Installation and Road Area)’. The application for preliminary approval overriding the planning scheme under the *Integrated Planning Act* was assessed by the council having regard to the whole of the planning scheme.<sup>86</sup> Once granted, the approval prevailed over the planning scheme to the extent of any inconsistency.<sup>87</sup> A preliminary approval of this nature sets the framework for the assessment of a proposed development by specifying codes, criteria and levels of assessment against which the development is assessed.<sup>88</sup>

The development application submitted by Mirvac was accompanied by a number of site specific reports, addressing matters such as flooding and stormwater.<sup>89</sup>

To ensure that the Tennyson Reach proposal met the flooding and drainage requirements of the Brisbane planning scheme, the flooding and stormwater reports were reviewed by a hydraulic engineer from the technical specialist team.<sup>90</sup> The engineer’s review identified three issues requiring the provision of further information from the developer: the ‘flood immunity’ of access roads, overland flow easements and underground drainage requirements.<sup>91</sup>

A senior town planner of the Brisbane City Council<sup>92</sup> gave evidence that, in his experience, the engineer’s advice was, in effect, an implied statement that all flooding issues, other than the three referred to, had been adequately addressed.<sup>93</sup> He confirmed that he proceeded on that assumption.<sup>94</sup> Assessment managers would not, he said, usually deviate from an engineer’s advice; any matters about which the engineers remained silent would not be further considered in the assessment process.<sup>95</sup>

The Commission does not find that the engineer failed to consider any relevant issue. The point to be made is that proceeding on assumption is problematic. An assessment manager might assume that all hydraulic matters have been considered and dismissed in the absence of advice to the contrary, whereas there may in fact have been a failure to consider them at all.

Communication between individuals of different professional disciplines was also a feature of Mirvac’s subsequent request to change the development permit for a material change of use that was granted on 9 October 2006 for the State Tennis Centre.<sup>96</sup> The request sought approval for the construction of additional storage rooms and a new multi-purpose room at the tennis centre.<sup>97</sup> Plans submitted in support of the application indicated that flood barriers would be incorporated along the door openings of the rooms.<sup>98</sup>

The proposed change was referred to the principal engineering officer in the development assessment team (not the technical specialist team), who advised that the proposed change to the existing development approval would not affect the previously set engineering conditions.<sup>99</sup>

A week later, the council architect responsible for reviewing the proposal gave his advice, expressing concerns as to how the barriers would operate in terms of flooding, and requesting that the issue be referred to hydraulic engineers for comment.<sup>100</sup> The architect’s concerns were referred to the developer, which provided further information about the flood barriers.<sup>101</sup> However, the senior town planner indicated that he did not know whether the architect’s concerns had been forwarded to the council’s hydraulic engineers for comment; he could not find any document on the file which suggested that this had occurred.<sup>102</sup>

### 8.2.3 Improving council assessment processes

A range of professional disciplines can helpfully contribute to the assessment of a development application against flood controls in planning instruments. In particular, given the complexity of the type of information supplied with respect to flooding issues, expert engineering assistance is often required.

When a flood study is provided in support of a development application it should ideally be referred to an appropriately qualified engineer, as a matter of course, for advice as to whether the proposed development meets the applicable flood-related assessment criteria. The Commission acknowledges that this may not be possible for some councils, due to resource constraints.

As one development application may be subject to comment by a number of professionals, it is important that the responsibilities and accountability of each contributor are clear from the outset.

There must also be sufficient communication between each contributor and the town planner in charge of the file generally for the town planner to be able to make a complete evaluation. For example, where an engineer provides advice with respect to a flood study report submitted as part of the application, an indication as to matters of concern with the hydrology of the proposed development alone is insufficient. The engineer's advice to the town planning officer should specifically comment on the adequacy of the development by reference to each of the scheme criteria to the extent they are able; and otherwise identify and explain any inability to comment. Councils should implement a process to ensure communication of this kind occurs.

## *Recommendation*

8.5 Councils should review their assessment processes to ensure that:

- the person with primary responsibility for the assessment of the development application considers what expert input is required
- where a development application is subject to comment by a number of professionals, the responsibilities and accountability of each contributor are clear
- where flood-related information is referred to an expert for advice, the expert is required to comment on the extent of compliance by reference to each relevant assessment criteria and identify and explain any inability to comment.

### 8.2.4 Information requests

Earlier in this report, the Commission has made recommendations which are designed to ensure that councils receive appropriate flood information from an applicant at the time a development application is made; see section 5.1.2 *Features of the model flood planning controls* and section 8.1.2 *Site-specific flood information provided by an applicant*.

When flood information provided in support of a development application is insufficient for the flood risk associated with the development to be assessed, a council acting prudently will request the applicant to provide further information. The value of making that request will depend on the precision with which the council identifies the information which it requires.

For example, Ipswich City Council, when assessing a development for a child care centre in Goodna, on land susceptible to flood, requested the applicant to submit a site-specific flood study for the proposal which would address the potential effect of the development on flood levels at surrounding properties.<sup>103</sup> A council officer gave evidence that the request was made because the child care centre was surrounded by residential uses.<sup>104</sup> In the Commission's view, while the effect of the development on surrounding areas was a relevant consideration, the council's request was incomplete because the development applicant was not asked to provide information about the way in which stormwater and flood would affect the proposed development itself. This was a relevant line of inquiry given the site's susceptibility to flood. As it happened, and despite the limited scope of the information request, the flood study provided by the development applicant included information about the effect of flood on the proposed development.<sup>105</sup> This outcome was not, however, guaranteed by the terms of the request.

### 8.2.5 Problems in development assessment

The Commission has not undertaken a comprehensive investigation of the difficulties which may arise in practice when assessing development applications against flood-related assessment criteria. However, Bundaberg Regional Council has drawn to the Commission's attention a specific difficulty it has had to deal with, as well as the more general problem of lack of available expertise.

## Difficulties in establishing compliance with a planning scheme

Planning schemes generally contain criteria against which development proposals are to be assessed in relation to flood risk. Sometimes, because of the way criteria are drafted, it is difficult for applicants to demonstrate compliance.

By way of example, the Kolan Shire Planning Scheme, through the use of an infrastructure overlay map, identifies 12 properties in the town of Gin Gin as being located within a flood and drainage liability area.<sup>106</sup> The scheme requires that development proposed on land identified in the overlay map provide ‘an acceptable level of flood immunity’.<sup>107</sup> One way in which an applicant can demonstrate compliance with this standard is by constructing the floor level of habitable rooms at not less than 300 millimetres above the level of a 1% AEP flood.<sup>108</sup> Other provisions in the planning scheme also require floor levels for particular uses to be at a height above the 1% AEP flood level.<sup>109</sup>

Demonstrating compliance with the habitable floor level standard is prohibitively onerous,<sup>110</sup> because Bundaberg Regional Council (the council responsible for administering the scheme) does not have information about the 1% AEP flood level for the Kolan Shire.<sup>111</sup> Thus, short of engaging a specialist engineer to determine a 1% AEP flood level, an applicant cannot demonstrate compliance with this provision of the planning scheme.

The council has decided that, in practice, if an applicant demonstrates that the proposed development was designed with floor levels similar to the levels of the adjacent homes, that will satisfy the council that there is an acceptable level of flood immunity.<sup>112</sup> The council intends to address this difficulty in its new planning scheme by undertaking hydraulic modelling of the creeks in the area.<sup>113</sup>

Avoiding the circumstances described above is, it seems to the Commission, a matter of councils and the Queensland Government taking appropriate care when making planning schemes.

## Expertise of staff

It is essential that assessment is undertaken by appropriately qualified staff to ensure any approved development adequately addresses flood risk. Some councils, though, are hampered by a lack of resources and ability to attract and retain suitability qualified staff.

The director of infrastructure and planning of the Bundaberg Regional Council expressed concern about the dearth of suitably trained staff to assess hydrologic and hydraulic reports. The council has difficulty attracting and retaining engineers with experience and skills in stormwater modelling; this affects its ability to properly assess development applications for which stormwater design is a relevant consideration.<sup>114</sup> The council deals with this in practice by paying for its staff to be trained in the use of the relevant models.<sup>115</sup> This is a pragmatic, if not ideal, solution to the problem.

## 8.3 Development conditions

Councils,<sup>116</sup> and in some cases, government agencies,<sup>117</sup> can attach conditions to a development approval. Conditions are a valuable part of the development assessment process. They regulate how a development is to be established and will proceed. Just as development applications can be refused where they are subject to an unacceptable risk of flood, so too can they be approved, where the risks associated with flood can be managed by attaching conditions to the approval. For example, a development may be made subject to a condition that minimum floor levels are adopted.

Once a development approval has been granted by a council, it attaches to the land and binds any subsequent owner or occupier of the land who chooses to exercise the rights conferred by the approval.<sup>118</sup> The ways in which subsequent owners and occupiers of land may be made aware of the conditions attaching to the land is discussed in section 2.9.2 *Flood information for dealing with property*.

Conditions can only be lawfully imposed if they are relevant and reasonably required in relation to the development or use of premises; a condition must not be an unreasonable imposition on the development or use of premises.<sup>119</sup> The scope of matters that may be controlled through conditions is broad,<sup>120</sup> although is subject to some specific limitations.<sup>121</sup> Conditions must be certain and final.<sup>122</sup>

### 8.3.1 Conditions going to acceptability of use

In some cases, conditions are of such fundamental importance that without their inclusion, a development application would be refused.

The Commission has, for example, heard evidence about Ipswich City Council's assessment process for a child care centre in Goodna, which it approved in August 2006.<sup>123</sup> The site is located on land which is at risk of flooding from two sources: the Bremer River and an adjacent overland flow path (described by an employee of the centre as a creek)<sup>124</sup>. It is within Ipswich City Council's '1 in 100 flood line' and is above the council's '1 in 20 development line' by about a metre.<sup>125</sup> The entire site was affected by the 1974 flood and during the January 2011 flood was inundated to a depth of at least 1.8 metres.<sup>126</sup>

The development application was submitted with a town planning report, which set out how (in the town planner's view) the proposal complied with the relevant planning scheme codes.<sup>127</sup> As the application was for the construction of a child care facility, the Ipswich Planning Scheme 2004's community use code required the use be located so as to 'avoid areas prone to flooding', and be able to function effectively during and immediately after natural hazard events, such as flood.<sup>128</sup>

The town planner's report acknowledged the site's proximity to the '1 in 20 development line' and that it would be completely covered by a '1 in 100 flood'. It went on to note that the site was within the area of 'the backup flood water' from the Brisbane River but was not likely to be subject to flash flooding. In the event of a potential 'backwater flood' it was expected that approximately 12 to 24 hours notice would be available to evacuate the facility.<sup>129</sup>

After receiving the development application and the town planning report, the council requested the applicant to submit a site-specific flood investigation for the proposal.<sup>130</sup> The engineer's report provided in response examined local flooding from the adjoining waterway only; it stated that mitigation of Brisbane River 'backup flooding' could not be achieved at the local level.<sup>131</sup> The report suggested that the proposed development could achieve immunity from a 1% AEP flood by setting appropriate minimum building levels and constructing walls along two boundaries to divert flows from the roadway into the waterway and to prevent the entry of flows into the site from the waterway.<sup>132</sup> Despite the fact that the site-specific flood report did not address how riverine flooding could be mitigated, a council witness gave evidence that the council saw no reason for a further report to be obtained from the applicant or for commissioning its own flood report.<sup>133</sup>

In response to questioning about the reasons which informed the council's decision that the development proposal complied with the requirements of the community use code in respect of flood, the council officer acknowledged the following:

- the application's compliance with the requirement to avoid areas susceptible to overland flooding was assessed with a clear understanding that the site had been inundated in the past from riverine flooding, but the assessment had regard primarily to flooding by stormwater<sup>134</sup>
- the proposed facility would not be able to function effectively during and immediately after a major flood, such as at that which took place on 11 January 2011, but it was considered that the site could function during, and immediately after, a less severe flood.<sup>135</sup>

The council witness's evidence was that ultimately the development was considered to comply with the community use code requirements in respect of flood by reason of the conditions imposed on the development approval.<sup>136</sup> Relevant conditions required that:

- the design and construction of the development be in accordance with the site-specific flood report submitted to the council (this included the construction of the solid wall along part of the boundary of the site)<sup>137</sup>
- all buildings and structures have a base floor level of 300 millimetres above the level associated with a 1% AEP flood<sup>138</sup>
- a sealed surface be constructed to convey stormwater flows into the existing drainage channel<sup>139</sup>
- signs be erected in the car park to advise that the car park is subject to local creek flooding and to backwater flooding from the Brisbane River in some circumstances<sup>140</sup>

- a flood escape plan and procedure be developed and periodically rehearsed; the plan is to include permanently displayed signs and directions for staff, visitors and parents to follow.<sup>141</sup>

The council witness said that he could, in hindsight, see that there would have been benefit in imposing conditions requiring construction of the building with flood-resistant materials, and that the car parks signs should have described the whole development, and not just the car park, as being subject to flooding in some circumstances.<sup>142</sup> But in the Commission's view, even if these measures had been made conditions on the approval, the development would have remained incapable of complying with the community use code requirement that child care facilities should be located away from 'areas prone to flooding'.

### 8.3.2 Standard conditions

Typically, the conditions which attach to a development approval are written by the assessment manager. To alleviate the drafting burden, many councils maintain a pool of standard conditions which they draw from when conditioning a development. In doing so, councils need to ensure that only conditions which are required and relevant to the development are included. The approval of the Goodna child care centre provides an example of the use of standard conditions.

Ipswich City Council attached a standard condition related to flood to its approval of the Goodna child care centre in August 2006. This development application is discussed above, see section 8.3.1 *Conditions going to acceptability of use*.

Condition 24(g) to the approval required the applicant to provide a stormwater detention basin or system on the land, designed and constructed in accordance with the Queensland Urban Drainage Manual, with some further requirements for its construction.<sup>143</sup> Condition 24(h) required the proposed development to be designed and constructed in accordance with the flood report provided in support of the application.<sup>144</sup>

The report referred to in condition 24(h) expressly stated that the site area, topography and development layout was 'not really suited to a stormwater detention arrangement' and instead proposed the construction of a water tank on site to reduce stormwater discharges.<sup>145</sup>

The council officer who gave evidence said that condition 24(g) was a standard engineering condition, qualified by condition 24(h).<sup>146</sup> He acknowledged, in hindsight, some difficulty in seeing the point of the condition.<sup>147</sup> Certainly, any member of the public examining the conditions could have been forgiven for believing that infrastructure for stormwater detention would be part of the development; there was no clue to the contrary.

As stated at the beginning of section 8.3, conditions attaching to a development approval must be relevant and reasonably required. Councils should take care when imposing conditions on a development approval to ensure that each condition has purpose.

### Recommendation

- 8.6 Councils should take care when imposing conditions to ensure that each condition has purpose; standardised conditions should not be included where they have no application to the development in question.

### 8.3.3 Conditions which require flood evacuation plans

Ipswich City Council also attached to its approval of the Goodna child care centre in August 2006, discussed above in section 8.3.1 *Conditions going to acceptability of use* and section 8.3.2 *Standard conditions*, a condition that required a 'flood escape plan and procedure' be developed and periodically practised. The plan was to include permanently displayed signs and directions for staff, visitors and parents to follow.<sup>148</sup> The council officer explained that this condition was imposed to ensure the safe evacuation of the centre given the site's potential for flooding.<sup>149</sup>

Evacuation plans are an appropriate topic to be addressed in a condition to a planning approval and, in the case of the Goodna child care centre, this condition was one of several related to the site's susceptibility to flooding. It would be, however, inadvisable to rely on a condition requiring a flood evacuation plan as the sole basis for

approving a development susceptible to flooding. The success of such a measure depends on human intervention, which of itself assumes the occupiers of the site are aware of the condition, are present at the time of flooding and able to comply with the plan.

### **Recommendation**

- 8.7 Councils should not rely on a condition requiring an evacuation plan as the sole basis for approving a development susceptible to flooding.

## **8.4 Communicating information about flood risk**

In instances where a council has information about flood risk, it should be communicated to a development applicant early in the assessment process. A planning scheme is one means of communicating this information in the first instance, for example, by depicting an area at risk of flood on a map.

There may be other circumstances in which a council conducts an assessment of a site on the basis of less than the full extent of flood information that is available. For example, a council must comply with the rules of the *Sustainable Planning Act 2009* in assessing a development application. For code assessment, councils must only consider the codes and standards contained in planning instruments,<sup>150</sup> not extraneous materials. This means if a council has a new flood map not yet reflected in a planning scheme, it generally cannot use the map in the assessment process for code assessable development. In such circumstances, it would be prudent for the council to alert the applicant to the fact that the development application has not been assessed by reference to all available flood data. This would allow such an applicant to consider obtaining the additional data. Similarly, if the council does not have any flood information at all, it should notify the applicant accordingly, to ensure that the applicant does not infer from the fact of a development approval's being granted that there is no flood risk.

Ipswich City Council has used decision notices that include advice notes about flood information for sites which were inundated during the 1974 floods. These decision notices contain the following advice:

The subject site was fully inundated in the 1974 flood. Council, and its servants and agents, accept no liability or responsibility for any loss or damage to person or property of whatever nature or however caused as the direct or indirect consequence of the granting of the approval herein contained. Such approval has been granted at the request of the Developer and in reliance of [sic] information submitted by the Developer in support thereof.<sup>151</sup>

The Commission observes that there is some inconsistency in advising an applicant, on the one hand, of a site's susceptibility to flood, and on the other, stating that the approval has been granted as appropriate solely on the basis of the applicant's information. And if the applicant had no notice of the risk of flood before receiving the council's advice, it is doubtful that the applicant was in a position to provide adequate information. Council officers explained that the purpose of the advice note is to alert development applicants that their site flooded in 1974; it has no formal status for development assessment purposes.<sup>152</sup>

The Commission's preferred approach is for councils to provide advice to applicants about the extent of any flood assessment during any pre-lodgement meetings and in writing at the time of receiving a development application, rather than in a decision notice. This would allow an applicant to take the information into account before taking further steps to obtain a development approval, and well before establishing the proposed use on land susceptible to flood.

### **Recommendation**

- 8.8 Councils should consider providing advice to development applicants during pre-lodgement meetings, and at the time of receiving a development application, about the way in which the development will be assessed for flood risk and what flood information council will be relying on to make this assessment.

## (Endnotes)

- 1 The development assessment process is governed by the *Sustainable Planning Act 2009*, whereas Queensland's building certification system is governed by the *Building Act 1975*.
- 2 Growth Management Queensland, Improving building certification in Queensland Discussion Paper, August 2011 [p8] available at: [www.dlqp.qld.gov.au/resources/guidelines/building/improving-building-certification.pdf](http://www.dlqp.qld.gov.au/resources/guidelines/building/improving-building-certification.pdf).
- 3 See section 4.1.2 *Application of State Planning Policy 1/03*.
- 4 Section 235, *Sustainable Planning Act 2009*; Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p29: para 11.10]; Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3918: line 9].
- 5 Exhibit 633, First Statement of Rory Kelly, 31 August 2011, Annexure RJK-18 [p86-87, 116].
- 6 Exhibit 707, Statement of Timothy Peisker, 7 September 2011 [p2: para 8].
- 7 The report noted that the site had been inundated in 1863, 1864, 1870, 1893 and 1974. See Exhibit 707, Statement of Timothy Peisker, 7 September 2011, Annexure TP-03, Appendix A.
- 8 Exhibit 707, Statement of Timothy Peisker, 7 September 2011 [p2: para 10]; Annexure TP-03 [p98: para 9.1].
- 9 Transcript, Timothy Peisker, 4 October 2011, Brisbane [p3599: line 35]; Exhibit 707, Statement of Timothy Peisker, 7 September 2011, Annexure TP-06 [p2: para 13].
- 10 Exhibit 707, Statement of Timothy Peisker, 7 September 2011 [p3: para 18-19]; Annexure TP-06 [p4].
- 11 Exhibit 707, Statement of Timothy Peisker, 7 September 2011, Annexure TP-06 [p4]; Transcript, Timothy Peisker, 4 October 2011, Brisbane [p3604: lines 40-50].
- 12 Exhibit 707, Statement of Timothy Peisker, 7 September 2011 [p3: para 20]; Transcript, Timothy Peisker, 4 October 2011, Brisbane [p3603: line 23].
- 13 Exhibit 707, Statement of Timothy Peisker, 7 September 2011, Annexure TP-09 [p3].
- 14 Exhibit 707, Statement of Timothy Peisker, 7 September 2011, Annexure TP-09 [p6, 8].
- 15 Exhibit 707, Statement of Timothy Peisker, 7 September [p4: para 28].
- 16 Transcript, Timothy Peisker, 4 October 2011, Brisbane [p3604: line 52].
- 17 Transcript, Timothy Peisker, 4 October 2011, Brisbane [p3617: line 24].
- 18 Transcript, Timothy Peisker, 4 October 2011, Brisbane [p3617: line 39].
- 19 Transcript, Timothy Peisker, 4 October 2011, Brisbane [p3617: line 49].
- 20 Transcript, Timothy Peisker, 4 October 2011, Brisbane [p3618: line 10].
- 21 Transcript, Brett Draffen, 6 October 2011, Brisbane [p3772: line 39].
- 22 Transcript, Brett Draffen, 6 October 2011, Brisbane [p3772: line 46].
- 23 Exhibit 707, Statement of Timothy Peisker, 7 September 2011, Annexure TP-15 [p10]; Annexure TP-16, Attachment A [p1: para 1].
- 24 Exhibit 707, Statement of Timothy Peisker, 7 September 2011, Annexure TP-15 [p10]; Attachment B [p20].
- 25 Transcript, Timothy Peisker, 4 October 2011, Brisbane [p3618: line 51]; Exhibit 707, Statement of Timothy Peisker, 7 September 2011 [p7: para 54].
- 26 Exhibit 707, Statement of Timothy Peisker, 7 September 2011 [p8: para 58].
- 27 Exhibit 707, Statement of Timothy Peisker, 7 September 2011 [p8: para 59]; Transcript, Timothy Peisker, 4 October 2011, Brisbane [p3622: line 40].
- 28 Transcript, Timothy Peisker, 4 October 2011, Brisbane [p3618: line 5 – p3619: line 16].
- 29 Exhibit 707, Statement of Timothy Peisker, 7 September 2011 [p8: para 62].
- 30 Exhibit 633, First Statement of Rory Kelly, 31 August 2011, Annexure RJK-32.
- 31 Exhibit 631, Statement of David Dunworth, 26 August 2011 [p2: para 4]; Exhibit 572, Statement of Julie Savage, 21 September 2011 [p4: para 16]; Exhibit 740, Second Statement of Brett Draffen, 26 September 2011 [p3: para 14-15].
- 32 Exhibit 631, Statement of David Dunworth, 26 August 2011, Annexure A.

- 33 Exhibit 572, Statement of Julie Savage, 21 September 2011 [p5: para 19].
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- 34 Exhibit 703, Statement of Ian Whitehead, 2 September 2011 [p3: para 9]; Transcript, Cameron Pearson, 27 September 2011, Brisbane [p3197: line 2].
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- 35 Exhibit 703, Statement of Ian Whitehead, 2 September 2011 [p4: para 11]; Transcript, Ian Whitehead, 4 October 2011, Brisbane [p3561: line 11]. Four clay courts and two grass courts at the State Tennis Centre were built at the level that would be reached by a flood with an average recurrence interval of 20. Specialist advice assessed the cost of remediation of these six courts following flood as being \$166 000 and Mirvac established a sinking fund for this amount. In the January 2011 floods, the grass and clay courts had to be entirely replaced at a cost of approximately \$400 000: Exhibit 707, Statement of Timothy Peisker, 7 September 2011 [p14: para 105]; Transcript, Timothy Peisker, 4 October 2011, Brisbane [p3621: line 35 – p3622: line 14]; Transcript, Ian Whitehead, 4 October 2011, Brisbane [p3561: line 53].
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- 36 Submission of Julie Savage [p1]; Transcript, David Dunworth, 27 September 2011, Brisbane [p3225: line 26].
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- 37 Transcript, David Dunworth, 27 September 2011, Brisbane [p3225: line 18].
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- 38 Transcript, Gary White, 19 September 2011, Brisbane [p2769: line 5].
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- 39 Statement of Andrew Damien Blake, 11 November 2011 [p5: para 19]; Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2910: line 4].
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- 40 Submission 2 of Brisbane City Council, 8 April 2011 [p18: para 5.12-5.13; p19: para 5.14].
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- 41 Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p2: para 1.1.6]; Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3916: line 10].
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- 42 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3917: line 7].
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- 43 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3916: line 46].
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- 44 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3916: line 46 – p3917: line 5].
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- 45 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3916: line 10].
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- 46 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3917: line 26].
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- 47 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3916: line 22].
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- 48 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3916: line 35].
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- 49 Transcript, Wayne Sweeney, 12 October 2011, Maryborough [p3987: line 11].
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- 50 Transcript, Michael Ellery, 12 October 2011, Maryborough [3998: line 26].
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- 51 Transcript, Wayne Sweeney, 12 October 2011, Maryborough [p3986: line 32; p3987: line 18].
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- 52 Transcript, Wayne Sweeney, 12 October 2011, Maryborough [p3987: line 39].
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- 53 Exhibit 532, Statement of Gary White, 2 September 2011 [p28: para 146]; Transcript, Gary White, 19 September 2011, Brisbane [p2747: line 35].
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- 54 Exhibit 532, Statement of Gary White, 2 September 2011 [p28: para 146]; Transcript, Gary White, 19 September 2011, Brisbane [p2747: line 43].
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- 55 Transcript, Gary White, 19 September 2011, Brisbane [p2747: line 48].
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- 56 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3922: line 13].
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- 57 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3922: line 19].
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- 58 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3922: line 25].
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- 59 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3917: line 24].
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- 60 Transcript, Michael Ellery, 12 October 2011, Maryborough [p3999: line 33].
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- 61 Transcript, Carl Wulff, 19 October 2011, Ipswich [p4197: line 22].
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- 62 Transcript, Joanne Pocock, 18 October 2011, Ipswich [p4157, line 3].
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- 63 Exhibit 861, Statement of Gary Ellis, 13 October 2011, Annexure GE-44.
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- 64 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4243: line 38; p4244: line 5].
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- 65 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4246: line 22].
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- 66 Exhibit 861, Statement of Gary Ellis, 13 October 2011, Annexure GE-44 [p7: Table 6.1].
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- 67 Letter from Cardno (Qld) Pty Ltd, 'Flooding behaviour', 11 November 2011 [p5].
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- 68 Exhibit 861, Statement of Gary Ellis, 13 October 2011 [p10: para 14].
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- 69 Exhibit 833, Statement of Joanne Pocock [p4: para 21, 23].
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- 70 Exhibit 861, Statement of Gary Ellis, 13 October 2011 [p10: para 14].
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- 71 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4250: line 30].
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- 72 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4246: line 30].
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- 73 Exhibit 861, Statement of Gary Ellis, 13 October 2011, Annexure GE-44.
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- 74 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4249: line 38].
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- 75 Transcript, Gary Ellis, 19 October 2011, Ipswich [p4251: line 38]; Transcript, Joanne Pocock, 18 October 2011, Ipswich [p4156: line 1].
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- 76 Exhibit 544, Statement of Martin Reason, 9 September 2011 [p7: para 32 and 33].
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- 77 Exhibit 957, Eighth Statement of Rory Kelly, 9 November 2011 [p7: para 22].
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- 78 Exhibit 957, Eighth Statement of Rory Kelly, 9 November 2011 [p7: para 23]. For a general description of the development assessment process of Brisbane City Council, see Exhibit 957, Eighth Statement of Rory Kelly, 9 November 2011. In brief, the Development Assessment Branch of Brisbane City Council is divided into five regional teams, each comprising a regional manager, urban planners, engineers, engineering officers, architects, pollution officers, ecologists, landscape architects and support officers.
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- 79 Exhibit 957, Eighth Statement of Rory Kelly, 9 November 2011 [p7: para 24]; Exhibit 544, Second Statement of Martin Reason, 9 September 2011 [p7: para 34].
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- 80 Exhibit 544, Statement of Martin Reason, 9 September 2011 [p7: para 34].
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- 81 Exhibit 544, Statement of Martin Reason, 9 September 2011 [p7: para 36].
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- 82 Exhibit 544, Statement of Martin Reason, 9 September 2011 [p8: para 37].
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- 83 Exhibit 633, First Statement of Rory Kelly, 31 August 2011 [p19: para 68].
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- 84 The planning legislation which preceded the *Sustainable Planning Act 2009*.
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- 85 Exhibit 633, First Statement of Rory Kelly, 31 August 2011 [p19: para 69].
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- 86 Sections 3.5.5A, *Integrated Planning Act 1997*.
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- 87 Section 3.1.6 *Integrated Planning Act 1997*.
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- 88 Section 3.1.6, *Integrated Planning Act 1997*.
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- 89 The full development application, including the reports mentioned, can be found at Annexure RJK-18 of Exhibit 633, First Statement of Rory Kelly, 31 August 2011.
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- 90 Exhibit 633, First Statement of Rory Kelly, 31 August 2011 [p22: para 81]; Annexure RJK-19 [p1].
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- 91 Exhibit 633, First Statement of Rory Kelly, 31 August 2011, Annexure RJK-19 [para 1.5].
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- 92 At the time of the development application for the Tennyson Reach development, the council officer was a Principal Planner for the Brisbane City Council's 'Development Assessment South' division, his current position is Regional Manager of Development Assessment South: Exhibit 633, First Statement of Rory Kelly, 31 August 2011 [p3: para 12-13].
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- 93 Exhibit 633, First Statement of Rory Kelly, 31 August 2011 [p22: para 82]; Transcript, Rory Kelly, 4 October 2011, Brisbane [p3592: line 15].
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- 94 Transcript, Rory Kelly, 4 October 2011, Brisbane [p3592: line 20].
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- 95 Transcript, Rory Kelly, 4 October 2011, Brisbane [p3593: line 34].
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- 96 Exhibit 634, Second Statement of Rory Kelly, 8 September 2011, Brisbane [para 13]; Annexure RJK-33 [p1-3]. The application was made under sections 3.5.24 and 3.5.33 of the *Integrated Planning Act 1997*.
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- 97 Exhibit 634, Second Statement of Rory Kelly, 8 September 2011, Brisbane [para 13].
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- 98 Exhibit 634, Second Statement of Rory Kelly, 8 September 2011, Brisbane, Annexure RJK-33 [p14].
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- 99 Exhibit 634, Second Statement of Rory Kelly, 8 September 2011, Brisbane [para 16]; Annexure RJK-35.
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- 100 Exhibit 634, Second Statement of Rory Kelly, 8 September 2011, Brisbane, Annexure RJK-36 [para 18].
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- 101 Exhibit 634, Second Statement of Rory Kelly, 8 September 2011, Brisbane, Annexure RJK-38 [para 20].
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- 102 Transcript, Rory Kelly, 10 November 2011, Brisbane [p4941: line 27].
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- 103 Exhibit 858, Statement of Timothy Foote, 7 October 2011, Annexure TCF-2 [p1: para 2].
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- 104 Transcript, Timothy Foote, 19 October 2011 [p4222: line 6].
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- 105 Exhibit 858, Statement of Timothy Foote, 7 October 2011, Annexure TCF-10.
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- 106 Exhibit 766, First Statement of Andrew Fulton, 1 September 2011 [p8: para 1.4.4]; Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3919: line 10].
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- 107 Exhibit 766, First Statement of Andrew Fulton, 1 September 2011, Annexure T: Kolan Shire Planning Scheme [p5.29: Table 5.13].
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- 108 Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p8: para 1.4.2].
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- 109 Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p8: para 1.4.3].
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- 110 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3919: line 51].
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- 111 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3919: line 45].
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- 112 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3919: line 55].
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- 113 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3920: line 26].
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- 114 Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p32: para 13.1.1]; Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3921: line 49].
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- 115 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3922: line 1].
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- 116 Section 324, *Sustainable Planning Act 2009*.
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- 117 Section 287 (1)(a) , *Sustainable Planning Act 2009*.
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- 118 Section 245, *Sustainable Planning Act*. It is an offence to contravene a condition of a development approval, section 580 of the *Sustainable Planning Act 2009*.
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- 119 Section 345, *Sustainable Planning Act 2009*.
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- 120 Section 346, *Sustainable Planning Act 2009*.
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- 121 Section 347, *Sustainable Planning Act 2009*.
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- 122 *McBain v Clifton Shire Council* [1996] 2 Qd R 493; *Mt. Marrow Blue Metal Quarries Pty Ltd v Moreton Shire Council* [1996] 1 Qd R 347.
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- 123 Exhibit 858, Statement of Timothy Foote, 7 October 2011, Annexure TCF-10, Ipswich City Council Development Application Decision Notice dated 14 August 2006.
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- 124 Exhibit 829, Statement of Krystal Wilson, 14 October 2011 [p1: para 2]; Transcript, Krystal Wilson, 18 October 2011, Ipswich [p4103: line 1].
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- 125 Transcript, Timothy Foote, 19 October 2011, Ipswich [p4216: line 7]. Ipswich City Council's '1 in 20 development line' is based on a long standing flood regulation which was established in the 1976 Town Planning scheme for the former City of Ipswich. See Ipswich City Council, Second Submission, 28 April 2011[p5: para 1.5].
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- 126 Exhibit 789, Statement of Krystal Wilson, 14 October 2011 [p4: para 18].
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- 127 Exhibit 858, Statement of Timothy Foote, 7 October 2011, Annexure TCF-1, JB Goodwin Midson & Partners Assessment Report – 45 Alice Street Goodna.
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- 128 Exhibit 858, Statement of Timothy Foote, 7 October 2011, Annexure TCF-1, JB Goodwin Midson & Partners Assessment Report – 45 Alice Street Goodna [p17].
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- 129 Exhibit 858, Statement of Timothy Foote, 7 October 2011, Annexure TCF-1, JB Goodwin Midson & Partners Assessment Report – 45 Alice Street Goodna [p17].
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- 130 Transcript, Timothy Foote, 19 October 2011, Ipswich [p4221: line 37]; Exhibit 858, Statement of Timothy Foote, 7 October 2011, Annexure TCF-2, Ipswich City Council Information Request, 10 May 2005.
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- 131 Transcript, Timothy Foote, 19 October 2011, Ipswich [p4222: lines 32-44]; Exhibit 858, Statement of Timothy Foote, 7 October 2011, Annexure TCF-3, Letter JB Goodwin Midson & Partners to Ipswich City Council dated 24 February 2006 enclosing Stormwater and Flood report prepared by Tabletop Architects Planners Engineers [p1].
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- 132 Exhibit 858, Statement of Timothy Foote, 7 October 2011, Annexure TCF-3 [p3].
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- 133 Exhibit 858, Statement of Timothy Foote, 7 October 2011 [p11: para 57].
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- 134 Transcript, Timothy Foote, 19 October 2011, Ipswich [p4222: line 50; p4225: line 1].
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- 135 Transcript, Timothy Foote, 19 October 2011, Ipswich [p4225: lines 35-46; p4229: lines 19-26].
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- 136 Transcript, Timothy Foote, 19 October 2011,  
Ipswich [p4224: line 38; p4226: line 17].
- 137 Exhibit 858, Statement of Timothy Foote,  
7 October 2011 [p12: para 63].
- 138 Exhibit 858, Statement of Timothy Foote,  
7 October 2011 [p13: para 63].
- 139 Exhibit 858, Statement of Timothy Foote,  
7 October 2011 [p13: para 63].
- 140 Exhibit 858, Statement of Timothy Foote,  
7 October 2011 [p13: para 63].
- 141 Exhibit 858, Statement of Timothy Foote,  
7 October 2011 [p13: para 63].
- 142 Transcript, Timothy Foote, 19 October 2011,  
Ipswich [p4226: lines 21-35; p4228: line 48].
- 143 Exhibit 858, Statement of Timothy Foote,  
7 October 2011, Annexure TCF-10 [p12].
- 144 Exhibit 858, Statement of Timothy Foote,  
7 October 2011, Annexure TCF-10 [p12].
- 145 Exhibit 858, Statement of Timothy Foote,  
7 October 2011, Annexure TCF-10 [p14].
- 146 Transcript, Timothy Foote, 19 October 2011,  
Ipswich [p4223: line 13].
- 147 Transcript, Timothy Foote, 19 October 2011,  
Ipswich [p4223: line 35 cf. p4223: line 48].
- 148 Exhibit 858, Statement of Timothy Foote,  
7 October 2011, Annexure TCF-10 [p14, Condition  
27(k)].
- 149 Transcript, Timothy Foote, 19 October 2011,  
Ipswich [p4227: line 33].
- 150 Section 313 (5), *Sustainable Planning Act 2009*.
- 151 Exhibit 858, Statement of Timothy Foote [p13: para  
64]; Annexure TCF 10 [p16: Condition 2].
- 152 Exhibit 833, Statement of Joanne Pocock [p7-8: para  
38, 42].



# 9

## 9 Building controls

Development controls in a floodplain should contain an appropriate mix of measures, including land use planning and building controls, to minimise the impact of floods.

Land use planning controls are primarily contained in local planning instruments and indicate the types of development suitable for various parts of the floodplain.<sup>1</sup> Building controls regulate the structural form of development and are primarily contained within national or state building regulations but are also found, in some instances, in local planning instruments.

Where land use planning allows development in places susceptible to flooding, building controls may reduce the risks posed to people and property. Building controls may also reduce the cost of property damage caused by flooding and the time taken to restore a building so that it can be reoccupied after a flood.<sup>2</sup>

### 9.1 Minimum floor levels

A council may specify minimum floor levels for habitable rooms through a planning scheme, a temporary local planning instrument or a council resolution.<sup>3</sup> The State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* suggests that councils may also set minimum floor levels for non-habitable rooms where local flooding characteristics warrant doing so.<sup>4</sup>

There are variations in the way councils impose minimum floor levels. For example, Brisbane's planning scheme requires habitable and non-habitable rooms of houses to be built to specified flood immunity levels.<sup>5</sup> Ipswich's temporary local planning instrument for floods requires other factors to be considered as well in determining the minimum floor level for a habitable room, such as the consistency in height between the proposed building and the existing streetscape.<sup>6</sup>

### 9.2 Freeboard levels

In setting floor levels, councils typically use a 'freeboard' to provide an additional buffer allowing for uncertainty in estimating flood water heights, the effects of wave action and unforeseen variation in local flood behaviour.<sup>7</sup> However, as floods vary from event to event, there is a limit to the protection afforded by a freeboard allowance.<sup>8</sup>

It is not mandatory for councils to set a freeboard level, nor is any particular freeboard level prescribed. As with minimum floor levels, this has led to variation in approaches among councils, with some setting freeboard levels for habitable and non-habitable floor levels, some setting them for habitable floor levels only, and some not setting them at all.<sup>9</sup> Where councils have set freeboard levels, they generally range from 300 millimetres to 500 millimetres.<sup>10</sup>

A town planning expert who gave evidence to the Commission supported the introduction of a mandatory minimum freeboard level across the state, allowing councils to retain the discretion to raise the level for planning reasons, for example, to protect heritage buildings.<sup>11</sup> A council might also choose to set a higher freeboard where there was a high measure of uncertainty surrounding its estimated flood level.

The Queensland Government intends to introduce a new mandatory part to the Queensland Development Code: mandatory part 3.5 ‘Construction of buildings in flood hazard areas’.<sup>12</sup> The proposed new part establishes a standard minimum freeboard of 300 millimetres,<sup>13</sup> but leaves councils free to set a greater freeboard height, if they consider it necessary.<sup>14</sup> The operation of the proposed new part is discussed in further detail in section 9.5 *Proposed new part of the Queensland Development Code: ‘Construction of buildings in flood hazard areas’*.

## 9.3 Building materials and design

The question arises as to whether there should be greater regulation, in areas at risk from flooding, of the design and types of materials used in the construction of buildings and other structures.

A town planning consultant submitted to the Commission that despite the obvious benefits of using flood resistant materials and innovative design solutions, the associated costs often discouraged developers from employing them.<sup>15</sup> The Property Council of Australia is similarly concerned that prescribed mitigation measures for buildings may add to project costs, reducing their affordability.<sup>16</sup> The Insurance Australia Group has suggested that building standards and codes should be improved so that they better protect property from flood damage, but in a cost effective manner.<sup>17</sup>

Although the Commission does not consider it appropriate for it to prescribe building design and materials, it is worth mentioning the experiences of some building owners whose properties incorporated building materials and design measures to mitigate flood damage. Local and state governments and individual property owners may benefit from considering similar measures.

In Maryborough, businesses in the low-lying marina precinct are some of the first to be affected by flooding of the Mary River. The owner of the main marina building fitted the building with louvre windows that could be easily removed, and built partition walls out of besser block.<sup>18</sup> Following the 2010/2011 floods, the building owner and tenants have further adapted the building to enable more efficient evacuation before, and quicker recovery after, flooding by placing equipment on wheels and raising the height of power points.<sup>19</sup>

In Gympie, a furniture store which flooded to its second storey was fully operational within a week of the flood because of its comprehensive evacuation plan<sup>20</sup> and building improvements which better enabled it to cope with and recover from flooding.<sup>21</sup> The improvements included constructing walls from modern fibrous cement, using acrylic water based paint, raising the height of electricity supply points and using flood resistant floor materials.<sup>22</sup>

A residence in West End in Brisbane, built on the edge of the Brisbane River, includes several features designed to reduce any flood related damage. Design features included ensuring there was no built-in furniture in the downstairs area. Water resistant materials were used to build the doors and walls of the lower levels.<sup>23</sup>

Some councils have also benefited from designing their buildings to be more flood resilient. For example, Ipswich City Council designed the caretaker’s residence and kiosk at Colleges Crossing so they could be dismantled and removed before flooding occurs.<sup>24</sup> The council proposes to construct its public buildings from concrete rather than timber to lower any cost of cleaning and restoration after a flood.<sup>25</sup>

The location of essential services such as lifts, electrical switch boards and back-up power supplies is also a relevant consideration in the design of a building to mitigate effects of flooding. The proposed new part of the Queensland Development Code introduces standards for the location of essential services in buildings.<sup>26</sup> This is further discussed in section 10.3 *Electrical infrastructure*.

The proposed new part of the Queensland Development Code establishes requirements about the design of residential buildings.<sup>27</sup> Building Codes Queensland is also considering introducing non-mandatory provisions into the Queensland Development Code relating to the use of water resistant materials of a non-structural nature. Some councils have indicated they will incorporate these standards into their local planning instruments, making them mandatory.<sup>28</sup> Following the 2010/2011 floods, a number of councils included standards about the use of flood resilient materials in their temporary local planning instruments.<sup>29</sup> Matters of building materials and design are also referred to in the model code proposed by the Queensland Reconstruction Authority.<sup>30</sup>

## 9.4 State versus local regulation

There is agreement in the building industry about the need for more detailed building controls in areas susceptible to flooding.<sup>31</sup> However, there is some debate about which level of government should regulate these types of controls.

Certain aspects of building work are assessed by a building certifier against the Queensland Development Code; other aspects of building work may be assessed by a council, if it has incorporated building controls in its planning scheme.<sup>32</sup> Building work regulated by the Queensland Development Code cannot be regulated by planning schemes.<sup>33</sup> This rule did not apply to temporary local planning instruments, but the Queensland Government has recently passed the *Sustainable Planning and Other Legislation Amendment Act 2012*, which ensures that temporary local planning instruments are also unable to regulate building work covered by the Queensland Development Code.<sup>34</sup>

The Queensland Government Planner considers it is appropriate to incorporate building controls into either building codes (which include the Queensland Development Code) or into local planning instruments (which include planning schemes and temporary local planning instruments).<sup>35</sup>

On the other hand, Building Codes Queensland considers it is generally inappropriate for building controls to be included in local planning instruments.<sup>36</sup> Building Codes Queensland's view is that compliance with building controls is a matter best addressed through dedicated building codes that are routinely used by the construction industry, such as the Queensland Development Code and the Building Code of Australia.<sup>37</sup> It argues that if building design criteria were included in local planning instruments, there would be variation in building requirements and terminology across councils.<sup>38</sup>

Building Codes Queensland also notes that any overlap between local planning instruments and building codes may create uncertainty for building certifiers<sup>39</sup> and lead to duplication in processes, creating additional costs and delays in the development application process.<sup>40</sup>

However, Ipswich City Council's view is that planning schemes should deal with building design, habitable floor levels and the placement of buildings,<sup>41</sup> whereas structural adequacy, use of flood resistant materials and construction techniques should be regulated by the Queensland Development Code.<sup>42</sup>

For some aspects of building controls for areas at risk of flooding, this debate will be resolved with the introduction of a proposed new part of the Queensland Development Code: Mandatory Part 3.5 'Construction of Buildings in Flood Hazard Areas'.

## 9.5 Proposed new part of the Queensland Development Code: 'Construction of buildings in flood hazard areas'

The Queensland Development Code consolidates many of Queensland's building standards into a single document and is applied by building certifiers in the assessment of applications for building work.<sup>43</sup> It incorporates and adds to many of the standards contained in the Building Code of Australia<sup>44</sup> and regulates a range of building matters such as the design and siting of certain buildings, fire safety and the establishment of swimming pool barriers.

Some parts of the Queensland Development Code are mandatory,<sup>45</sup> other parts are not. The non-mandatory parts of the code provide model standards which may be modified by councils to suit local circumstances and incorporated into planning schemes. The code, as it is presently framed, does not include any mandatory or non-mandatory parts that regulate the construction of buildings in areas at risk of flooding.

The Building Code of Australia contains provisions dealing with natural hazards including bushfires, earthquakes and cyclones, though, like the Queensland Development Code, it does not deal with flood. The Commonwealth Government attributes this omission to the fact that planning authorities have the power to prohibit building in areas at risk from flooding and to require habitable floors to be above a specified flood level.<sup>46</sup>

The Australian Building Codes Board has recently developed the 'Draft Standard for Construction of Buildings in Flood Hazard Areas'<sup>47</sup> to address the lack of specific state or national building regulation for how buildings should be constructed in areas at risk of flooding.

Basing its work on this draft national standard, Building Codes Queensland has prepared a proposed new Mandatory Part 3.5 of the Queensland Development Code, 'Construction of Buildings in Flood Hazard Areas'.

Queensland's proposed new part has three performance requirements which establish new standards for buildings in areas at risk from flooding. They are (paraphrased):

- to maintain the structural integrity of residential buildings during a flood
- to set criteria for the design and location of utilities<sup>48</sup> (for example, electrical switchboards and lift motors)<sup>49</sup>
- to protect sanitary drains from backflow.<sup>50</sup>

The first reflects, for the most part, the draft national standard, but the second and third do not appear in the draft national standard.

A more detailed discussion of the second and third performance requirements is in sections *10.1 Sewage and sewerage* and *10.3 Electrical infrastructure*.

The Queensland Government has indicated that the proposed new part will commence following the release of this report in early 2012,<sup>51</sup> but before the finalisation of the draft national standard, which will be available for adoption by states and territories on 1 May 2013.<sup>52</sup>

### **9.5.1 Required flood information**

The Commission has concerns the proposed new part may, in certain circumstances, be unduly onerous for applicants wishing to build in areas at risk of flooding.

For the proposed new part to apply to building work, the following is required:

- the relevant council must have designated a 'flood hazard area'<sup>53</sup> within its region
- the building work is proposed within the designated flood hazard area
- the building work is proposed below a particular level, known as the 'defined flood level', within that flood hazard area.<sup>54</sup>

The defined flood level, for a lot located in a flood hazard area, in the proposed new part is defined to mean:

- a. the expected flood level for the area declared by a Local Government under the *Building Regulation 2006*, section 13; or
- b. if a Local Government has not declared an expected flood level –
  - i. the 1% *Annual Exceedance Probability* flood level for the lot, as determined by a *competent person*; or
  - ii. the highest recorded flood level for the lot.<sup>55</sup>

It is not apparent whether clause (b)(ii) of the definition requires that a flood level has been recorded at the lot, or whether it is sufficient for the flood level at the lot to be worked out from a recorded flood level at some other place (for example, at a gauge). If the latter, the definition does not contain any indication who should determine the highest recorded flood level for a lot. Neither part of clause (b) provides any information about how the relevant flood level is to be determined.

The effect of the definition seems to be that, where a council has designated a flood hazard area but has not declared an expected flood level, it is left to the building applicant to ascertain either the 1% AEP flood level or the highest recorded flood level for the relevant lot.

This scenario may arise, for example, where a council has adopted the Queensland Reconstruction Authority maps, without amendment, for the purpose of designating its flood hazard area.<sup>56</sup> While these maps may assist councils to identify areas where future flood investigations are required, they do not establish flood levels for all lots.<sup>57</sup> Flood levels might be able to be worked out where there is a gauge nearby, but for lots not directly adjacent to a gauge, further work will have to be done. (For further discussion about the Queensland Reconstruction Authority maps see section *2.7.3 Assessment of mapping options*.)

As well as the problems of determining the defined flood level, there are the difficulties of meeting the first requirement of the proposed new part, which is, in effect, that the building be designed and constructed to withstand a flood.<sup>58</sup> The proposed acceptable solution 'A1' (which entails compliance with sections of the draft national standard) applies only where one of the following also applies:

- a. the Local Government has declared, under section 13 of the *Building Regulation 2006*, an expected *maximum flow velocity* for the area in which the lot is located, that is less than 1.5 metres per second; or
- b. it is reasonable to expect the lot to be subjected to a *maximum flow velocity* of less than 1.5 metres per second; or
- c. the lot is located in an *inactive flow or backwater area*.<sup>59</sup>

That provision contemplates that councils will (after the necessary amendment of section 13 of the *Building Regulation 2006*) be able to declare the expected maximum flow velocities of flood water and to designate inactive flow or backwater areas.<sup>60</sup>

Where the defined flood level and ‘maximum flow velocity’ information for a lot are not declared by the relevant council, the building applicant may need to engage an engineer to establish them.<sup>61</sup> Hydrologic and hydraulic models are likely to be required.<sup>62</sup> The extent of the flood modelling required to determine the relevant flood level and flow velocity will depend upon the size and complexity of the watercourse, or the flow path, affecting the particular property.<sup>63</sup> (Flood studies are discussed further in section 2.2.)

Concerns have been raised about the time and cost implications for councils in obtaining the relevant flood data required to implement the proposed new part.<sup>64</sup> It has also been suggested that the potential requirement for a site-specific flood analysis where a council has not declared (for example) a defined flood level in its flood hazard area may be ‘both impractical and cost prohibitive’ for applicants for all but the largest of projects.<sup>65</sup> And it is said, with some justice, that it is unreasonable to require an applicant to obtain information about the maximum velocity of flow to which the entire lot is subjected and whether it is in the inactive flow or backwater area, when in fact the proposed development may only occupy a part of a lot, unaffected by flooding problems.<sup>66</sup>

## Recommendations

- 9.1 The proposed new part of the Queensland Development Code, Mandatory Part 3.5 ‘Construction of buildings in flood hazard areas’, should be amended so that the performance requirement relating to building design and construction (Performance Requirement P1) for building on a lot will only be triggered where the council has:
  - designated part of its area as a natural hazard management area (flood) under section 13 of the *Building Regulation 2006*, and
  - either:
    - declared a height to be the expected flood level under section 13 of the *Building Regulation 2006*, or
    - adopted a highest recorded flood level for the lot, and
  - either:
    - declared a velocity to be the expected maximum velocity of flood water for the area in which the lot is located, or
    - designated the area in which the lot is located an inactive flow or backwater area.
- 9.2 The proposed new part of the Queensland Development Code, Mandatory Part 3.5 ‘Construction of buildings in flood hazard areas’, should be amended so that the performance requirements about utilities and sanitary drains (Performance Requirement P2 and P3) for building on a lot will only be triggered where the council has:
  - designated part of its area as a natural hazard management area (flood) under section 13 of the *Building Regulation 2006*, and
  - either:
    - declared a height to be the expected flood level under section 13 of the *Building Regulation 2006*, or
    - adopted a highest recorded flood level for the lot.

## Recommendation

- 9.3 The Queensland Government should consider amending the ‘Limitation’ section of the proposed new part of the Queensland Development Code, Mandatory Part 3.5 ‘Construction of buildings in flood hazard areas’, to allow for the possible application of ‘acceptable solution A1’ to a building located on a lot if:
- it is reasonable to expect the part of the lot on which the building work is proposed to be subjected to a maximum velocity of less than 1.5 metres per second, or
  - the part of the lot on which the building work is proposed is located in an inactive flow or backwater area.

### 9.5.2 Assessing building applications against the proposed new part

A building certifier generally assesses building work applications.<sup>67</sup> A council may also become involved in the assessment process as a ‘concurrence agency’.<sup>68</sup> This enables the council to require the building certifier to refuse the application, approve it in its entirety or impose conditions on the approval of the application.<sup>69</sup>

Ipswich City Council has concerns about how building certifiers will deal with the determination of technical flood issues, such as calculating maximum velocities, when applying the proposed new part.<sup>70</sup> It considers that councils should have the primary responsibility for assessing building work applications within a flood hazard area, or, at a minimum, be a concurrence agency for these applications.<sup>71</sup>

It is logical that the entity assessing a building application to which the proposed new part applies should have the appropriate technical expertise to make informed decisions.

In circumstances where the proposed new part applies to a building application, a council (as the concurrence agency) will be able to indicate to a building certifier that it would be ‘impractical or undesirable’ for the building to comply with some requirements of the part.<sup>72</sup> This enables councils to exercise discretion in circumstances where there are competing planning considerations.<sup>73</sup> For example, a council may consider it to be ‘impractical or undesirable’ to build an extension to an existing building above the defined flood level where the existing building is at a lower level.<sup>74</sup>

The breadth and imprecision of the expression ‘impractical or undesirable’ may result in its inconsistent application by councils: this would run counter to one of its objectives, which is to introduce consistency in the application of building regulations.<sup>75</sup> It has been suggested to the Commission that the expression is also likely to introduce uncertainty, because its terms have not been used before in a planning context. It was suggested the expression be rephrased to be more consistent with the language of the *Sustainable Planning Act*, by amending the proposed new part to provide that councils can decide whether there are sufficient grounds to justify the decision to approve a development, despite any conflict with the proposed new part.<sup>76</sup>

The Queensland Government contends that the current wording provides flexibility for councils to consider a wide range of matters when making their determinations.<sup>77</sup> To assist in interpretation of the provision, the Queensland Government included in the proposed new part some examples of the types of matters a council may wish to consider. These include:

- the expected level of flood inundation, the level of surrounding homes and any practical difficulties in achieving compliance
- the level of an existing building for additions and any practical difficulties in achieving compliance
- heritage or other planning related matters.<sup>78</sup>

The Queensland Government also intends to develop material to guide councils on the types of matters they may wish to consider when making a decision.<sup>79</sup> The Commission believes this may go some way to ensuring consistent decisions are made.

### 9.5.3 Early adoption of the proposed new part

The Queensland Government intends to adopt the proposed new part in early 2012,<sup>80</sup> which is prior to the finalisation of the draft national standard (expected to be available for adoption on 1 May 2013).

The draft national standard is to be the subject of consultation throughout Australia to identify compliance costs, effects on competition and ways to maximise the efficiency of the new requirements.<sup>81</sup> The results of that consultation are expected to be provided to the Australian Building Codes Board in February 2012.<sup>82</sup>

Building Codes Queensland asserts that the early adoption of the proposed new part is necessary to address the immediate need for detailed standards for constructing new buildings as well as to improve flood resilience of communities across Queensland.<sup>83</sup>

On 26 July 2011, Building Codes Queensland circulated a ‘Building Newsflash bulletin’ to building organisations, industry groups, councils and members of the general public seeking comments on the implementation of the proposed new part.<sup>84</sup> The proposed new part has also been published on the Department of Local Government and Planning’s website, with an explanatory note.<sup>85</sup> That is the extent of public consultation. Building Codes Queensland has also consulted directly with various councils, the Queensland Reconstruction Authority and other building industry representatives.

The consultation process for the draft national standard has not yet been completed.<sup>86</sup> The Commonwealth Government anticipates the results of the consultation process will be available by June 2012.<sup>87</sup>

The Commonwealth Government expects the Queensland Government will undertake a similar consultation process before the proposed new part commences.<sup>88</sup> Examples of what the Commonwealth Government believes the Queensland Government may need to consider as part of the consultation process include:

- the potential costs for councils of undertaking flood studies to determine maximum velocities or to identify inactive flow or backwater areas
- the potential costs for applicants of engaging suitably qualified professionals to determine flood levels or flood behaviour
- the costs of building materials or design solutions to meet the requirements of the proposed new part.<sup>89</sup>

The Commission acknowledges the advantages of prompt attention to ensuring proper regulation of building in flood risk areas. However, it would be unfortunate if measures were put in place hastily, without proper consideration of their implications for both councils and those wishing to build, and without the benefit of more extensive public consultation.

## (Endnotes)

- 1 Local planning instruments include planning schemes, temporary local planning instruments and planning scheme policies (section 77, *Sustainable Planning Act 2009*) and are discussed in more detail in chapter 3 *Planning framework* and in chapter 5 *Local planning instruments*.
- 2 Exhibit 966, Report of Paul Grech, *Report to Queensland Floods Commission of Inquiry Addressing Town Planning Issues*, 15 October 2011 [p42: para 19.2].
- 3 Minimum floor levels of buildings are regulated by the *Building Act 1975*. Section 13(1)(b) of the *Building Regulation 2006* allows councils to declare minimum floor levels for habitable rooms. Non-Mandatory Part 1.5 ‘Floor Heights’ of the Queensland Development Code may be adopted by councils to establish minimum floor levels for residential dwellings.
- 4 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p58].
- 5 Brisbane City Council, Brisbane City Plan 2000, Chapter 5 ‘House Code’, Section 4 ‘Performance Criteria and Acceptable Solutions’, Section 4.1 ‘General Requirements’ [p100-101].
- 6 Ipswich City Council Temporary Local Planning Instrument 01/2001 – Flooding Regulation [p5, 7].
- 7 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), *Floodplain management in Australia: best practice principles and guidelines*, SCARM Report 73, 2000 [p23]. Freeboard is also defined in the glossary.
- 8 Transcript, Glen Brumby, 28 September 2011, Brisbane [p3328, 3329].

- 9 Exhibit 666, Statement of Glen Brumby, 15 September 2011, Attachment 19: sub-attachment 4.
- 10 Exhibit 666, Statement of Glen Brumby, 15 September 2011, Attachment 19: sub-attachment 4; Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p23].
- 11 Exhibit 964, Report of Steve Reynolds, *Building Controls for Flood Hazard Areas*, 7 November 2011 [p13: para 36].
- 12 The Queensland Development Code contains mandatory and non-mandatory building standards that are used by building certifiers to assess building applications. It is available at the Department of Local Government and Planning website at [www.dlqp.qld.gov.au/building/queensland-development-code.html](http://www.dlqp.qld.gov.au/building/queensland-development-code.html) accessed on 20 January 2012.
- 13 Draft Mandatory Part 3.5, Queensland Development Code, Construction of Buildings in Flood Hazard Areas, 21 November 2011 [p5].
- 14 Statement of Glen Brumby, 16 November 2011 [p4: para 5(g)].
- 15 Submission of John Brannock (Brannock and Associates), 4 April 2011 [p5].
- 16 Submission of Property Council of Australia, 4 April 2011 [p3].
- 17 Submission of Insurance Australia Group, 31 March 2011 [p7].
- 18 Exhibit 795, Statement of Michael Cox, 28 September 2011 [p7: para 26].
- 19 Exhibit 795, Statement of Michael Cox, 28 September 2011 [p7: para 26]; Transcript, Michael Cox, 12 October 2011, Maryborough [p3994].
- 20 Evacuation plans are further discussed at section 8.3 *Development conditions*.
- 21 Exhibit 817, Statement of Amanda White, 28 September 2011 [p1: para 3].
- 22 Exhibit 817, Statement of Amanda White, 28 September 2011 [p1: para 4 – p2: para 9].
- 23 Exhibit 585, Statement of Emma Scragg, 24 August 2011 [p3: para 4 – p4: para 7].
- 24 Exhibit 853, Statement of Carl Wulff, 2 September 2011 [p15: para 83]; Transcript, Carl Wulff, 19 October 2011, Ipswich [p4192].
- 25 Transcript, Carl Wulff, 19 October 2011, Ipswich [p4191].
- 26 Draft Mandatory Part 3.5, Queensland Development Code, Construction of Buildings in Flood Hazard Areas, 21 November 2011 [p7].
- 27 Draft Mandatory Part 3.5, Queensland Development Code, Construction of Buildings in Flood Hazard Areas, Performance requirement P1, 21 November 2011 [p7].
- 28 Exhibit 666, Statement of Glen Brumby, 15 September 2011 [p12: para 50-51].
- 29 Exhibit 666, Statement of Glen Brumby, 15 September 2011 [p12: para 52]. For a discussion about temporary local planning instruments introduced following the 2010/2011 floods see section 5.2 *Temporary local planning instruments*.
- 30 The model code is discussed in more detail in section 4.2.2 *The Model Code provided by the Queensland Reconstruction Authority*.
- 31 Exhibit 666, Statement of Glen Brumby, 15 September 2011 [p13: para 53].
- 32 Chapter 4, Part 1, Division 1, *Building Act 1975*; Chapter 4, Part 2, Division 1, *Building Act 1975*.
- 33 Section 86, *Sustainable Planning Act 2009*; Sections 32, *Building Act 1975*; Section 33, *Building Act 1975*.
- 34 Clause 62, Sustainable Planning and Other Legislation Amendment Bill 2011.
- 35 Transcript, Gary White, 7 November 2011, Brisbane [p4620].
- 36 Exhibit 1015, Statement of Glen Brumby, 1 November 2011 [p4: para 15].
- 37 Exhibit 1015, Statement of Glen Brumby, 1 November 2011 [p4: para 15].
- 38 Exhibit 1015, Statement of Glen Brumby, 1 November 2011 [p4: para 17].
- 39 Exhibit 1015, Statement of Glen Brumby, 1 November 2011 [p5: para 18].
- 40 There may be duplication when an application is assessed at both the planning and building approval stage, see Exhibit 1015, Statement of Glen Brumby, 1 November 2011 [p4: para 19].

- 41 Exhibit 912, Statement of John Adams, 25 October 2011 [p12-13: para 40b].
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- 42 Exhibit 912, Statement of John Adams, 25 October 2011 [p13: para 40c].
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- 43 Chapter 4, Part 1, Division 1, *Building Act 1975*; Chapter 4, Part 2, Division 1, *Building Act 1975*.
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- 44 The Building Code of Australia is a nationally uniform set of technical standards for the design and construction of buildings and other structures. The Building Code of Australia and the Plumbing Code of Australia comprise the National Construction Code. The National Construction Code is regulated by the Australian Building Codes Board. If there is any inconsistency between the Queensland Development Code and the Building Code of Australia, the Queensland Development Code prevails, see Section 35, *Building Act 1975*.
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- 45 Schedule 1, *Building Act 1975* details the parts of the Queensland Development Code that have legislative effect.
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- 46 Exhibit 1016, Submission of the Commonwealth Government, 28 October 2011 [p3: para 11].
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- 47 Australian Building Codes Board, Draft Standard for Construction of Buildings in Flood Hazard Areas, version 7, October 2011 (Exhibit 1016, Submission of the Commonwealth Government, 28 October 2011, Annexure 4: Australian Building Codes Board, ‘Draft Standard for Construction of Buildings in Flood Hazard Areas’, version 7, October 2011).
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- 48 The location of essential services is further discussed in section 10.3 *Electrical infrastructure*.
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- 49 Utilities is defined in the proposed new part to mean: lift motors and lift motors for emergency lifts; electrical switchboards and meters; back-up power supplies and generators for essential services; sprinkler valve rooms and any associated pumps; fire indicator panels; controls for stairwell pressurisation and air-handling systems used for smoke control; and hot water systems (see draft Mandatory Part 3.5 of the Queensland Development Code ‘Construction of Buildings in Flood Hazard Areas’, 21 November 2011 [p7]).
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- 50 See performance requirements P1, P2 and P3 of the draft Mandatory Part 3.5 of the Queensland Development Code ‘Construction of Buildings in Flood Hazard Areas’, 21 November 2011 [p7]. The prevention of backflow of sewage into buildings is discussed further in section 10.1 *Sewage and sewerage*.
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- 51 Correspondence from the Queensland Government, Queensland Development Code, 18 January 2012.
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- 52 Submission from the Attorney-General’s Department, Commonwealth Government, undated [p3: para 12].
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- 53 A ‘flood hazard area’ is defined within the proposed new part as ‘an area, whether or not mapped, designated by a Local Government as a natural hazard management area (flood) under section 13 of the Building Regulation 2006’ - Draft Mandatory Part 3.5 of the Queensland Development Code ‘Construction of Buildings in Flood Hazard Areas’, 21 November 2011, Definitions [p4].
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- 54 Draft Mandatory Part 3.5, Queensland Development Code, ‘Construction of Buildings in Flood Hazard Areas’, 21 November 2011.
- 
- 55 Draft Mandatory Part 3.5, Queensland Development Code, ‘Construction of Buildings in Flood Hazard Areas’, 21 November 2011 [p5].
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- 56 The Queensland Reconstruction Authority contemplates the Queensland Reconstruction Authority maps being used by councils to trigger the proposed new part (Queensland Reconstruction Authority Guideline *Planning for stronger, more resilient floodplains: Part 1 - Interim measures to support floodplain management in existing planning schemes* [p16]).
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- 57 The Queensland Reconstruction Authority maps include historical data of flood heights at gauges. That historical data could be used to identify a flood level at properties immediately adjacent to the gauge, but would require a hydraulic model to identify flood heights at any other property.
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- 58 Draft Mandatory Part 3.5, Queensland Development Code ‘Construction of Buildings in Flood Hazard Areas’, 21 November 2011, Performance Requirement 1 [p7].
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- 59 Draft Mandatory Part 3.5, Queensland Development Code ‘Construction of Buildings in Flood Hazard Areas’, 21 November 2011, Limitation [p3].
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- 60 To enable this, the Queensland Government proposes to amend the *Building Regulation 2006* accordingly (Statement of Glen Brumby, 16 November 2011 [p8-9: para 13]).
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- 61 In explaining the operation of the proposed new part, Building Codes Queensland advised that where a council does not provide a defined flood hazard level, then for buildings to be located in a designated flood hazard area, a hydrologist would be required to obtain this information (Exhibit 666, Statement of Glen Brumby, 15 September 2011 [p11: para 48]).
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- 62 Trevor Johnson, Cardno, *Draft Queensland Development Code*, 19 December 2011 [p4, 5].
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- 63 Trevor Johnson, Cardno, *Draft Queensland Development Code*, 19 December 2011 [p4].
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- 64 Submission of Ipswich City Council, 6 December 2011 [p4].
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- 65 Submission of the Local Government Association of Queensland, 6 December 2011 [p1].
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- 66 Submission of the Local Government Association of Queensland, 6 December 2011 [p1].
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- 67 Section 45, *Building Act 1975*.
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- 68 Section 46, *Building Act 1975*.
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- 69 The role of a ‘concurrence agency’ is described in more detail in chapter 3 *Planning framework*.
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- 70 Submission of Ipswich City Council, 6 December 2011 [p1].
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- 71 Submission of Ipswich City Council, 6 December 2011 [p3: para 1.2(b)].
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- 72 Where an application involves building work for the construction of a class 1 building or an addition to a class 1 building and that work does not comply with performance requirement P1 of the proposed new part or section 2.7(a) of the draft national standard, the council may give a concurrence agency response about whether it is impractical or undesirable for the work to comply entirely or partly with performance requirements P1 and P2 of the proposed new part. The Queensland Government proposes to include the referral agency jurisdiction in Item 27, Table 1 of Schedule 7 of the *Sustainable Planning Regulation 2009* (Draft Mandatory Part 3.5 of the Queensland Development Code ‘Construction of Buildings in Flood Hazard Areas’, 21 November 2011 [p3]).
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- 73 Statement of Glen Brumby, 16 November 2011 [p2: para 5.b].
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- 74 Department of Local Government and Planning, Explanatory notes for the draft Queensland Development Code to adopt the draft Australian Building Codes Board Standard for Construction of Buildings in Flood Hazard Areas [p2].
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- 75 Exhibit 1015, Statement of Glen Brumby, 1 November 2011 [p4: para 15, 17].
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- 76 Submission of Ipswich City Council, 6 December 2011 [p3: para 1.2(d)].
- 
- 77 Correspondence from the Queensland Government, 18 January 2012.
- 
- 78 Draft Mandatory Part 3.5, Queensland Development Code ‘Construction of Buildings in Flood Hazard Areas’, 21 November 2011. [p3].
- 
- 79 Correspondence from the Queensland Government, 18 January 2012.
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- 80 Correspondence from the Queensland Government, 18 January 2012.
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- 81 This process is a requirement of the Council of Australian Governments’ Guidelines for Best Practice Regulation, 2007 (Exhibit 1016, Submission from the Commonwealth Government on the draft Standard, 28 October 2011 [p1-2: para 5]).
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- 82 Exhibit 1016, Submission from the Commonwealth Government on the draft Standard, 28 October 2011 [p5: para 26].
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- 83 Exhibit 1015, Statement of Glen Brumby, 1 November 2011 [p2: para 7].
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- 84 Exhibit 666, Statement of Glen Brumby, 15 September 2011 [p7: para 30]; Attachment 14; Exhibit 1015, Statement of Glen Brumby, 1 November 2011 [p3: para 9].
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- 85 Statement of Glen Brumby, 16 November 2011 [p1-8].
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- 86 Although Building Codes Queensland intends to consider the results of the national consultation process once completed (Exhibit 1015, Statement of Glen Brumby, 1 November 2011 [p13: para 44(i)]).
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- 87 Submission from the Attorney-General’s Department, Commonwealth Government, undated [p3: para 12].
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- 88 Submission from the Attorney-General’s Department, Commonwealth Government, undated [p3: para 13].
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- 89 Submission from the Attorney-General’s Department, Commonwealth Government, undated [p3: para 13].
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# 10

## 10 Essential services

The Commission's interim report examined the adequacy of measures to manage the supply of essential services including power, water and communications during the 2010/2011 floods.

This chapter addresses the damage caused by the 2010/2011 floods to sewerage, stormwater, electricity, telecommunications and roads and rail infrastructure. It considers how damage to this essential services infrastructure can be minimised in future floods, with a particular emphasis on planning and design measures.

### 10.1 Sewage and sewerage

#### 10.1.1 Definitions

'Sewage' is human waste product, sometimes referred to as 'wastewater'.

'Sewerage infrastructure' or the 'sewerage system' is the infrastructure through which sewage flows, for example pipes, pump stations and treatment facilities. In the material before the Commission it is sometimes referred to as 'wastewater infrastructure'.

'Effluent' is sewage in a liquid form that has been treated or partially treated.

#### 10.1.2 The role of sewerage infrastructure

By enabling the safe collection and treatment of human waste, sewerage systems play a critical role in ensuring the health of the community and the environment. These systems were damaged or inundated in a number of locations in the 2010/2011 floods, with, in some locations, the discharge of untreated sewage into residential areas, public parks and waterways.

Sewage disposal occurs either through a centralised public sewerage system or through smaller independent systems, commonly referred to as septic systems, located on private properties (usually in rural areas with more dispersed populations).

A public sewerage system comprises an integrated sewage collection and treatment network. Sewage is collected from individual private premises by service branch lines that transmit the collected material to larger mains. The mains then feed into pump stations and sewers that connect to sewage treatment plants.<sup>1</sup> Within the sewage treatment plants, sewage is passed through a series of biological and chemical treatments that render it safe to be discharged into a waterway or to be used as recycled water.<sup>2</sup>

Public sewerage systems are managed by public authorities. In most parts of Queensland the council is the responsible authority, except in the south-east where sewerage is managed by specialised service providers known as 'distributor-retailers' that are responsible for catchment areas spanning several councils. The councils and distributor-retailers are responsible for the sewerage system up to the point where the sewerage infrastructure connects to the boundary of private properties. Generally, sewerage infrastructure and septic systems on private land are the responsibility of the property owner.

Damage to, or the inundation of, any part of a sewerage system may result in the discharge of untreated sewage, presenting a hazard to health and to the environment, even when diluted. Discharges from public sewerage systems are a particular concern, given the large volume of sewage that passes through them.

### 10.1.3 The regulatory structure applicable to sewerage infrastructure

A number of pieces of legislation regulate sewerage infrastructure.

The *Water Supply (Safety and Reliability) Act 2008* provides the regulatory framework for water and sewerage services in Queensland and sets out the functions and powers of water and sewerage service providers.

The *Sustainable Planning Act 2009* provides the planning framework for the development of water and sewerage infrastructure. Under the Act, any new infrastructure or upgrades to existing infrastructure may be subject to development assessment.

The *Plumbing and Drainage Act 2002* establishes the legislative framework for plumbing and drainage and on-site sewerage facilities in Queensland. It provides a mechanism for enforcing compliance with standards for on-site sewerage work and facilities.

The *Local Government Act 2009* and the *City of Brisbane Act 2010* prohibit the connection of any part of the sewerage system to the stormwater system and give councils the power to take enforcement action to rectify illegal connections.

The *Environmental Protection Act 1994* (and related legislation) imposes standards to ensure that the management of sewerage infrastructure does not unduly cause adverse effects to the environment.

In south-east Queensland, there has recently been a major reform of the administration of water and sewerage networks through the *South-East Queensland Water (Restructuring) Act 2007* and the *South-East Queensland Water (Distribution and Retail Restructuring) Act 2009*. The latter Act created three separate council-owned ‘distributor-retailers’ that took over the management and operation of sewerage infrastructure and services from councils: UnityWater, which serves Moreton Bay and Sunshine Coast regions; Queensland Urban Utilities, which serves the Brisbane, Ipswich, Lockyer Valley, Scenic Rim and Somerset regions; and Allconnex which serves the Gold Coast, Logan and Redland City regions. (Gold Coast, Logan and Redland City councils will take back responsibility from Allconnex on 1 July 2012.) In all other areas the council is responsible for the management of sewerage infrastructure.

### 10.1.4 The impact of the 2010/2011 floods on sewerage infrastructure

The Commission received evidence that sewerage systems were affected in all areas where major flooding was experienced, and that, in many areas, there was a need to warn the public about the possible contamination of public areas and waterways by untreated sewage.

#### Damage to sewerage infrastructure managed by Queensland Urban Utilities

The Commission received detailed evidence from Queensland Urban Utilities about the impact of the 2010/2011 floods on its sewerage system, which serves approximately 1.25 million people.<sup>3</sup> Flooding affected 128 sewerage pump stations operated by Queensland Urban Utilities; they suffered varying levels of damage.<sup>4</sup> Nine sewage treatment plants were affected.<sup>5</sup> The principal damage caused by inundation was to the electrical systems (the generators and switchboards) resulting in critical failures of treatment systems<sup>6</sup> (see section 10.1.6 *Electrical switchboards and generators* below).

The damage to infrastructure and the inundation of the sewerage system resulted in the discharge of untreated sewage through overflow relief structures, which are designed for this purpose, and backflow of sewage into private properties in the Brisbane area. (Overflow relief structures are discussed in section 10.1.7 *Prevention of sewage discharge* below.) The Brisbane City Council issued a media release on 12 January 2011 notifying residents of the prospect that untreated sewage could enter floodwaters and of the risk this posed to human health.<sup>7</sup> The operations log and situation reports for the Brisbane local disaster co-ordination centre show that reports were received of untreated sewage entering waterways and of sewage leaks occurring near residential premises.<sup>8</sup> A situation report of 28 January 2011 identified 19 public parks as possibly contaminated with sewage.<sup>9</sup>

Queensland Urban Utilities' records show that between 11 January 2011 and 25 January 2011 it attended 110 locations to perform site clean-ups, in 65 of those cases responding to reports of 'sewerage flooding / backflow'.<sup>10</sup> (Because its focus was on cleaning up rather than identifying causes, it was unable to confirm whether all cases involved sewage flooding or backflow.<sup>11</sup>) To alleviate public health risks, the organisation used diesel pumps to collect untreated sewage, which was removed by tankers or discharged to waterways.<sup>12</sup> Queensland Urban Utilities' general manager for planning expressed the view that the likely causes of sewage flooding and backflow were the large volume of rain, the height of the floodwaters, the failure of sewerage infrastructure due to inundation and loss of electricity and, possibly, sewerage systems being overwhelmed by stormwater entering through illegal connections.<sup>13</sup>

The owner of an apartment in a multi-storey complex at West End described to the Commission how, during the 2010/2011 floods, dirty water, possibly sewage, rose into baths and toilets in the apartment complex. She suspected that it emanated from the sewerage system because the baths and toilets were not overtapped by floodwater.<sup>14</sup> Queensland Urban Utilities' general manager for planning said the organisation had not received any reports of sewage backflow or flooding at the building at the time, although it was aware of flooding in the general vicinity.<sup>15</sup> Investigations conducted by Queensland Urban Utilities later in 2011 indicated that sewage backflow in West End was caused by a number of factors, including debris in the sewer, a fracture in the cross-river sewerage pipeline that ran under the Brisbane River and the inundation of the Grey Street pump station.<sup>16</sup>

## **Damage experienced elsewhere in Queensland**

The 2010/2011 floods caused significant damage to sewerage infrastructure throughout Queensland. Its repair was expensive, the loss of treatment facilities inconvenient and the releases of untreated sewage a cause of hardship and distress.

The director of infrastructure for the South Burnett Regional Council gave evidence of multiple sewer collapses and damage to sewage treatment plants in the Nanango and Kingaroy areas.<sup>17</sup> The cost of reconstruction of and repairs to the council's water supply and sewerage infrastructure exceeded \$2 million.<sup>18</sup>

In the neighbouring area of North Burnett Regional Council, floodwaters damaged the sewerage pump stations and effluent holding tanks in Mundubbera, Gayndah and Monto. The sewerage system functioned satisfactorily until flooding reached a level which required removal of the control panels and electrical systems.<sup>19</sup> In Mundubbera, floodwater entered the sewerage system through flooded houses, causing an overload of the pump station, which was then shut down.<sup>20</sup> Untreated sewage was discharged into the river system from the Mundubbera and Gayndah pump stations, which had been shut down.<sup>21</sup> Eidsvold also experienced flooding, but it did not suffer the same damage to the sewerage infrastructure as occurred elsewhere in the North Burnett council region. The cost to the council of the reconstruction works required for the water and sewerage systems was around \$2 million.<sup>22</sup>

In St George, in the Balonne region, steps were successfully taken to prevent inundation of the sewerage infrastructure. Sewerage pump stations were sandbagged and sewer entry points below previous flood levels were blocked to prevent floodwater causing backflow.<sup>23</sup>

At Theodore, in the Banana Shire, the sewerage pump station transmitting sewage to the township's sewage treatment plant was flooded. Ergon Energy shut off power to it on the morning of 27 December 2010, preventing further pumping to the treatment plant.<sup>24</sup> By the afternoon of that day, reports were being received of backflow through the sewerage system.<sup>25</sup> In Jericho and Alpha, within the Barcaldine Regional Council area, a number of septic tanks were submerged in floodwater. Following the flooding, sewage pumping trucks were used to pump the tanks out.<sup>26</sup>

In Bundaberg, the sewage treatment plants at Millbank and East Bundaberg were disabled by the council's removal of the plants' electrical systems in anticipation of the inundation which subsequently occurred. Because the sewerage network as a whole is gravity driven, even without a functioning electrical system it continued to deliver sewage to the treatment plants, with the result that untreated sewage was discharged into the waterways. These discharges were heavily diluted; only a negligible impact on the environment was identified.<sup>27</sup> Although the removal of the electrical systems disabled the plants, it meant that systems could be restored more efficiently once the floods subsided.<sup>28</sup> There were also concerns about the malfunctioning of private septic systems: a resident of Gooburrum gave evidence that the floodwaters near his house were declared contaminated because the contents of underground septic tanks had leached into the water.<sup>29</sup> He also said that his neighbour's septic tank had floated up out of the ground.<sup>30</sup>

In the Western Downs, the sewerage systems in Chinchilla and Dalby were affected by flooding, but no major damage was sustained. Sewerage services continued to operate throughout the floods in Chinchilla, despite the main pump station's being located in the flooded area of the town.<sup>31</sup> In Dalby the sewerage network was inundated, although full treatment was restored shortly after the floods receded.<sup>32</sup>

In Kilkivan, effluent ponds forming part of the sewage treatment plant flooded and overtopped.<sup>33</sup> The director of engineering at Gympie Regional Council said that the council investigated claims that effluent may have entered residential premises, but concluded that it had not, and that no harm had been suffered from the overtopping.<sup>34</sup> An SES officer from Kilkivan gave evidence that some houses in Kilkivan were flooded by sewage or effluent, including one located only 500 metres from the sewage treatment plant; but he acknowledged that it was not clear whether the source of the waste in that house was the sewage treatment plant or private septic systems.<sup>35</sup> One of the houses he identified was ultimately condemned, at least in part because of evidence that sewage had entered the house.<sup>36</sup>

The chief executive officer of UnityWater, the distributor-retailer that provides sewerage services for the Moreton Bay Regional Council and the Sunshine Coast Regional Council, gave evidence that almost \$1 million in damage was suffered to the sewerage systems of Maroochydore, South Buderim, Caloundra (Golden Beach and Dicky Beach), Kallangur, Brendale and Murrumba Downs.<sup>37</sup>

In the Southern Downs, the Stanthorpe sewage treatment plant was inundated by floodwaters.<sup>38</sup>

In Emerald, 19 of the 30 sewerage pump stations were inundated by floodwater; of those, seven suffered electrical damage as a result of their control panels or switchboards being submerged. The 12 pump stations that did not suffer electrical damage were able to return to service once the floodwaters subsided.<sup>39</sup> In Rolleston, two pump stations were flooded and suffered electrical damage.<sup>40</sup>

## 10.1.5 The location and design of public sewerage infrastructure

### The location of public sewerage infrastructure

The location of the plant and infrastructure in public sewerage systems is constrained by a number of factors, which in combination often lead to the location of public sewerage systems in areas susceptible to flooding.

Sewage treatment plants have to be located within reasonable proximity of the communities that they serve. The distance from the point of collection of sewage to the location of its treatment must be minimised, because sewage degrades when it travels over distance, affecting its treatability.<sup>41</sup> (At the same time, of course, a buffer between residential areas and sewage treatment plants is desirable.<sup>42</sup>) Additional limiting factors include the need to allow access for maintenance and the need to allow for the location of other infrastructure, such as stormwater systems and underground power cables.<sup>43</sup>

Most sewerage infrastructure networks are driven by gravity and are designed to make use of the gradient of the land. Although alternative systems (such as pressurised sewerage systems) exist, gravity based systems are the most cost effective because of their relatively low power consumption and pumping costs. As a result, sewerage systems are usually designed to drain to the lowest point of the natural land layout and sewage treatment plants are typically located on low lying land.<sup>44</sup> Treatment plants require discharge points for the release of treated sewage and, in an emergency, of untreated sewage, which means that they are usually positioned adjacent to waterways, such as rivers or creeks.<sup>45</sup> In consequence, the natural site for a sewage treatment plant will often be on low lying land near a waterway, which may be susceptible to flooding.

State Planning Policy 1/03 imposes particular development outcomes on development within 'natural hazard management areas', which includes areas identified as likely to be inundated during a 'Defined Flood Event'. There is a specific development outcome that '[e]ssential services infrastructure (e.g. on-site electricity, gas, water supply, sewerage and telecommunications) maintains its function during a [defined flood event].'<sup>46</sup> The 'Defined Flood Event' is determined for each area by the relevant council, but is typically identified by reference to the 1% AEP flood.<sup>47</sup> It does not necessarily encompass all land that might, at some time, flood. This development outcome is not mandatory and can be departed from where there is an overriding need in the public interest or in order to satisfy a development commitment.<sup>48</sup> Whether an overriding need exists depends on an assessment of the net economic, social and environmental benefits to the community and the likelihood of suitable alternative sites being available.<sup>49</sup>

State Planning Policy 1/03 applies where a natural hazard area for flood has been identified, unless a local planning instrument has been recognised as compliant with it, in which case the local planning instrument applies.

For example, Bundaberg Regional Council has jurisdiction over four legacy planning schemes from pre-amalgamation councils. Codes within three of them - the Bundaberg City Flood Management Code,<sup>50</sup> the Burnett Shire Natural Features or Resources Overlays Code,<sup>51</sup> and the Isis Shire Residential Zone Code<sup>52</sup> - contain provisions about the protection of sewerage infrastructure from flooding similar to those in State Planning Policy 1/03, whereas in Kolan Shire, there are no provisions.<sup>53</sup>

Queensland Urban Utilities gave evidence that, during the planning stage for sewerage infrastructure, consideration is given to flood risk, including the proposed site's history of flooding, hydrological site assessments, Q100 levels, flood models and the resilience of the proposed infrastructure to flooding.<sup>54</sup> These factors are weighed against engineering and commercial considerations.

UnityWater explained that the design manuals applicable to its area of operation specify various flood resilience parameters for sewerage pump station wet wells and switchboards. It noted that the level to which sewage treatment plants should be built is not specified, but that all of its sewage treatment plants are located above the 1% AEP flood level.<sup>55</sup>

The North Burnett Council, which had a number of pumping stations affected by flood, is in the process of lifting low-lying pumping stations to higher elevations to improve their flood resilience. The director of technical services for the North Burnett Regional Council noted that even after such changes are made, pumping stations remain vulnerable to being overwhelmed by the entry of water into the sewerage system through flooded homes.<sup>56</sup>

The evidence does not lead the Commission to conclude that there is a need for any fundamental reconsideration of the location of sewerage infrastructure to reduce its flood susceptibility. The approach taken in State Planning Policy 1/03 appears sound. However, in light of the reality that many sewage treatment plants are located in areas susceptible to flooding, improving resilience through design of the infrastructure is important.

## **The design of sewerage infrastructure**

The Department of Environment and Resource Management (DERM) Planning Guidelines for Water Supply and Sewerage, prepared by the Queensland Government to assist in strategic planning for water and sewerage,<sup>57</sup> provide guidance on process and principles, rather than specific technical requirements. The general manager for Queensland Urban Utilities gave evidence that it had a general rule of operating within the guidelines, but found them in some instances impractical. He noted, as an example, that section 5.2.2 of chapter 5 of the guidelines suggested the peak wet weather flow in a sewer could be modelled as five times the average dry weather flow; whereas Queensland Urban Utilities experienced up to thirty times the average dry weather flow through its network during extreme weather events.<sup>58</sup> The representative of one regional council indicated that it had moved from reliance on the guidelines to use of the Water Services Association of Australia Codes, an industry publication.<sup>59</sup>

Queensland Urban Utilities has adopted a formal sewer overflow mitigation strategy (developed by reference to industry guidelines, including the DERM guidelines)<sup>60</sup> as part of its strategic asset management plan. One component of the strategy is to identify areas that are at risk of sewage flooding or backflow to allow the authority to direct its infrastructure upgrade, maintenance and education campaigns to those vulnerable areas and to track sewage flows more closely. It has a case management approach for properties that are particularly susceptible to sewage flooding or backflow (as identified from a history of past complaints, the condition of the sewerage system, and hydraulic models of the sewerage system)<sup>61</sup> to ensure they are given priority.<sup>62</sup>

Queensland Urban Utilities' sewerage network has been constructed with reserve capacity to allow it to continue to function in the event of failure of one part of the system. For example, it has storage areas for sewage and back-up generators for the event of power failure.<sup>63</sup> The network has overflow relief structures built into it which, in emergency situations, discharge sewage into local watercourses to prevent discharges in residential areas.<sup>64</sup> Pump stations are typically designed to include submersible pumps and motors that are not affected by floods. Electrical control panels are elevated, to some extent, to minimise the risk from flooding.<sup>65</sup>

UnityWater adverts to similar matters to those considered by Queensland Urban Utilities in the design and management of sewers. The chief executive officer explained that the requirement that all sewers are built to at least five times the average dry weather flow allows for the inevitability that there will be defects and openings in any sewer through which stormwater runoff and groundwater can enter.<sup>66</sup> Standards are applied in the design of certain components of the sewer network, such as a requirement that sewerage pumping station wet walls must be finished 300 millimetres above the level of the flood with an average recurrence interval of 20 years.<sup>67</sup> Sewers must

be a minimum of 150 millimetres in diameter to minimise blockages.<sup>68</sup> The chief executive officer explained that UnityWater uses hydraulic models to model sewage flows to identify areas that may need to be reinforced, and it is presently installing a supervisory control and data acquisition system that will allow it to monitor and control pumping stations remotely.<sup>69</sup>

The flood resilience of the sewerage network can be improved by sealing, or by sealing and pressurising, the sewerage pipe network to prevent stormwater or floodwater entering the network.<sup>70</sup> Sealed systems comprise pipes and maintenance shafts with welded joints to prevent stormwater or tree roots entering the system.<sup>71</sup> A pressure system is operated by a pumping unit located on each property, rather than by gravity. The pump requires power to operate and is therefore an increased cost to the property owner.<sup>72</sup> Queensland Urban Utilities suggested that the Australian Building Codes Board standard presently being developed should include a requirement that all new developments have sealed sewers and all new developments in areas that are susceptible to flood have sealed and pressurised sewers.<sup>73</sup> The Commission has not received detailed evidence on the advantages and disadvantages of these systems and is not a position to make a finding as to whether the Australian Building Codes Board standard should contain such a requirement.

Queensland Urban Utilities pointed out that its ability to take control over the design of sewerage infrastructure was limited by the fact that it has no role in planning decisions such as the location of new property developments. It is simply obliged to provide sewerage infrastructure for whatever is planned or developed,<sup>74</sup> although it does act as a referral agency for major developments and thus has a role in assessing those development applications.<sup>75</sup> A further limitation is that property owners are responsible for all sewerage systems and plumbing to the boundary of their property, over which the authority has no control.<sup>76</sup> Queensland Urban Utilities suggested that there may be advantages to allowing it greater involvement in planning processes and the setting of development conditions through more direct engagement between it and councils.<sup>77</sup>

Queensland Urban Utilities' suggestion has merit: there are obvious benefits to ensuring that planning and development decisions that affect sewerage infrastructure are made in consultation with the authority responsible for the management of that infrastructure. However, there are a number of ways in which that might be achieved and it is unnecessary for this Commission to select a mechanism. The Queensland Government intends to conduct a review, due to be completed by July 2013, of the planning and development assessment arrangements across the south-east Queensland region to determine the role of distributor-retailers in land use and infrastructure decision-making processes.<sup>78</sup>

As noted above, evidence was received that floodwater may have been contaminated by sewage leaking from private on-site sewerage systems, such as septic tanks. The Commission did not receive detailed submissions on the adequacy of the design standards applicable to private on-site sewerage systems. Relevant standards are set out in the Queensland Plumbing and Wastewater Code, which provides acceptable performance solutions to meet the statutory requirements of the *Plumbing and Drainage Act*.<sup>79</sup> Flood resilience is not a specific performance criterion and is not mentioned in the code at all. It appears to the Commission that this is a matter that it would be prudent for the Queensland Government to consider for inclusion as a performance criterion.

## Recommendation

- 10.1 The Queensland Government should consider including in the criteria in the Queensland Plumbing and Wastewater Code a requirement that the risk of leakage from private on-site sewerage systems during floods be minimised.

### 10.1.6 Electrical switchboards and generators

The main damage to sewerage infrastructure during the 2010/2011 floods was to the electrical switchboards and generators, which are not designed to withstand submersion in water.<sup>80</sup> The other principal components of the system, for example pumps, are typically designed to be submersible and are not affected by inundation (although they are vulnerable to impact damage, and some parts are susceptible to power outages).

Damage to the switchboards and generators resulted in critical failures to treatment systems. This infrastructure is vital to the operation of the system as a whole; its susceptibility to inundation determines whether the sewerage

system can function during a flood, and it affects the length of time required for the system to become operational again after a flood.

The State Planning Policy 1/03 Guideline provides suggested solutions to achieve the planning outcome that sewerage infrastructure must continue to function during a Defined Flood Event (DFE).<sup>81</sup> It proposes, relevantly, that any components of the infrastructure that are likely to fail to function or may result in contamination when inundated by floodwater (for example, electrical switchgear and motors) are '(a) located above the DFE; or (b) designed and constructed to exclude floodwater intrusion/infiltration'.<sup>82</sup>

Queensland Urban Utilities' chief operating officer gave evidence that, where practical, critical electrical and mechanical infrastructure is located at elevated levels within the sewerage system.<sup>83</sup> He observed that in existing infrastructure this is not necessarily above the Q100 level.<sup>84</sup> Following the 2010/2011 floods, Queensland Urban Utilities considered moving switchboards in sewage treatment plants to above the Q100 level, but preferred, given the considerable design and site works that would have been involved, to focus on restoring operational infrastructure to its pre-flood condition.<sup>85</sup>

UnityWater gave evidence that its understanding of the combined effect of the Queensland Government guidelines and the design manuals of the councils within its jurisdiction was that sewerage pumping station switchboards must be located one metre above the level of the flood with an average recurrence interval of 50 years.<sup>86</sup>

Queensland Urban Utilities is reassessing the appropriate positioning of electrical systems in new infrastructure, and has commissioned consultants to reassess new infrastructure being built in an upgrade of the Fernvale and Lockyer Valley sewage treatment plants.<sup>87</sup> It has also commissioned a firm of consulting engineers to undertake a study of the resilience of its existing infrastructure, including the electrical systems, against future floods.<sup>88</sup> In advance of this study's being finalised, Queensland Urban Utilities has relocated to higher ground a major power generator at Oxley Creek sewage treatment plant, which was flooded in the 2010/2011 floods.<sup>89</sup>

The general manager for planning for Queensland Urban Utilities suggested that in all new developments in areas susceptible to flooding there should be a requirement that, subject to funding constraints, critical infrastructure should be located above peak maximum flood levels.<sup>90</sup> The Commission has not received detailed evidence on the relative costs, advantages and disadvantages of mandating that critical infrastructure is always located above a prescribed flood level, whether that be 1% AEP flood, highest historical flood or probable maximum flood level. (Certainly the last seems an over-cautious approach.) It may be that in certain locations the cost of designing and constructing a sewage treatment plant with elevated critical infrastructure is disproportionate to the benefits to be obtained. The Commission considers it desirable that relevant authorities undertake risk and cost/benefit analyses of upgrading existing infrastructure where there have been significant adverse effects from flooding on the infrastructure and, in consequence, on the community. When resources allow, the review of other infrastructure to determine whether it should be upgraded would be desirable; priority should be given to areas that are most vulnerable to inundation.

## *Recommendations*

- 10.2 Authorities responsible for the construction of sewerage infrastructure should, when embarking on new works, undertake risk and cost/benefit assessments to determine the level at which electrical infrastructure that may be vulnerable to inundation should be placed.
- 10.3 Authorities responsible for the management of sewerage infrastructure should conduct a review of their existing infrastructure to identify electrical infrastructure that may be vulnerable to inundation and perform risk and cost/benefit assessments to determine if it should be relocated to a higher level.

### 10.1.7 Prevention of sewage discharge

When the sewerage system becomes overwhelmed, untreated sewage sometimes discharges through household drains and toilet pedestals.<sup>91</sup> In general, such discharges are a greater danger to human health than sewage contaminated floodwater because they are undiluted.<sup>92</sup> A number of mechanisms can be installed within the

sewerage system to mitigate or prevent these discharges: overflow relief structures, overflow relief gully grates and sewage reflux valves.

## Overflow relief structures

Overflow relief structures are built as part of the public sewerage system to provide an outlet for sewage to discharge in emergency situations or in extreme weather events. They are pipes designed to discharge the untreated sewage into a waterway; while undesirable, this is preferable to discharging to residential or commercial properties. As already described, these overflow relief structures discharged untreated sewage into waterways in Brisbane during the 2010/2011 floods.

Overflow relief structures are typically located adjacent to waterways<sup>93</sup> or in other locations where the discharge will have a minimal effect on people and the environment and the discharge can be cleaned up efficiently.<sup>94</sup> However, when the levels of waterways are elevated, overflow relief structures near waterways may become submerged and incapable of discharging excess sewage from the overloaded system. The increase in water pressure throughout the sewerage network may then result in backflow, lifting manhole covers and causing localised flooding elsewhere in the system. Manhole covers can be secured to ensure that this does not occur, although there is the possibility that this may in turn cause backflow into residential ground floor facilities through shower grates and toilet pedestals.<sup>95</sup> Overflow relief structures, therefore, cannot be relied on to provide complete protection against sewage discharges during extreme weather events.

## Overflow relief gully grates

Overflow relief gully grates are small grates located on residential premises within the private property boundary. They are connected to the sewerage system and have an opening at a lower height than the lowest bathroom or kitchen fixture within the premises. Their purpose is to ensure that if there is any backflow into the private sewer system, the discharge will occur through the overflow relief gully grate outside the house rather than through the bathroom or kitchen fixtures.<sup>96</sup>

Overflow relief gully grates cease to function if the level of stormwater or floodwater rises above the height of the grate outlet; at this point they become an entry point for stormwater into the sewerage system. Queensland Urban Utilities intends to trial different designs for overflow relief gully caps to prevent stormwater entering the grates:<sup>97</sup> a welcome initiative. The problems caused by the entry of stormwater into the sewerage system are discussed further at *10.1.8 Illegal connections of stormwater to sewerage infrastructure* below.

## Recommendation

- 10.4 Queensland Urban Utilities should make the results of its trials on the use of caps for overflow relief gully grates available to other authorities responsible for sewerage infrastructure. Consideration should be given by those authorities as to how the results can be used to improve the flood resilience of their sewerage networks.

## Sewage reflux valves

Sewage reflux valves, also known as backflow preventers, are devices that can be installed in household sewerage systems. They act as one-way valves to prevent the backflow of sewage into private sewer systems and then into bathroom or kitchen fixtures. Under current arrangements, it is up to house owners whether or not they install sewage reflux valves at their properties. Queensland Urban Utilities considers that householders are typically reluctant to install these valves because they may preclude the use of toilets and showers during floods, since when in operation they prevent waste from being discharged from the property.<sup>98</sup> Another cause of reluctance is that, since the backflow preventers are located on private premises, their maintenance is the responsibility of the landowners rather than a public authority.<sup>99</sup>

In some locations, a variant of a sewage reflux valve known as a gate valve is used. These are manually operated valves that require comparatively less maintenance.<sup>100</sup> Backflow can also be prevented through the use of sealed and pressurised sewers on private property.<sup>101</sup>

On 2 February 2011, Building Codes Queensland presented a paper to the Plumbing Industry Council that outlined its concerns that sewage infiltration from sewerage mains caused significant damage to properties that were not inundated with floodwater in the 2010/2011 floods. It stated that overflow relief gullies failed to provide adequate protection and recommended that properties in low-lying areas subject to flooding should install reflux valves at the boundary connections to prevent surcharge from sewer mains.<sup>102</sup> No proposal was made to amend legislation to make such installations mandatory, because the matter was being reviewed by councils.<sup>103</sup>

Subsequently, a proposed new part of the Queensland Development Code has included a requirement imposing new standards for the prevention of sewage reflux through the mandatory installation of sewage reflux valves in new buildings in designated flood hazard areas.<sup>104</sup> The proposed new part of the code requires that the sanitary drain for a building be protected from backflow by fitting a reflux valve for sewage between the building and the point of connection to the public sewerage infrastructure. The installed reflux valve should be accessible for maintenance.<sup>105</sup>

Councils generally support the inclusion of reflux valves as a mandatory part of the Queensland Development Code, noting, however, that the valves can fail if not maintained properly.<sup>106</sup> The Building Services Authority has also noted that reflux valves are not always effective.<sup>107</sup> An independent engineering consultant engaged by the Commission commented that while reflux valves are effective in preventing backflow during floods, because they are prone to blockage and may increase head losses, they should only be used where sewage backflow is likely to occur.<sup>108</sup> The maintenance of reflux valves is an issue that lends itself to the development of guidance material, particularly where responsibility for maintenance falls upon the homeowner. Should the Queensland Development Code include mandatory provisions related to the installation of reflux valves, the Queensland Government should develop appropriate advisory material for homeowners.

It is uncontroversial that mitigating the risk of sewage reflux and improving flood resilience of the sewerage infrastructure are desirable outcomes and that, at least in some circumstances, the installation of sewage reflux valves assists in achieving them. However, the Commission has not received detailed evidence on the relative advantages and disadvantages of these valves in all situations. It is not, therefore, in a position to reach a conclusion on the merits of including in the Queensland Development Code a requirement for the mandatory fitting of sewage reflux valves. (See section 9.5 *Proposed new part of the Queensland Development Code: ‘Construction of buildings in flood hazard areas’* for further discussion of the Queensland Development Code.)

## Recommendation

- 10.5 If the Queensland Development Code is amended to include provisions requiring homeowners to install sewage reflux valves, the Queensland Government should develop and make available to homeowners appropriate guidance material to assist them in meeting their responsibilities to maintain reflux valves.

### 10.1.8 Illegal connections of stormwater to sewerage infrastructure

The sewerage and stormwater systems serve different purposes. The stormwater system manages rainfall, whereas the sewerage system is designed to collect and transfer human waste to sewage treatment plants.<sup>109</sup> The sewerage system is not designed to convey significant quantities of stormwater or floodwater and may be overwhelmed if large volumes of either enter the system.<sup>110</sup> If the sewerage system’s capacity is exceeded, untreated sewage will be directed into waterways through overflow relief structures.<sup>111</sup>

The discharge of stormwater into the sewerage system is prohibited under section 193 of the *Water Supply (Safety and Reliability) Act*. Notwithstanding this, the chief operating officer of Queensland Urban Utilities described the practice of property owners directing a downpipe from a building’s roof into the sewer overflow grate as ‘quite common’.<sup>112</sup> That conclusion was drawn in part from the dramatic increase in the volume of flow experienced through Queensland Urban Utilities’ system during exceptional weather events<sup>113</sup> (although such flows could also be caused by stormwater entering broken sewerage pipes or by the inundation of inlets or outlets).<sup>114</sup> It is also based on the results of what Queensland Urban Utilities general manager of planning described as ‘smoke testing’: the introduction of smoke into the sewerage system so that the smoke will then rise through the sewers and emit from the gutters of houses that have stormwater pipes connected to the sewerage system.<sup>115</sup> Queensland Urban Utilities expressed its concern that homeowners connecting their stormwater systems to the sewerage system may have

contributed to the sewerage system's being overwhelmed in the 2010/2011 floods.<sup>116</sup> UnityWater also identified the existence of illegal connections; when it conducted surveys of the areas for which it is responsible, it found that between 5 and 10 per cent of properties surveyed had illegal connections.<sup>117</sup>

The Brisbane City Council has a different view of the prevalence of such illegal connections: during the December 2010/January 2011 period it recorded only seven cases in which stormwater drainage systems were illegally connected to sewerage systems, six of them related to connections to private sewerage drainage systems rather than to Queensland Urban Utilities' infrastructure.<sup>118</sup> Only four more instances were investigated in the intervening period to November 2011.<sup>119</sup> Brisbane City Council regards the impact of illegal stormwater connections to sewerage infrastructure as perhaps 'overstated', having regard to the low incidence of illegal connections and the relatively low volume of stormwater entering the sewerage infrastructure through illegal connections where they occur.<sup>120</sup>

The divergence of views between Queensland Urban Utilities and the Brisbane City Council as to the proportions of the problem of illegal connections may arise from a difference in approach to analysis of the issue: Brisbane City Council points to the rates of enforcement, whereas Queensland Urban Utilities focuses on the number of probable illegal connections it has identified through flow analysis and smoke testing, without enforcement action. Another possibility is that the issue of illegal stormwater connections is not as significant in Brisbane as elsewhere in Queensland Urban Utilities' area of operation. The Commission has not received evidence on this point from the other councils in areas Queensland Urban Utilities serves.

Illegal connections are not the only means by which stormwater enters the sewerage system; for example, it may enter through uncapped sewerage relief gully grates. The DERM Planning Guidelines for Water Supply and Sewerage specifically incorporate 'unauthorised roof, ground or stormwater drainage' as a component in determining 'peak wet weather flow', a value used in calculating the minimum capacity of the sewerage system.<sup>121</sup> That recognition suggests that the problem of illegal stormwater connections should be considered by sewer designers and an allowance made for a degree of surplus capacity to accommodate it.

Up until July 2010, councils were responsible for the sewerage networks and still retain that responsibility outside of south-east Queensland. A prohibition on connections of stormwater to sewerage infrastructure is imposed by, and associated enforcement powers are granted to councils under, the *Plumbing and Drainage Act*, the *Standard Plumbing and Drainage Regulation 2002*, the *Sustainable Planning Act*, *Local Government Act* and, in the case of the Brisbane City Council, the *City of Brisbane Act*. The councils' enforcement powers under the *Plumbing and Drainage Act* include the power to issue written notices to the owners of premises with illegal drainage or to the person who performed the plumbing or drainage work requiring the recipient to do such things as may be stated in the notice:<sup>122</sup> typically, to rectify the illegal connection.<sup>123</sup> Similar powers are conferred by the *Local Government Act* and the *City of Brisbane Act*.<sup>124</sup> All three pieces of legislation empower council representatives to enter private property with the occupier's permission or with a warrant.<sup>125</sup> Councils do not have a regulatory or enforcement role under the *Water Supply (Safety and Reliability) Act*,<sup>126</sup> but, in the view of the Brisbane City Council, their existing powers under legislation are adequate to prevent, and order rectification of, illegal connections.<sup>127</sup>

The enforcement and investigation powers vested in the councils have not been transferred to the distributor-retailers, despite the transfer of responsibility for water and sewerage services.<sup>128</sup> A distributor-retailer may enter 'places' for the purpose of repairing its own infrastructure,<sup>129</sup> but not for the purpose of identifying illegal connections of stormwater pipes to the sewerage system and, in any event, not into parts of 'places' used for residential purposes.<sup>130</sup> Nor can it compel the disconnection of such connections.

Queensland Urban Utilities' present practice is that when it identifies a suspected illegal connection, it reports the matter to the relevant council, which is then responsible for inspecting the property or otherwise dealing with the private property owner.<sup>131</sup> However, Queensland Urban Utilities submitted that the councils' use of powers was directed primarily towards stormwater management, and ensuring sewerage discharges did not enter the stormwater system, rather than the converse.<sup>132</sup> When smoke testing of properties is conducted, Queensland Urban Utilities personnel attend sites together with personnel from the council responsible for that area.<sup>133</sup> Queensland Urban Utilities described the level of co-operation between it and its participating councils as 'very good', but it suggested that it was an inefficient use of resources to have personnel from both the distributor-retailer and the relevant council present when investigating illegal stormwater connections.<sup>134</sup> In Queensland Urban Utilities' view, the current regulatory framework is inadequate.

Queensland Urban Utilities submitted that stormwater flows within the sewerage system could be effectively reduced through two measures. First, it proposed increased community and industry education on the need to maintain separate sewerage and stormwater systems and the importance of not connecting stormwater systems to the sewerage systems; some property owners may not be aware that the systems are separate or may not appreciate the importance of the separation.<sup>135</sup> Second, it suggested an extension of the statutory powers of distributor-retailers like Queensland Urban Utilities under the *Water Supply (Safety and Reliability) Act* to allow them to investigate whether illegal stormwater connections exist on private properties and, if so, to require their removal.<sup>136</sup> UnityWater and Ipswich City Council made similar submissions to the Commission.<sup>137</sup> Another proposal was for a statutory requirement that any house to be sold be subject to inspection of its stormwater connections prior to sale.<sup>138</sup> If all else failed, ‘enhanced’ sewer planning in areas prone to flooding or stormwater flow might need to be considered.<sup>139</sup>

The Commission is not in a position to make findings about the extent to which illegal connection of stormwater pipes to sewerage infrastructure causes sewerage flooding. However, it seems clear that illegal connections do occur and, if allowed to go unchecked, have the potential to affect adversely the ability of the sewerage system to withstand extreme weather events. There seems, also, to be a gap in the practical workings of the enforcement regime applicable to illegal stormwater connections. However, the Commission is unconvinced that the remedy is to extend powers of entry or enforcement to an additional group of entities. The distributor-retailers have the technological capability to detect illegal connections of stormwater to sewage infrastructure. The better course is for them to work with councils, providing evidence for enforcement action, with a mutual exchange of information.

## Recommendations

- 10.6 Queensland Urban Utilities, and other distributor-retailers and councils, that have identified a practice of stormwater drains being connected to sewerage infrastructure, should conduct a program of education to raise public awareness that this practice is illegal and impedes the operation of the sewerage infrastructure.
- 10.7 Councils and distributor-retailers should agree to protocols for the exchange of information about suspected illegal connections, the steps being taken to investigate them or the basis for concluding that no investigation is required, and the results of any investigations or enforcement actions.

### 10.1.9 Interactions with disaster management groups

Queensland Urban Utilities raised a concern that, despite its role as a provider of essential services in contact with the public, as users of sewerage services, it did not have any direct involvement with or line of communication to the state disaster management group during the 2010/2011 floods.<sup>140</sup> Instead, the state disaster management group engaged with the SEQ Water Grid Manager.<sup>141</sup> Queensland Urban Utilities pointed out that while the SEQ Water Grid Manager undoubtedly has an important role to play in disaster management, unlike Queensland Urban Utilities it has no responsibility for sewerage and does not interact directly with the end users of sewerage services.<sup>142</sup>

That concern would appear to be met by 48A of the *Disaster Management Act 2003* (inserted into the Act by the *Disaster Readiness Amendment Act 2011*) which requires disaster management groups to consult with providers of essential services, such as sewerage infrastructure, if the chairperson of the disaster management group considers that the provider can assist the group. Disaster management groups are defined in the *Disaster Management Act* to include state, district and local groups.<sup>143</sup>

For the reasons outlined by Queensland Urban Utilities, it is likely that in many disaster situations, particularly major floods, Queensland Urban Utilities and other distributor-retailers will be well-placed to assist the relevant disaster management group.

## 10.2 Stormwater

### 10.2.1 Overview of the stormwater network

#### The role of the stormwater network

Stormwater is rain water that has not yet entered a river system or soaked into the ground. The aim of the stormwater network is to ensure that stormwater flows generated from developed catchments cause minimal nuisance, danger and damage to people, property and the environment.<sup>144</sup> Those parts of the stormwater system that are used primarily to manage the quality of the water, rather than its flow,<sup>145</sup> are not considered in this report.

The stormwater network comprises:

- a. stormwater infrastructure, which is the civil works built for the primary purpose of stormwater collection and conveyance, such as pipes, gullies, inlets and culverts
- b. natural components such as overland flow paths and waterways.<sup>146</sup>

In Australia, stormwater and sewerage networks are designed to operate separately: the stormwater network is not designed to process human waste, and sewerage networks do not have the capacity to carry the volume of flows caused by stormwater.<sup>147</sup> The problem of stormwater infiltration into the sewerage system is discussed in section *10.1 Sewage and sewerage*.

The stormwater network provides some flood mitigation benefits, but is not designed to manage major creek or river flooding.<sup>148</sup> If the stormwater network is poorly designed or poorly maintained it may provide only limited flood mitigation benefits. Areas with old stormwater networks constructed for smaller populations than those they now serve, or built to outdated design standards, are flooded more frequently by stormwater than areas with modern networks.<sup>149</sup>

Stormwater contributed to flooding in many locations in the 2010/2011 floods, sometimes in combination with riverine flooding. There are two particular types of stormwater flooding which will be dealt with in some detail in this section: flooding of basements by stormwater, which is discussed in section *10.2.4 Basements*, and flooding by stormwater by backflow through the pipe network, which is discussed in section *10.2.6 Backflow flooding*. The latter type of flooding was especially a problem in low-lying areas of Brisbane, occurring even before the banks of the river had been breached.

#### The components of stormwater networks

Stormwater pipes are pipes designed for the purpose of collecting and conveying stormwater. They include both stormwater drains and secondary pipes that link gullies and inlets to the stormwater drains.<sup>150</sup> Stormwater pipes are often located underground.

Gullies and inlets are entry points for stormwater to enter stormwater pipes. The term ‘gully’ usually refers to a gridded box inlet of the type commonly seen in suburban streets. ‘Inlets’ are usually openings in parks or open areas.<sup>151</sup>

Kerbs and channels (or gutters) are the structures built on the sides of roads that allow the road surface to convey water flow.<sup>152</sup>

Culverts are short passageways under roads designed to allow stormwater to flow from one side of the road to the other without being dammed by the roadway.<sup>153</sup>

Detention basins are depressions in the ground constructed for the purpose of catching and holding stormwater. The captured water is then drained out gradually by a pipe, so that the release has a reduced impact, compared to its effect if the same volume of water flowed uncontrolled during a large inundation.<sup>154</sup>

A backflow prevention device is a one-way valve installed at, or near, the point at which a stormwater pipe discharges into a waterway. The purpose of the device is to ensure that, if the water levels rise in the waterway, water does not flow back through the stormwater network and flood low-lying areas.<sup>155</sup> Backflow prevention devices are discussed in more detail at section *10.2.6 Backflow flooding* below.

The other key components of the stormwater network are waterways and overland flow paths.<sup>156</sup> In each case they may be naturally occurring or partially or totally constructed.<sup>157</sup> Waterways include creeks, rivers and wetlands. Overland flow paths are depressions in the ground in which water accumulates and then flows.<sup>158</sup>

## 10.2.2 The regulatory structure applicable to stormwater networks

A number of pieces of legislation regulate stormwater infrastructure.

The *Sustainable Planning Act 2009* provides the planning framework for managing the process by which development takes place, which includes carrying out plumbing and drainage work. All new work may be subject to development assessment.

The *Plumbing and Drainage Act 2002* establishes the legislative framework for plumbing and drainage work. It requires that stormwater drainage be kept separate from sewerage infrastructure.

The *Building Act 1975* requires that stormwater drainage be taken into account in building development approvals and stormwater runoff considered in building work undertaken in areas susceptible to erosion.

The *Local Government Act 2009* and the *City of Brisbane Act 2010* prohibit the connection of any part of the sewerage system to the stormwater system and give councils the power to take enforcement action to rectify illegal connections.

The *Environmental Protection Act 1994* (with related legislation) imposes standards to ensure that the management of stormwater and drainage does not cause undue adverse effects to the environment. The *Environmental Protection (Water) Policy 2009* requires councils to develop and implement urban stormwater quality management plans to manage the quality of urban stormwater flows.

## 10.2.3 The design and construction of stormwater networks

### Design principles

The stormwater network has a role to play in flood mitigation; however, it is not constructed to manage major river or creek flooding.<sup>159</sup> As with any infrastructure, stormwater infrastructure is only effective up to its design limits. Stormwater design standards aim to strike a balance between managing risk and the cost to the community, rather than to provide immunity from all stormwater flows.<sup>160</sup> For example, the underground pipe network is constructed to cope with stormwater from a storm with an average recurrence interval of 2 years to a storm with an average recurrence interval of 10 years;<sup>161</sup> its capacity will be exceeded during major inundations.<sup>162</sup> While it may be possible to build the network to accommodate rarer floods, for example to cope with a storm with an average recurrence interval of 100 years, this would involve higher capital and maintenance costs and is generally not economically feasible.<sup>163</sup>

Urban stormwater drainage systems are generally designed on a minor/major storm basis. The piped drainage system is designed to manage frequent minor storms of low severity, while the system of overland flow paths caters for severe storms which exceed the piped system.<sup>164</sup> Most stormwater flooding problems are caused by the inadequate capacity of one of these systems.<sup>165</sup> This is particularly an issue in older areas of cities and towns, where urban stormwater systems were designed before the advent of modern runoff and overland flow path practices.<sup>166</sup>

Councils are responsible for managing and enforcing compliance with stormwater standards in their respective jurisdictions through the design standards and development codes they administer.<sup>167</sup> The only stormwater infrastructure managed directly by the Queensland Government is that relating to state owned roads, for which the Department of Transport and Main Roads is the responsible authority.<sup>168</sup>

The Queensland Urban Drainage Manual is a stormwater planning and design guide produced by DERM in collaboration with councils and industry representatives.<sup>169</sup> The last edition was prepared in 2007. The manual is not mandatory, but it is used as a benchmark by councils to develop their own stormwater policies and standards.<sup>170</sup> Its contents are widely accepted and implemented by councils across Queensland.<sup>171</sup> The Queensland Development Code also sets out model standards for stormwater drainage for use by councils; however, they do not have any legislative force and are only advisory in nature.<sup>172</sup> (See section 9.5 *Proposed new part of the Queensland Development Code: 'Construction of buildings in flood hazard areas'* for a more detailed discussion of the Queensland Development Code.)

Stormwater infrastructure is most efficiently installed contemporaneously with other development. Careful attention to stormwater drainage systems when they are built is essential; upgrades of inadequate systems can be very expensive, and may be impossible.<sup>173</sup> In designing new stormwater infrastructure it is important to consider both its local effect and its effect on the network, to ensure it does not exacerbate flooding locally or in other areas. In the land planning process, it is the responsibility of the developer not to increase the runoff downstream of the development.<sup>174</sup> For example, where land is built up with fill prior to the construction of a new development, care should be taken that there are no impacts by way of ponding or runoff to adjoining properties.<sup>175</sup> (See section 7.6 *Placement of fill and development in a floodplain.*)

Stormwater design policies and standards, such as those set out in the Queensland Urban Drainage Manual, apply to new development.<sup>176</sup> They do not require that existing infrastructure be upgraded to meet the standards.

The Queensland Urban Drainage Manual specifies that the minor drainage system, which includes the underground drainage systems, should be built with sufficient capacity to convey flows from minor storm events in a way that does not pose a risk to pedestrians;<sup>177</sup> some inundation of the roadways is permitted.<sup>178</sup> A minor storm is one that has an average recurrence interval of between 2 and 10 years; which recurrence interval within that range applies depends on the level of urbanisation.<sup>179</sup> Some older stormwater networks, such as some of those in Brisbane and Ipswich, do not meet this standard.<sup>180</sup> The upgrade and optimisation of existing networks is considered further in section 10.2.5 *The maintenance and optimisation of stormwater systems.*

The needs of stormwater networks differ across Queensland depending on factors such as topography, climatic conditions, the size of the catchment and the level of development of each location.<sup>181</sup> The financial capacity of each council will affect its ability to maintain and upgrade the stormwater networks under its control.<sup>182</sup> Parts of the stormwater network are also significant for other council functions, such as road construction, and other parts perform dual functions, such as parklands that operate as overland flow paths.<sup>183</sup> It is therefore appropriate that the design of stormwater systems is managed by councils, by reference to state and national policy; no evidence was presented to the Commission suggesting this should not be the case. However, the guidance materials, particularly the Queensland Urban Drainage Manual, are important resources for councils, helping to ensure that a common approach is taken across catchments that encompass multiple councils. These materials need, therefore, to be kept up to date by the responsible state-level authorities. The last edition of the Queensland Urban Drainage Manual was published in 2007 and it no longer reflects all current legislation; for example, the list of key legislation refers to the *Integrated Planning Act 1997* rather than the *Sustainable Planning Act 2009*.<sup>184</sup> It would be useful for the manual to be reviewed to ascertain whether any parts of it need to be amended, to reflect the current law and to take into account insights gained from the 2010/2011 floods.

## *Recommendation*

- 10.8 The Department of Environment and Resource Management should review the Queensland Urban Drainage Manual to determine whether it requires updating or improvement, in particular, to reflect the current law and to take into account insights gained from the 2010/2011 floods.

## Overland flow paths

Understanding overland flows is critical to achieving an appropriate design of a stormwater network.<sup>185</sup> This adds complexity to the planning regime, because it requires detailed mapping of overland flows in order to allow their assessment in relation to any new development.<sup>186</sup> The modern approach to planning is to accommodate overland flows as far as possible. This has not always been the case; some older houses are built in the middle of overland flow paths.<sup>187</sup> Current practice requires the road network to follow overland flow paths; historical practices resulted in some roads traversing overland flow paths.<sup>188</sup>

There is significant benefit to be gained by mapping overland flow paths, especially in urban areas where human intervention has altered the natural paths.<sup>189</sup> There is less likely to be a benefit to mapping flow paths outside urban areas.<sup>190</sup> However, only a limited number of urban councils map overland flow paths in their planning systems, probably because it is a difficult and highly detailed process.<sup>191</sup> Brisbane City Council has prepared detailed maps of overland flow paths. These ‘flood flag maps’ are made publicly available and used in the assessment of development

applications, although the mapping is not yet complete.<sup>192</sup> Bundaberg Regional Council maintains local flooding models to help it manage stormwater flows in Bundaberg<sup>193</sup> and the surrounding areas and to assist in assessing development applications.<sup>194</sup> It has had difficulty attracting and retaining engineers with appropriate modelling experience,<sup>195</sup> but plans to build new models for other areas and upgrade its existing models.<sup>196</sup> Ipswich City Council is undertaking a number of drainage and flood studies intended to assist with future stormwater and runoff design, which include sub-catchment studies of overland flow paths.<sup>197</sup> Fraser Coast Regional Council has, since amalgamation, provided information on overland flow paths in flood searches and responses to requests for building information, although its knowledge of flow paths is based on observations from council employees and members of the public rather than on a hydraulic model.<sup>198</sup> Moreton Bay Regional Council has commissioned a study to prepare a flood database that will include information on overland flow.<sup>199</sup>

Given the benefits to be gained from properly mapped overland flow paths, such mapping is to be encouraged. The Commission's understanding is that these maps can be prepared most accurately using hydraulic models. The models used should be capable of being amended to reflect changed conditions on the ground, particularly in areas that are rapidly developing.<sup>200</sup> If site-specific or local overland flow models are developed, those models must be consistent with the overall hydraulic model of the catchment.<sup>201</sup> (Hydraulic models are discussed further in chapter 2 *Floodplain management*.) The Commission recognises that the task is likely to be costly and resource intensive, and may be beyond the financial capacity of some councils.

## *Recommendation*

10.9 All councils should, resources allowing, map the overland flow paths of their urban areas.

## Detention basins

Detention basins are an important part of the stormwater network, particularly because, unlike other parts of the system, they are designed to manage large, sudden inundations.<sup>202</sup> Although they are sometimes used in cities (Bundaberg has seven major detention basins throughout the city as well as minor ones in car park areas),<sup>203</sup> the size of detention basins makes them more likely to be used outside central business district areas.<sup>204</sup> The amount of land they require means that their full cost includes not only their initial construction cost and continuing maintenance costs, but also the opportunity cost of the land's not being used for other purposes.<sup>205</sup>

### 10.2.4 Basements

Stormwater entered the basements of a number of high rise buildings in the 2010/2011 floods and caused damage. In some cases this was because basements were not adequately sealed, in others because the stormwater management systems installed in them were inadequate for the volume of water that entered. For example, one high-rise in the Brisbane central business district has stormwater pits in place to capture excess stormwater entering the underground levels of the building; these pits were unable to cope with the volume of water they received.<sup>206</sup> Similar problems occurred in a number of other apartment buildings. In one instance, a stormwater drain leaked and contributed to the inundation of the basement;<sup>207</sup> in another, the sump pumps designed to remove water from the basement failed because the electrical control board was inundated;<sup>208</sup> in a third, stormwater is believed to have entered a basement through leaking pipes.<sup>209</sup> Stormwater entered basements through a number of other channels including electricity and communication conduits<sup>210</sup> and air vents.<sup>211</sup> (The ingress of water through electrical conduits is discussed in section 10.3.5 *Conduits for electrical cables*.)

The damage caused in basements was significant in those instances where essential services infrastructure, such as lighting, exhaust, security and air-conditioning systems and lift systems, was located in the basement.<sup>212</sup>

The Queensland Government Planner observed that there were currently very few requirements (legislative or otherwise) for ensuring that essential services in a building - including fire safety systems, electricity supply, water and sewerage - were not affected during a flood event. Building designers would, consequently, only consider the effects of floodwaters on services where it was a specific element of the design brief or where it was required by other non-building regulations.<sup>213</sup>



Floodwaters inundate car park of Regatta Apartments (photo courtesy Paul Rees)

connections be fully sealed to ensure that there is no possibility of backflow into basements.<sup>215</sup>

The Commission is aware of a proposal to amend the Queensland Development Code to impose a requirement that, in buildings in ‘flood hazard areas’, utilities (for example lift motors, switchboards and fire indicator panels) be designed or located to reduce the effects of floodwater on them during a defined flood event.<sup>216</sup> The Commission has not received detailed evidence on this proposal, but it seems that such a measure would provide an additional layer of flood resilience to essential services contained in basements.

The Commission received a submission that there should be an examination of the effectiveness of non-return valves in basements.<sup>217</sup> That kind of examination is more appropriately undertaken by Building Codes Queensland, which is presently considering whether non-return valves should be fitted on stormwater connections to private properties in designated ‘flood hazard areas’. This remains a work in progress; there is uncertainty as to whether such valves are helpful in all circumstances.<sup>218</sup> (See section 9.5 *Proposed new part of the Queensland Development Code: ‘Construction of buildings in flood hazard areas’* for further discussion of the work being done by Building Codes Queensland.)

## Recommendations

- 10.10 Councils should consider amending their planning schemes to include provisions directed to consideration of the flood resilience of basements as a factor in determining the appropriateness of a material change of use.
- 10.11 In assessing and determining development applications for material change of use in areas susceptible to flood, councils should consider whether the new developments locate essential services infrastructure above basement level, or, alternatively, whether essential services infrastructure located at basement level can be constructed so that it can continue to function during a flood.

## 10.2.5 The maintenance and optimisation of stormwater systems

The first stormwater infrastructure in Brisbane was constructed in 1860. It was to serve the needs of a population of around 5000.<sup>219</sup> It is, therefore, unsurprising that some of the oldest parts of the city are prone to flooding;<sup>220</sup> an increase in population density puts additional strain on the stormwater system, as every new hard surface, such as a road or driveway, increases the volume of runoff.<sup>221</sup> Many councils manage large networks of stormwater infrastructure: Fraser Coast Regional Council has approximately 500 kilometres of stormwater pipes and culverts;<sup>222</sup> Brisbane City Council has 2640 kilometres of enclosed stormwater pipes.<sup>223</sup> In all stormwater systems, continuing maintenance is critical to ensuring that the stormwater system operates to the full extent of its capacity. A program of upgrades is essential to ensure that the system has the capacity to serve the current population and level of development.

All parts of the stormwater network require a level of maintenance: for example, culverts need to be inspected for debris,<sup>224</sup> detention basins need to be mowed<sup>225</sup> and vegetation needs to be managed in natural waterways.<sup>226</sup> The inspection and maintenance of the pipe network is difficult because most of it is located underground. New technology, such as remote-controlled vehicles with cameras, has reduced the need for manual inspection by torch and mirror, but it remains a slow process.<sup>227</sup> With modern technologies, Brisbane City Council is presently able to inspect approximately 80 kilometres of stormwater pipes every year, which means that on average the entire system will be inspected once every 30 to 40 years.<sup>228</sup> The Council's ability to undertake additional inspections is constrained by both the cost of the work and the limited number of appropriately trained personnel.<sup>229</sup>

In light of these resource constraints, Brisbane City Council targets its inspection program at those parts of the pipe network most likely to require maintenance. Priority is determined on the basis of complaints from the public, observations in the field by council staff<sup>230</sup> and an active system of identifying the parts of the network likely to require maintenance in light of, for example, the age of those pipes and recent flooding.<sup>231</sup> Once a problem is identified it may be addressed immediately or noted as future work that will be prioritised according to the impact of the fault.<sup>232</sup> The 2010/2011 floods mean that higher priority will now be given to the pipes in flood-affected areas, since these are likely to have been silted up.<sup>233</sup> This will be a drawn out process, as over 450 kilometres of pipes were affected.<sup>234</sup>

Brisbane City Council has developed a similar system for prioritising upgrades to the stormwater network to the areas most likely to be in need. In Brisbane, some parts of the system were built to lower design standards than those now used and to serve a much lower population density than now exists, meaning that flooding inevitably occurs in those areas more frequently than would occur under modern design standards.<sup>235</sup> The cost of the work required to bring all parts of the system up to modern standards is high, hence the need for Brisbane City Council to prioritise the work by reference to various criteria.<sup>236</sup>

The Commission is aware of a specific issue in Emerald relating to the inundation of houses and businesses in the 2010/2011 floods, said to have been caused by flooding from a local irrigation drainage system, the LN1 system.<sup>237</sup> SunWater owns and operates the system, which runs from the western edge of Emerald to the Nogoa River. It was designed for irrigation runoff, but it now takes a considerable volume of urban stormwater flow; the rapid development of Emerald in recent years has led to an increase in runoff into it. The Central Highlands Regional Council commissioned a firm of environmental consultants to prepare a flood report on the streams and rivers directly impacting on Emerald. The final report, published in December 2011, made recommendations for structural work to be undertaken on the LN1 drain to increase its capacity and reduce pooling.<sup>238</sup>

The Commission is not in a position to make a technical assessment of the adequacy of the LN1 system, but notes that a significant obstacle to such an assessment's being made, including as to any appropriate remedial steps to be taken, is the lack of a formal agreement between SunWater and the Central Highlands Regional Council about who should take ownership of the LN1 system and who should take responsibility for maintenance of the LN1 system.<sup>239</sup> This needs to be resolved expeditiously.

The Commission has also been made aware of problems with a stormwater drain in Moore Park, a beachside suburb of Bundaberg. The drain, which runs through the middle of the residential area of Moore Park, is one of the two main drains which serve the Moore Park community. Residents raised concerns with the Commission about the maintenance of the drain and the drain's effect on the area's susceptibility to flood.<sup>240</sup>

As with the LN1 drain in Emerald, the Commission is not in a position to assess the adequacy of the Moore Park town drain. However, given the drain's significance to the Moore Park area and the concerns expressed by residents, the Commission considers that the Bundaberg Regional Council should investigate the adequacy of the drain to serve the area.

## Recommendations

- 10.12 SunWater and the Central Highlands Regional Council should determine the issues of ownership and responsibility for maintenance of the LN1 drain system in Emerald.
- 10.13 The Bundaberg Regional Council should investigate the adequacy of the drain and take reasonable steps to ensure the Moore Park area is effectively served.

### 10.2.6 Backflow flooding

Backflow flooding of the stormwater network can occur where a stormwater pipe runs from a low-lying area to a discharge point located near a waterway. If the discharge point becomes submerged by a tide, storm surge or floodwater, water can pass back through the pipe and out of inlets and manholes.<sup>241</sup> If the banks of the waterway are higher than the low-lying area, flooding may occur in the low-lying area even though the banks are unbroken.

Backflow flooding occurred in a number of locations in the 2010/2011 floods, but was reported particularly in low-lying areas of Brisbane such as the central business district, Rosalie, Milton, New Farm and Auchenflower.<sup>242</sup> Residential properties were flooded and the basements of a number of large buildings were inundated by backflow flooding,<sup>243</sup> although typically the river's breaking its banks caused higher flood levels.<sup>244</sup>

In low lying areas, water rising out of the drains has been a problem for many years.<sup>245</sup> Some low lying streets in the Auchenflower area often have water over them in king tides.<sup>246</sup> In January 2011, Rosalie residents and business owners witnessed floodwaters flowing from drains at Nash Street,<sup>247</sup> at Torwood Street<sup>248</sup> and in other areas of Rosalie and Auchenflower.<sup>249</sup> The Commission heard evidence that in the Brisbane city centre there was backflow of water through the drains in Albert Street.<sup>250</sup> As discussed above, high-rise residential units were inundated by stormwater and backflow into their basements, as well as by water from the Brisbane River's breaking its banks.<sup>251</sup>

Before the 2010/2011 floods, many residents of Brisbane associated flooding solely with the overtopping of rivers.<sup>252</sup> As backflow flooding occurs when river levels are elevated, but below the point at which the banks are overtopped, the risk of the river overtopping is not necessarily a useful measure of the likelihood of flooding.<sup>253</sup> People living in areas susceptible to backflow flooding should be made aware of the risk, to ensure that they can make proper preparations before and during a flood.<sup>254</sup> Making such information readily available to the public would also assist prospective purchasers of a property in such areas to make better informed decisions. The preparation of flood maps and the dissemination of the information they present to the public is considered in chapter 2 *Floodplain management*.

The problem of backflow flooding will become more frequent and more severe if present predictions about climate change become reality.<sup>255</sup> Higher tides will mean that more drainage outlets become submerged during high tides and flooding.<sup>256</sup> This is an important consideration for councils seeking to enhance their flood resilience. It is not an issue that can be addressed simply by building higher banks or levees; these structures prevent surface inundation but do not prevent backflow through underground pipes.<sup>257</sup>

The risk posed by backflow flooding can be managed through planning and design standards. Modern development standards require that properties have higher ground floors. This reduces the risk of damage from any backflow flooding.<sup>258</sup> Constructing stormwater outlets at higher levels can reduce the frequency of backflow flooding; however, there is a limit to the height at which they can be positioned, because stormwater systems require a minimum gradient to make use of gravity.<sup>259</sup>

An alternative remedy for backflow flooding is the installation of backflow prevention devices. These are one-way or non-return valves that are designed to allow stormwater to discharge from a pipe into a waterway, but to close and seal against rising water in the waterway. Backflow flooding, at least in Brisbane, is a problem mainly in areas

where the stormwater drainage systems were built prior to the implementation of modern planning codes (which place greater emphasis on drainage issues than older codes).<sup>260</sup> Backflow prevention devices can be retrofitted to stormwater outlets in these systems. They are presently used in New Farm, Yeronga, West End and Newstead in Brisbane<sup>261</sup> and it is likely that if they had been fitted more widely some of the flooding of low-lying areas of Brisbane during the 2010/2011 floods would have been avoided, at least up until the point when the river overtopped its banks.<sup>262</sup> They are also used in other locations; for example, the Maryborough central business district has a shut off-valve to prevent overloading of the stormwater system during flood, as well as a number of valves used to manage tidal inundations.<sup>263</sup>

The Commission received detailed evidence on the use of backflow prevention devices from an environmental consultant presently conducting a review for the Brisbane City Council<sup>264</sup> and from an engineering consultant appointed by the Commission to provide an independent assessment of the usefulness of the devices.<sup>265</sup>

There are a number of types of backflow prevention devices, each of which have certain advantages and disadvantages and may be more or less suitable in different environments. They include:

- Flap gates, which are hinged flaps or gates fitted at the stormwater discharge point. They normally fall closed under their own weight, but open when the pressure from the build up of stormwater inside the pipes is sufficient to open the gate. They will close when the pressure outside the pipes, such as hydrostatic pressure from a rising waterway, is greater than that inside the pipe.<sup>266</sup> They operate by a simple mechanism and are relatively inexpensive compared to other backflow prevention devices. They require regular maintenance to ensure that they are not prevented from closing by silt, debris or marine organisms such as barnacles.<sup>267</sup>
- Duckbill valves, also called duckbill check valves, which are made of a flexible moulded material and normally have a closed vertical face. That face transforms into a more open face to allow discharges when the pressure builds inside the pipes and will close when there is greater pressure outside.<sup>268</sup> They are usually more expensive to install than flap gates and also require maintenance to ensure they are not blocked by silt or debris. They can be purchased pre-treated to prevent marine organisms' causing their failure.<sup>269</sup> Generally, less structural work is required to retrofit a duckbill valve onto an existing pipe than to fit a flap gate.<sup>270</sup>
- Mechanically operated valves, which exist in various forms.<sup>271</sup> They are either operated manually or by electronic sensors. They are significantly more expensive both initially and in terms of maintenance costs than flap gates or duckbill valves, particularly if they operate using sensors. Typically they are used only on industrial installations or at sewerage treatment plants where there are staff permanently onsite.<sup>272</sup>

The selection of the type of valve for use in a particular location will depend on a number of factors: construction costs, continuing maintenance and operation costs, the level of monitoring and maintenance required and the environment in which it will need to operate.<sup>273</sup> Backflow prevention devices are not appropriate for all stormwater pipes. While they operate to prevent backflow from occurring, the devices may impede the flow of water through the stormwater network, and in some circumstances may exacerbate local flooding because of the head loss they cause to the system.<sup>274</sup> In some locations the cost of installing the device may be disproportionate to the expected benefits and there may be better alternative flood mitigation steps. For example, Brisbane City Council's environmental consultant commented that in some areas, such as Auchenflower, it would be more cost-effective to augment the river bank (affording greater protection against riverine flooding) than to install a backflow prevention device.<sup>275</sup> In certain circumstances, backflow prevention devices may, by causing greater flows of water over banks which are overtopped, increase erosive damage to those banks.<sup>276</sup>

It is, accordingly, important to ensure that prior to any installation of a backflow prevention device, a full risk assessment is undertaken, which will likely include a full survey of the site and the affected stormwater network.<sup>277</sup> The use of backflow prevention devices is presently being considered by the Brisbane City Council; a recommendation for a full survey and risk assessment was made by the Flood Response Review Board of the Brisbane City Council.<sup>278</sup> Each of the expert consultants retained by, respectively, the Brisbane City Council and the Commission, was of the view of that backflow flooding risk assessment should be undertaken by all near-coastal councils.<sup>279</sup> Although the risk of backflow flooding caused entirely or in part by tides is limited to near-coastal councils, other causes of flood, such as rain, can also result in backflow. It would therefore be prudent for all councils to periodically conduct risk assessments to identify areas at risk of backflow flooding.<sup>280</sup>

## Recommendations

- 10.14 All councils should periodically conduct risk assessments to identify areas at risk of backflow flooding. In respect of such areas, councils should consider how such risks can be lessened, including in that process consideration of the installation of backflow prevention devices. Backflow devices should not, however, be installed unless and until a full risk based assessment has been undertaken.
- 10.15 Councils should conduct education campaigns directed to ensuring that all residents and property owners in areas identified as being at risk of backflow flooding are aware of the circumstances in which backflow flooding can occur, the hazard it presents and what should be done if it occurs.

## 10.3 Electrical infrastructure

### 10.3.1 The electricity supply industry in Queensland

The 2010/2011 floods caused widespread damage to the electricity network in Queensland. In many locations power outages occurred even where the local electrical infrastructure was not damaged, either because of damage elsewhere to connecting parts of the network, or because the electricity was disconnected as a precaution. While frustrating for some customers who lost power although they were not directly affected by flood, such precautionary disconnections are vital. Water conducts electricity; if floodwater comes into contact with a live source of electricity there is both a risk that someone in contact with the water may suffer an electric shock and a risk that the electrical infrastructure may short circuit and be damaged, possibly failing explosively.<sup>281</sup> (Precautionary disconnections were considered in the Commission's interim report in the context of flood preparedness and emergency response, see section 6.1.1 *Power* of the interim report.<sup>282</sup>)

Queensland's electrical supply industry is divided into generation, transmission and distribution functions. Generators such as Tarong Energy, Stanwell and CS Energy produce electricity. The generators are connected to the transmission network, which is operated by Powerlink Queensland. The transmission network connects to the distribution network, which provides the link to the consumer of the electricity and is operated by electricity distributors. In Queensland there are two major distributors: Energex and Ergon Energy. Both are government owned corporations under the *Government Owned Corporations Act 1993*. Each is responsible for a different geographic area.

Energex is responsible for the electricity distribution network throughout south-east Queensland, including the regions of Brisbane, Ipswich, Gympie and the Lockyer Valley that were affected by the 2010/2011 floods.<sup>283</sup> Energex supplies electricity to more than 2.8 million people.<sup>284</sup>

Ergon Energy distributes electricity to regional Queensland.<sup>285</sup> It serves about 1.4 million people across a network area of 1.7 million square kilometres; about 97 per cent of Queensland.<sup>286</sup> Its network is vast: it includes approximately 150 000 kilometres of overhead powerlines, 6200 kilometres of underground power cable, 1 million power poles, 370 zone substations, 530 major power transformers and 90 500 distribution transformers.<sup>287</sup>

The assets that comprise the distribution networks can be divided into two different categories, known as 'customer dedicated assets' and 'shared network infrastructure'. Each of these categories is discussed separately in this chapter.

Customer dedicated assets are constructed inside customer premises and are usually commercial and industrial substations. Despite the use of the term 'customer dedicated', these substations may also used to supply shared areas outside of the building they are housed in.<sup>288</sup>

All other distribution network assets are 'shared network infrastructure'. Shared network infrastructure consists of the assets used to distribute electricity throughout Queensland, other than customer dedicated assets.<sup>289</sup> It includes major bulk and zone substations, both of which supply electricity to many thousands of customers.<sup>290</sup> It also includes overhead lines, underground cables and pole mounted and ground mounted distribution equipment.<sup>291</sup>

## 10.3.2 The impact of the 2010/2011 floods on distribution infrastructure

### Energex infrastructure (south-east Queensland)

On the afternoon of 11 January 2011, Energex was warned that flood levels in the Brisbane and Ipswich areas were likely to be similar to those experienced in 1974.<sup>292</sup> It began taking steps to disconnect supply to substations and feeder systems and remove equipment from the substations it considered likely to be affected by flood. These included 10 major commercial and industrial substations in the Brisbane central business district and approximately 120 feeder systems throughout Brisbane and Ipswich.<sup>293</sup>

In the Brisbane central business district the substations that were pre-emptively disconnected were generally located below ground level.<sup>294</sup> A number of transformers throughout the central business district were also shut down because of the risk of water ingress during the anticipated flooding.<sup>295</sup> The effect of this was that buildings which did not flood, but whose electricity was connected to other buildings that did flood or were seen as at risk of flooding, were without power. Energex also disconnected electricity to private properties in the suburbs of Ipswich and Brisbane that were likely to be flooded, or were connected to assets likely to be flooded.<sup>296</sup> As a result, many properties in those suburbs that did not flood (and may have been at no risk of flooding) still experienced a loss of power.

Energex did not have the time or resources to pre-emptively disconnect every location. For example, the substation in the Brisbane suburb of Milton was not disconnected. When floodwater entered the terminals in the substation it caused an explosive electrical fault.<sup>297</sup> This substation is discussed in more detail in section *10.3.3 Shared network infrastructure* below.

Even where pre-emptive measures were taken, some infrastructure was still damaged. Damage occurred at all levels of the supply system, causing interruptions to assets further down the distribution network. For example, the broader Moggill region in Brisbane is provided with electricity via five high voltage feeders. Each of those feeders was affected by flood in some way (for example by fallen trees or fallen powerlines). This created an area within which no electricity was available for a time.<sup>298</sup>

In total, the 2010/2011 floods caused 300 000 customers in Ipswich and Brisbane to lose power.<sup>299</sup> Twelve thousand homes and businesses in south-east Queensland were flooded.<sup>300</sup> Ninety per cent of the high voltage feeders were operating again by 15 January 2011.<sup>301</sup> The restoration of power took some time; Energex required flood-affected properties to be inspected before it would reconnect the electricity.<sup>302</sup> Where Energex considered that electrical safety had been compromised, the customer was issued with a disconnection notice that could not be revoked until a qualified electrician had inspected the premises.<sup>303</sup>

The sudden and unexpected nature of the flash flooding in the Lockyer Valley meant that Energex was not able to pre-emptively disconnect supply to its electricity assets in that region.<sup>304</sup> Many of those assets were flooded, which tripped automatic switches that disabled the assets. While the switches operated as they were designed to, the repair process was more difficult and took longer than would have been the case if the assets had been pre-emptively disconnected.<sup>305</sup>

Much of the electricity infrastructure in the Lockyer Valley region was destroyed.<sup>306</sup> The most serious damage was experienced in and around Murphys Creek, Helidon, Grantham, Withcott, Lake Clarendon, Spring Creek and Carpendale.<sup>307</sup> The water washed away lines that were near watercourses, and ground mounted switch gear and transformers were inundated.<sup>308</sup> The water surge on Monday 10 January 2011 affected the main feeder lines to the region, causing 5000 customers to lose power.<sup>309</sup> Some 80 Energex crews worked extended hours for two weeks restoring power to homes and businesses in the Lockyer Valley;<sup>310</sup> thirty-one poles and 18 transformers had to be replaced and over 36 kilometres of line had to be reinstalled.<sup>311</sup>

About 25 zone substations (which provide the power to the distribution network) throughout south-east Queensland lost supply during the floods.<sup>312</sup> At the peak of the electrical interruptions, approximately 150 000 people were left without supply.<sup>313</sup> That interruption, however, was principally caused by the loss of the incoming power supply rather than flooding to the zone substations.<sup>314</sup> Only eight zone substations lost supply directly because of flood damage.<sup>315</sup>

Approximately 475 of Energex's distribution substations were affected by floodwater; of those 120 had to have major components replaced.<sup>316</sup> Some supplied only one building, but others were the connection points for a number of feeder routes and caused power outages to several buildings.<sup>317</sup>

Apart from the damage to substations, many other pieces of infrastructure were affected. Among other things, 101 distribution transformers, 55 switch fuse gear items, 55 substation relays, 3645 watt hour meters, 95 power poles and 98 kilometres of overhead cable had to be replaced.<sup>318</sup>

### Ergon Energy infrastructure (outside south-east Queensland)

The 2010/2011 floods affected approximately 600 000 square kilometres (or 35 per cent) of Ergon Energy's total distribution area.<sup>319</sup> The floodwaters remained in some areas for as long as two weeks and some towns experienced a number of floods in December 2010 and January 2011.<sup>320</sup>

However, Ergon Energy reported that the damage to its infrastructure was, in overall terms, relatively minor.<sup>321</sup> The total cost was estimated to be in the order of \$6 million.<sup>322</sup> By way of comparison, the damage Cyclone Yasi caused to Ergon's infrastructure was in the order of \$60 to \$80 million; and during the cyclone, about 220 000 customers lost electricity supply, compared with approximately 8300 during the 2010/2011 floods.<sup>323</sup> Ergon's primary assets are poles and wires, which are less susceptible to flood inundation than to damage caused by severe storms and cyclones.<sup>324</sup>

The outages that occurred throughout the Ergon Energy network were primarily caused by electricity being disconnected pre-emptively in response to the threat to public safety that would have been caused by floodwaters coming into contact with sources of live electricity.<sup>325</sup> Ergon Energy staff monitored forecast flood levels and determined which assets would be disconnected.<sup>326</sup>

### 10.3.3 Shared network infrastructure

#### Planning considerations

Damage to shared network infrastructure can disrupt the supply of electricity to large numbers of people, including those in premises not flooded if the shared network infrastructure supplying them runs through areas that have been damaged by flooding.<sup>327</sup>

The *Sustainable Planning Regulation 2009* divides shared network infrastructure into two categories:

- the construction of a new zone substation or bulk supply substation or the augmentation of an existing zone or bulk supply substation if the input or output standard voltage is significantly increased
- all other aspects of the supply network.<sup>328</sup>

The regulation's effect is that only work in the first category can be declared assessable development,<sup>329</sup> which in turn means that all other aspects of the supply network are exempt development.<sup>330</sup> Exempt development does not require a development approval, nor is it required to comply with planning instruments other than state planning regulatory provisions.<sup>331</sup>

The result, generally, is that when new substations are developed or significantly augmented, the local council planning schemes will apply, but for all other electrical infrastructure development they will not. In addition, the Brisbane City Council reported that it is 'not uncommon' for the community infrastructure designation process under the *Sustainable Planning Act 2009* to be used to designate land for operating works (which includes substations)<sup>332</sup> under the *Electricity Act 1994*, so that the development becomes exempt development and cannot be assessed under the Brisbane planning scheme.<sup>333</sup> However, the *Sustainable Planning Act* does allow requirements about works for community infrastructure (including requirements about its height and location) to be imposed as part of its designation as land for community infrastructure, even though it is exempt development.<sup>334</sup>

Energex explained that its zone substations or bulk supply substations are built on blocks of land that it owns; it endeavours to ensure those areas are as 'flood-proof as possible'<sup>335</sup> and purchases sites above the applicable defined flood level.<sup>336</sup> If a major bulk or zone substation is required in an area susceptible to flood, Energex will usually construct the new assets within the substation above the defined flood level.<sup>337</sup> Similarly, new work on existing assets in areas susceptible to flood is, where possible, carried out above the defined flood level.<sup>338</sup>

State Planning Policy 1/03 applies to the planning of bulk subsupply stations and zone substations. The State Planning Policy 1/03 Guideline provides that substations should be able to function effectively during, and immediately after, floods, and that they should not be built below the level of a flood with a 0.5 per cent annual exceedance probability.<sup>339</sup> The location of other network infrastructure is the responsibility of the distributor.

The *Electricity Act* requires distributors to provide electricity to any person who applies for connection.<sup>340</sup> That means that where there are residents or businesses in areas susceptible to flood, overhead lines, underground cables and other associated equipment forming part of the shared network infrastructure must be constructed and may be located below the defined flood level.<sup>341</sup> Such infrastructure follows the terrain; consequently, it is not always possible to provide flood proof infrastructure in every area.

The Commission examined two substations, both built in the last 10 years and both affected by flooding during the 2010/2011 floods, as case studies to consider their performance in the floods and to identify whether changes to the planning of substations and shared network infrastructure may be required.

## Milton substation

Energex's Milton substation is housed in the southern plaza of Suncorp Stadium. This was not where Energex had initially intended to build the substation.

Energex had identified the future need for a substation in Milton prior to the development of the stadium and had purchased various parcels of land for this purpose between 1990 and 1995.<sup>342</sup> It had expected to build the substation in or about 2004.<sup>343</sup> The load demand created by the stadium redevelopment, which was required to be completed by March 2003, and an increase in local demand, meant that the substation needed to be constructed earlier than Energex had intended.<sup>344</sup>

In September 2000, the Queensland Government designated the land on which the stadium is built as land for community infrastructure.<sup>345</sup> The stadium development itself was declared to be a significant project requiring an environmental impact statement under the *State Development and Public Works Organisation Act 1971* and an assessment statement was prepared dated August 2000. (Development declared to be a significant project has been considered by the Commission in chapter 6 *Satellite planning legislation*.) The environmental impact statement did not make any reference to flooding (an issue considered further in chapter 6) although it did, relevantly, indicate that the southern plaza of the stadium was a possible site for Energex's substation.<sup>346</sup>

At around the same time, in September 2000, the Queensland Government asked Energex whether it would sell the land it had purchased for the substation for use as part of the stadium development. Energex was reluctant to do so because it considered the site critical for energy supply and had already undertaken cabling and tunnelling works in preparation for its development.<sup>347</sup> However, in November 2000 the Queensland Government issued to Energex a notice of intention to resume the land for the stadium redevelopment.<sup>348</sup>

Following receipt of the resumption notice Energex searched, without success, for an alternative site for the proposed substation. One difficulty was that 110 kilovolt cables running from Ashgrove West had already been installed for the substation. To move the cables from the planned route point by just 100 metres would have added \$1.5 million to the cost of developing the substation.<sup>349</sup>

Meanwhile, the council approved the stadium development application in March 2001, and a negotiated decision notice was issued in May 2001. Condition 10 of the notice required all new proposed buildings to have finished floor levels above the Q100 level.<sup>350</sup> Two months later, the Minister for State Development exercised his 'call-in' powers pursuant to the *Integrated Planning Act 1997* and re-decided the development application. The decision notice he issued did not contain an equivalent to the council's condition 10.<sup>351</sup>

Unable to find a suitable alternative site, Energex had discussions with the Queensland Government about the location of the substation.<sup>352</sup> Energex's preference was to place the substation in the northern plaza of the stadium, which was a higher site and accordingly had a better flood profile.<sup>353</sup> The stadium architects examined the proposal but concluded that it would be impossible to disguise the mass of the building and that its operating noise would also create a difficulty.<sup>354</sup>

Energex disagreed with this assessment, but acknowledged that the substation could be developed in the southern plaza.<sup>355</sup> Energex wrote to the Queensland Government and said that:<sup>356</sup>

- the southern plaza site was acceptable, although extremely crowded, from the point of accommodating all substation equipment
- the site was well below the Brisbane City Council's predicted Q100 flood level
- the Brisbane City Council had advised Energex that given the value of the infrastructure being considered, a 'greater flood immunity' than Q100 might be appropriate

- given the disadvantages of the southern plaza, including flood susceptibility and difficult cable access, Energex preferred the northern plaza.

Ultimately the Queensland Government's preference prevailed and the southern plaza was selected to house the substation.

While the southern plaza was partly above the 1% AEP level, because of site constraints the cable basement had to be built below the 1% AEP level.<sup>357</sup> An overhead walkway to the Milton Railway Station meant that the height of the substation could be no more than 10 metres above the 1% AEP level.<sup>358</sup> Consequently, the floor level of critical equipment was placed at the 1% AEP level without any freeboard.<sup>359</sup> Energex viewed this flood risk as manageable because that part of the substation, if submerged, would not subject live high voltage electrical components to floodwater.<sup>360</sup>



Floodwaters surround the southern end of Suncorp Stadium, January 2011 (photo: Matthew Palmer)

The January 2011 flood reached 0.95 metres above what was the Brisbane City Council 1% AEP level for the Milton substation at the time of its construction.<sup>361</sup> Some design features meant that the entire substation did not go offline in the flood. For safety reasons, individual feeders and other components were switched offline to interrupt supply to flood-affected areas.<sup>362</sup> However, there was significant damage to the substation, mainly from water and debris ingress, to the equipment and floors below the flood level.<sup>363</sup> Some damage was caused by the collapse of ducting and structures under the weight of mud and debris.<sup>364</sup>

Energex estimates that the cost of rectifying the damage to the substation was \$750 000.<sup>365</sup> It plans to implement new flood resilience measures, including building bunds around the switchroom, installing sump pumps on the switch room floor, sealing vents below the defined flood level and replacing all local power sockets below the defined flood level with appropriately rated outlets.<sup>366</sup>

### Bundaberg Central substation

The Bundaberg Central zone substation located on Walla Street, Bundaberg South is owned by Ergon Energy.<sup>367</sup>

Ergon Energy had investigated other sites in the area prior to building the substation on Walla Street, but was unable to find any alternative flood free sites suitably sized and located.<sup>368</sup> Bundaberg City Council approved Ergon's development application for the establishment of the electrical substation on the site in 2007. The development approval required essential services infrastructure to be built above the defined flood level of 8.5 metres.<sup>369</sup>

Consistent with that condition, the works specification for the substation prepared by Ergon Energy required all critical outdoor equipment to be located above 8.8 metres and all indoor equipment to be located above 9.55 metres.<sup>370</sup>

On 28 December 2010, floodwaters began to enter the substation's yard. As a precautionary measure Ergon Energy disconnected the yard equipment due to the uncertainty of the forecast flood levels.<sup>371</sup> Although there was a large amount of water in the yard around the substation, water did not reach the building or essential infrastructure on the site.<sup>372</sup>

### The distributors' proposed new resilience measures

Following the 2010/2011 floods Ergon Energy and Energex have both reviewed their flood resilience measures for infrastructure located in areas susceptible to flood.

Ergon Energy recently revised its flood level standard for the establishment of new bulk supply and zone substations. Its new standard requires zone substations to be built at or above the 0.5% AEP flood level. If infrastructure is to be located below that level, resilience measures must be taken so that the substation can operate effectively during and immediately after a flood up to the height of the recommended flood level.<sup>373</sup> Where a substation is proposed, but the 0.5% AEP flood level is not presently known, and it is believed that flood risk exists in relation to the proposed site, Ergon Energy will obtain a hydrological assessment by an external consultant.<sup>374</sup>

Ergon Energy suggested that greater flood resilience would be achieved if more overhead assets were developed, as opposed to underground or on the ground structures. It noted, however, that in its experience, local authorities normally require underground or on ground infrastructure in new urban developments.<sup>375</sup>

Energex is considering implementing additional resilience measures for its substations, particularly the four that were directly affected by flood in January 2011. They include moving critical equipment to higher locations, installing bunds around substations and installing automatically activated sump pumps.<sup>376</sup>

These resilience measures are directed to ensuring that critical infrastructure is built so that it can continue to operate during and immediately after major floods (as was the case for the Bundaberg Central substation).

During the Commission's public hearings Energex was asked about its capacity to isolate parts of its network, so that only directly affected areas lose electricity, rather than disconnecting whole service areas.<sup>377</sup> Energex explained that isolating discrete parts of the network is not simple. Many high voltage feeders are built across areas that flooded in the 2010/2011 floods. These feeders supply electricity to a large number of customers. When one goes offline it is virtually impossible to avoid disconnecting people further down the line. Energex is considering installing connection points in the network for generators to supply electricity to customers who were not

experiencing flooding, but had lost power supply because flooding had cut supply at another location.<sup>378</sup> This appears to be a logical means of dealing with the problem.

## Amendments to planning requirements for electrical infrastructure

Flood resilient electrical infrastructure is important, not least because other essential services needed during and after a flood depend on electricity to operate.

The Milton substation case highlights the importance of ensuring that flood resilience is given priority in the location and design of essential electrical infrastructure. The initial concerns of Energex about the site were borne out: important infrastructure was damaged; this was not only inconvenient but also created a safety hazard. There were significant costs associated with restoring the substation, and the additional flood resilience measures now being implemented will be expensive. The decision to place the site in the south plaza, which was more susceptible to flood, was driven by considerations other than flood; the Commission is not in a position to say that the decision was wrong. However, the example demonstrates the importance of giving proper weight to flood risk when considering where to locate substations.

The example of the Bundaberg Central substation illustrates how to ensure essential infrastructure continues to operate during severe floods. Achieving flood resilience was an objective from the outset and was an important consideration in the selection of the site. The scope of works prescribed detailed minimum specifications and its requirements reflected the attention given to flood risk and resilience. The end result was that following an inspection, some testing and cleaning, the substation was returned to full capacity in the evening of 1 January 2011, just three days after the flood peak.<sup>379</sup>

The flood resilience measures proposed by Energex and Ergon Energy for infrastructure located in areas susceptible to flood are important for at least two reasons. First, there is a need to protect existing infrastructure that cannot practically be moved to a site with greater flood immunity (for example, the Milton substation). Second, the statutory obligation to provide electricity means that new development of electrical infrastructure in areas susceptible to flooding may be unavoidable. Such initiatives by the distributors are welcome; it would also be beneficial for the Queensland Government and councils to impose minimum standards for electrical infrastructure in the planning regime.



*Flooding at Ergon Energy's Bundaberg Central Substation (photo courtesy Ergon Energy)*

It is the Commission's view that critical infrastructure in assessable substation developments should be built with the objective that they remain operational during and immediately after a flood. In some cases, it would be prohibitively expensive to build infrastructure to withstand the probable maximum flood. The magnitude of the flood that the infrastructure should be able to withstand is dependent on what is acceptable to community and government; a risk assessment should be conducted to determine that level. This risk assessment should be done as part of the tailoring of model flood planning controls to take account of local circumstances. Whatever the magnitude of the flood chosen, steps should be taken to make the infrastructure resilient to it. In some cases, this may be best, and most practically, achieved by placing the critical infrastructure at a height where it is not susceptible to flood waters. In others, the objective may be best achieved by adopting other flood resilience measures.

## Recommendations

- 10.16 The Queensland Government should draft assessment criteria to be included in the model flood planning controls that require critical infrastructure in assessable substation developments is built to remain operational during and immediately after a flood of a particular magnitude. That magnitude should be determined by an appropriate risk assessment.
- 10.17 If the Queensland Government does not include such assessment criteria in the model flood planning controls, councils should include assessment criteria in their planning schemes that require critical infrastructure in assessable substation developments is built to remain operational during and immediately after a flood of a particular magnitude. That magnitude should be determined by an appropriate risk assessment.
- 10.18 The Queensland Government should consider measures to ensure that requirements are included in the designation of land for community infrastructure under the *Sustainable Planning Act 2009* to ensure that critical infrastructure for operating works under the *Electricity Act* is built to remain operational during and immediately after a flood of a particular magnitude. That magnitude should be determined by an appropriate risk assessment.
- 10.19 Electricity distributors should consider installing connection points for generators to provide electricity supply to non-flooded areas that have had their supply cut during floods.

### 10.3.4 Customer dedicated assets

Customer dedicated assets are commercial and industrial substations located inside an electricity consumer's premises. The Commission received evidence that some substations housed within buildings in the Brisbane central business district flooded and stopped operating during the January 2011 floods and remained inoperative, often for lengthy periods of time, after the floods.

The Stamford Plaza Hotel, built in 1984, is a multi-storey hotel located on Edward Street in Brisbane. It is approximately 10 metres from the river.<sup>380</sup> The building has a two-storey basement. The first floor is a car park and the second floor of the basement, used for various purposes, has an Energex substation housed within it.<sup>381</sup>

At around midday on Tuesday 11 January 2011, the security manager of the hotel suspected that the basement was going to flood and made the decision to evacuate property in the basement to the third and fourth levels of the hotel.<sup>382</sup> At 6.20 pm that evening, water had not started to enter the basement, but was close to doing so; Energex advised at that time that power would be cut to its substation but could not say exactly when.<sup>383</sup> Power was cut at 10.10 pm. Two hundred guests were in the building.<sup>384</sup> As the lifts were not operational, they had to use the fire escape, lit with candles and torches, to evacuate.<sup>385</sup> A generator in the basement could not be used, because the basement could not be isolated from its circuit; if the generator had been switched on it would have made the basement, filled with water, live with electricity.<sup>386</sup>

The hotel was without power for seven weeks. It was not able to reopen until 31 March 2011, and then only on a limited basis because the basement was still being reconstructed.<sup>387</sup> The Energex substation was replaced in its

original position: because of its size there was nowhere else to put it. The generator circuit has, however, been upgraded so that damaged parts of it can be isolated in any future flood.<sup>388</sup>

A contrasting case was Festival Towers, a 41-storey development at 108 Albert Street, Brisbane City. Development approval for the building was granted in 2002.<sup>389</sup> The building has a four-level basement car park, and the two lower basements flooded in January 2011.<sup>390</sup> The essential services at Festival Towers were above the defined flood level. The electrical switchboards and the substation were placed on level one of the building,<sup>391</sup> with the result that the building was able to remain almost fully operational throughout January 2011 floods.<sup>392</sup>

## Planning considerations

The *Electricity Act 1994* and the *Electricity Regulation 2006* require that if a distributor reasonably considers it necessary to install a substation on the premises of a customer, the distributor may require the owner of the premises to provide, amongst other things, the space for a substation.<sup>393</sup> However, while the regulation requires the customer to provide space for a substation, it does not mandate where the space is to be located. In particular, it does not mandate that the space be above the defined flood level.

State Planning Policy 1/03 requires that ‘essential services infrastructure (e.g. on-site electricity, gas, water supply, sewerage and telecommunications) maintains its function during a [defined flood event].<sup>394</sup> However, it only applies if a council has identified a defined flood event.

In response to the 2010/2011 floods, both Brisbane City Council and Ipswich City Council introduced temporary local planning instruments. The Brisbane City Council temporary planning instrument now requires essential infrastructure to be built above the defined flood level, and in the case of residential buildings, that it have a 500 millimetre freeboard. It defines essential infrastructure as including:<sup>395</sup>

any room used for fire control panel, telephone PABX, sensitive substation equipment including transformers, low voltage switch gear, high voltage switch gear, battery chargers, protection control and communication equipment, low voltage cables, high voltage cables, and lift controls etc.

The Ipswich temporary planning instrument also introduced new requirements for the location of essential infrastructure. The temporary planning instrument suspends part of the Flooding and Urban Stormwater Flow Path Areas of the Ipswich planning scheme and relevantly replaces it with requirements that:<sup>396</sup>

- electrical installations are sited in the area of ‘greatest flood immunity’
- electrical switchboards, main data servers and the like are positioned above the adopted flood regulation line with all electrical and data installations below this level designed and constructed to withstand submergence in floodwater.

The Queensland Reconstruction Authority has also produced a guideline: ‘Planning for stronger, more resilient electrical infrastructure’. The guideline proposes that in new high rise building design electrical equipment should be raised and electrical infrastructure located above the defined flood level (as opposed to the traditional basement location) to improve resilience against flooding.<sup>397</sup>

Energex told the Commission that it was liaising with the Brisbane City Council to amend the development approval guidelines to incorporate requirements to improve the flood resilience of Energex substations within new developments.<sup>398</sup> Energex said that it presently encounters difficulties in having input into the location of substations in buildings as the developer has often determined the position of the electrical infrastructure before approaching Energex.<sup>399</sup> By the time Energex is approached developers have often already obtained development approval and the approvals ordinarily contain detailed designs and plans.<sup>400</sup> The decision has effectively been made before Energex is involved.

Flooding of customer dedicated assets was a cause of great inconvenience and disruption – it meant that people were unable to return to their places of residence or businesses for lengthy periods of time. For future development it presents as a problem with a simple solution: customer dedicated assets should not be built in basements.

The location of existing customer dedicated assets presents more difficulty. Given their size and weight, it may be difficult to move them. The impact of flooding may be mitigated through other measures such as bunds, pumps and through designing circuits that can be isolated to allow electricity to be provided from another source.

Energex submitted that amending the *Electricity Regulation* to require electricity customers to supply space above the defined flood level for substations would be one way to improve flood immunity.<sup>401</sup> Energex noted that a risk associated with amending the legislation was that there was no legal link to the *Sustainable Planning Act 2009* assessment process, creating the prospect that any amendment to the *Electricity Regulation* might be overlooked.<sup>402</sup> However, Energex also noted that some councils placed conditions on development approvals or provided advice on development applications that alerted developers to the need to liaise with Energex about connection requirements. Energex suggested, therefore, that amending the regulation would work best in conjunction with planning controls.<sup>403</sup> Energex appears to prefer a state planning regulatory provision as a planning control, requiring customer dedicated substations to be built above the defined flood level.<sup>404</sup>

## *Recommendation*

- 10.20 The Queensland Government should consider whether there should be a legislative requirement that customer dedicated assets be built at or above the applicable defined flood level and if so, the Queensland Government should consider which legislation should contain such a requirement.

### 10.3.5 Conduits for electrical cables

Electrical infrastructure includes underground cables that supply power to larger buildings. These form part of the shared network infrastructure. To facilitate the supply of electricity to commercial and industrial premises, electricity distributors run electrical cables from the footpath through conduits into the substation enclosure inside the customer's building.<sup>405</sup> Accommodating the conduits is part of the customer's obligation under the *Electricity Regulation* to provide space for network infrastructure.<sup>406</sup>

The Commission received evidence that the fact that these conduits were not sealed against water allowed water to enter basements in some Brisbane central business district buildings during the 2010/2011 floods. Other forms of conduit – for example, those providing utilities such as telephone and data lines – may also have caused flooding in buildings.<sup>407</sup> Energex's executive general manager of network performance estimated that twenty buildings may have had their basements inundated by water entering through electrical conduits.<sup>408</sup>

Witnesses to flooding at the Festival Towers building reported that from 9.00 am on 12 January 2011 water was entering the basement of the complex through two 'waterfalls'. The sources of these 'waterfalls' were likely to be unsealed conduits.<sup>409</sup> The first was an Energex conduit that carried power to the building.<sup>410</sup> The second was a conduit that carried communication services into the building.<sup>411</sup> The Energex conduit appears to have been the main source of the water entering the basement; a witness observed that water had ceased to flow through the communications conduit by the afternoon of 13 January 2011.<sup>412</sup>

A Brisbane City Council representative explained that the council did not consider any flood risk caused by Energex conduits because such development was not assessable under the Brisbane City Council's planning scheme.<sup>413</sup> She observed that while the council might impose a condition on new basements, the reality was Energex might subsequently install further or altered services unaffected by such conditions. In her view, the method of installing, sealing and waterproofing utilities was a matter between the utility provider and the developer.<sup>414</sup>

Another property which may have flooded, in part, from unsealed energy conduits was the River Park Central Apartments. Located on Mary Street in Brisbane City and completed in 2004, the complex has 120 residential units over 30 levels. The building has a one-level basement; below the basement is an electrical substation which is connected to conduits that carry cables.<sup>415</sup> During the January 2011 flood, a resident saw water coming from near where the substation was located.<sup>416</sup> The precise source of this water was not identified, but the resident suspected it came from the electricity cable conduits.<sup>417</sup>

Energex acknowledged that it does not presently seal conduits to keep out large flows of water under pressure. Energex's commercial and industrial substations manual requires conduits to 'be securely sealed by the consumer in an approved Energex manner ... to prevent ingress of dirt until cable installation by Energex'.<sup>418</sup> It does not address the ingress of water.<sup>419</sup> Energex's understanding is that the building owners, rather than Energex, are responsible for the location, design, installation and maintenance of electrical conduits.<sup>420</sup> Since the 2010/2011 flood, however,

Energex has been working with the owners of basements that experienced flooding through conduits to seal the conduits using different products.<sup>421</sup> Energex's general manager said that its commercial and industrial substation manual will be updated once Energex has had greater experience with the new products currently being trialled;<sup>422</sup> an update to the manual is expected to be completed by the middle of 2012.<sup>423</sup>

The Australian Building Codes Board has developed a draft standard for the construction of buildings in flood hazard areas.<sup>424</sup> It is anticipated that the draft standard will be included in the 1 May 2013 version of the Building Code of Australia.<sup>425</sup> The draft code contains a standard that 'electrical conduits and cables installed below the FHL [flood hazard level] must be waterproofed or placed in waterproofed enclosures'.<sup>426</sup> For that provision to have any operation it will be necessary for councils to adopt a defined flood hazard level.<sup>427</sup> (See also chapter 9 *Building controls*.)

There is a gap in responsibility for ensuring that conduits do not compromise the flood immunity of basements. Although steps are now being taken voluntarily, the Queensland Government should consider imposing a requirement to ensure that it is clear who is ultimately responsible for securing such conduits, including those installed after the initial construction of a building. The Commission has not heard detailed evidence on who should bear this responsibility. At present, responsibility for the design and maintenance of conduits falls on the building owner,<sup>428</sup> although there appears to be a sound argument that the distributor that uses the conduit should be responsible (or, at least, required to be closely involved) given that it has the expertise required to safely and effectively seal the conduits.

## *Recommendation*

- 10.21 The Queensland Government should consider implementing mandatory requirements to ensure that all conduits for the purpose of providing electrical supply below the applicable defined flood level are sealed to prevent floodwaters from entering them or flowing into them.

## 10.4 Telecommunications infrastructure

Telecommunications services are crucial during disaster events for emergency service personnel and affected communities, but they are vulnerable. Breakdowns in telecommunications during natural disasters can result from lack of network coverage, power outages or damage to telecommunications infrastructure.<sup>429</sup>

Telecommunications providers ('carriers')<sup>430</sup> determine the extent of network coverage, which is usually dictated by commercial considerations.<sup>431</sup> The problem of power outages in the 2010/2011 floods was discussed in the Commission's interim report, as were the initiatives carriers adopted to deal with them: using generators, installing temporary mobile base stations, or re-routing telecommunications traffic to areas not affected by the power outage.<sup>432</sup>

The third cause of loss of telecommunications - damage to infrastructure - is particularly acute in flooding. Its extent will largely depend on two factors: where infrastructure is placed and carriers' approaches to the design and protection of their facilities. The first, the locating of telecommunications infrastructure, is guided by federal and state instruments.

### 10.4.1 The locating of telecommunications infrastructure

The installation of telecommunications infrastructure is regulated at the Commonwealth level by the *Telecommunications Act 1997*. The Act distinguishes between 'low-impact' facilities, temporary facilities for defence, and 'other' facilities.<sup>433</sup> Low impact facilities are defined in the *Telecommunications (Low-impact facilities) Determination 1997*:<sup>434</sup> they include small radio communications dishes,<sup>435</sup> antennae<sup>436</sup> and public payphones,<sup>437</sup> though the designation of some activities as low impact depends upon their proximity to residential, commercial, industrial and rural areas. For instance, an extension to a telecommunication tower less than five metres in height will only be designated as a low impact facility in industrial and rural areas, and not in residential or commercial areas.<sup>438</sup>

Low impact, temporary and defence-related facilities are exempt from state and territory planning laws. However, carriers must comply with the *Telecommunications Act 1997* and the *Telecommunications Code of Practice 1997*<sup>439</sup> when installing these facilities. The code of practice also requires that carriers follow industry codes and standards,<sup>440</sup> including the Communications Alliance's *Deployment of mobile phone network infrastructure* industry code.<sup>441</sup>

Section 5.1 of the industry code requires carriers to take a 'precautionary approach' when selecting a site.<sup>442</sup> Amongst other things, the precautionary approach requires that carriers consider whether a site is likely to be a 'community sensitive location': a residential area, or the vicinity of a child care centre, school, aged care centre, hospital or 'regional icon' (the last is not defined, and could mean anything).<sup>443</sup> The objective is to avoid such locations.

Facilities which do not fall within the 'low impact' category, or which are not temporary or defence-related facilities, are subject to development approval by councils.

Queensland's State Planning Policy 1/03 Guideline suggests that essential services infrastructure, including telecommunications facilities, be:

- placed above the defined flood level
- constructed to exclude floodwaters
- designed and constructed to resist hydrostatic and hydrodynamic forces as a result of inundation by a defined flood event.<sup>444</sup>

Since the State Planning Policy 1/03 Guideline is not binding, councils may decide whether to incorporate these suggested outcomes into their planning schemes. Thus, flood risk for telecommunications infrastructure may be approached differently by different councils.

By way of example, Brisbane City Council's planning scheme incorporates a telecommunication tower code (Chapter 5) and telecommunication towers planning scheme policy (Appendix 2). The code and policy require that towers do not constitute a safety hazard to aviation operations<sup>445</sup> and that sites be selected in an effort to minimise impacts on the surrounding environment and community,<sup>446</sup> though they do not take account of flood risk. Assessable development for telecommunications infrastructure may enliven other regulations in the Brisbane City Council planning scheme, which do consider flood risk.<sup>447</sup> However, the code and policy do not incorporate the suggested outcomes in the State Planning Policy 1/03 Guideline.

Where a carrier has been unable to secure development approval through a council,<sup>448</sup> it may apply to the Australian Communications and Media Authority for a facility installation permit.<sup>449</sup> This process is intended to ensure that there is a balance between the sometimes inconsistent aims of addressing community concerns and investing in infrastructure to meet demands for telecommunications services.<sup>450</sup> In considering a permit application, the Australian Communications and Media Authority must apply criteria<sup>451</sup> which require, amongst other things, that:

- where telecommunications facilities are proposed to be placed near communities, the community has been fully consulted and has agreed (wherever possible) to the placement of the facility, and
- alternative 'less sensitive' sites have been considered.

The combined effect of commonwealth, state and local regulation of the telecommunication industry means that carriers are encouraged to build telecommunications infrastructure away from residential and community use zones. Since residential and community use areas are generally situated outside the floodplain, a consequence of this approach has been that some telecommunications facilities have been built in areas susceptible to flooding. One carrier pointed out that the requirement under state and local regulations for base stations, in particular, to have low visual impact meant that they were often located in areas more susceptible to flood.<sup>452</sup>

The installation of telecommunications facilities involves an obvious tension between minimising their impact on the community and reducing the chance of their flooding.

## Recommendation

10.22 Carriers, councils and the Australian Communications and Media Authority should take into account the risk of flooding when considering the placement of telecommunications facilities.

## 10.4.2 The design and protection of telecommunications infrastructure

Given the various (legitimate) reasons for installing telecommunications infrastructure outside residential and community use areas, it is inevitable that some telecommunications infrastructure will still have to be built on floodplains. In those circumstances, carriers need to make their facilities as flood-resilient as possible.

Optus selects sites for exchanges and fibre access nodes which are above the flood level that has an annual exceedance probability of one per cent.<sup>453</sup> It also attempts to place mobile base stations and transmission hubs above this level.<sup>454</sup> However, this is only possible where accurate flood data is available. Clearly wider availability of floods maps would assist it in doing so.<sup>455</sup>

Telstra takes various approaches to increasing the resilience of telecommunications infrastructure located in areas susceptible to flooding. These include elevating facilities above defined flood levels<sup>456</sup> and bolting steel plates to the walls of exchanges or wrapping them in plastic to prevent the intrusion of floodwaters.<sup>457</sup>



*Telstra's St George exchange wrapped in plastic and sandbagged to protect it from floodwaters during the 2010/2011 floods*  
Source: Exhibit 215, Supplementary submission of Telstra, 8 April 2011, Annexure 1 [p9].



*Telstra's CMUX unit at Rockhampton built on an elevated platform, so it was above floodwaters during the 2010/2011 floods*  
Source: Exhibit 215, Supplementary submission of Telstra, 8 April 2011, Annexure 1 [p12].

Carriers will, no doubt, continue their efforts to improve the resilience of telecommunications facilities against the impacts of flooding, with measures such as those identified in State Planning Policy 1/03 in mind. It is in their best interests, and those of emergency service personnel and the wider community, to ensure telecommunications services continue to function during disaster events.

## 10.5 Roads and rail

Road and rail infrastructure in Queensland was significantly affected by the 2010/2011 floods. Transport links are essential to all communities; this part of the Commission's report examines the response of transport authorities to the need to re-establish these links as quickly as possible after flooding. Possible improvements in flood immunity<sup>458</sup> are considered as an aspect of preparedness. The problem of properties isolated by the flooding of low-lying access routes is discussed in section 7.8 *Anthills: Properties isolated by flooding of low-lying access routes*.

### 10.5.1 Roads

The development and upkeep of Queensland's network of major roads is the responsibility of the Department of Transport and Main Roads. This system of roads is referred to as the state-controlled road network.<sup>459</sup> Within this network, roads have a priority status assigned to them (from one to three), depending on a range of factors including their social and economic importance, freight and passenger traffic volumes, and strategic significance.<sup>460</sup> Thus, the Bruce Highway, unsurprisingly, has a priority status of one, although there are 111 priority one, 44 priority two and 71 priority three roads in Queensland.<sup>461</sup>

Priority levels guide the department's road development and investment programs.<sup>462</sup> They also helped to determine the department's response and recovery priorities following the widespread disruption of the network caused by the 2010/2011 floods.<sup>463</sup>

Queensland has over 33 000 kilometres of state-controlled roads. Over 9000 kilometres (or about 27 per cent) of the network were affected by the natural disasters of the 2010/2011 wet season.<sup>464</sup> In south-east Queensland, the road network sustained more damage than any other state asset during the floods.<sup>465</sup>



Flooded road at Jondaryan, January 2011 (photo courtesy G Cooke, Jondaryan District Residents Association)

Most priority one roads (including the Bruce, Warrego, Cunningham, New England, Leichhardt, Dawson, Capricorn, Gregory, Peak Downs and Landsborough Highways) were closed at a number of locations and for varying periods of time during the floods. In terms of the duration of closures, some of the worst affected places were:

- the Bruce and Capricorn Highways around Rockhampton (between 10 and 20 days)
- the Capricorn Highway east of Duaringa and west of Comet (between 10 and 20 days in each case)
- the Warrego Highway between Dalby and Chinchilla (between 10 and 20 days)
- the Leichhardt Highway north of Taroom (between 30 and 50 days) and around Theodore (between 20 and 30 days).<sup>466</sup>

The department's response to the floods involved a three-phase approach consisting of:

- the incident response phase, guided by the Road Network Incident Response Plan<sup>467</sup>
- the network recovery phase, guided by the Flood Recovery Phase Project Plan<sup>468</sup>
- the network restoration or reconstruction phase.<sup>469</sup>

Remedial roadworks undertaken during the initial two phases are not designed to achieve greater flood immunity; rather, they are meant to achieve the prompt resumption of safe vehicular use.<sup>470</sup>

The third, or restoration, phase involves longer term work to restore flood damaged roads to 'current engineering standards'.<sup>471</sup> While this implies some degree of improvement, as roads are to be restored not to their pre-existing state but to prevailing modern standards, it does not necessarily equate to improved flood immunity. Instead, opportunities to improve the 'resilience' and safety of the road network are identified and pursued should there be funding available to do so.<sup>472</sup>

The *Queensland Transport and Roads Investment Program 2011-12 to 2014-15* sets out the road and rail transport projects the department expects to complete in the coming four years. However, the document only identifies firm funding commitments for the first two years, in the case of projects funded by the Queensland Government, and for the first year for projects funded by the Commonwealth Government. After those timeframes, the funding allocations become indicative only.

A review of the investment program reveals that most of the roadworks being undertaken on sections of the priority one network that were affected by the 2010/2011 floods are directed to flood recovery (or reinstatement) works, rather than increasing immunity. Where enhancement of the network is contemplated, it is often for the purpose of catering for increased traffic volumes or improving road safety. For example:

Project location	Flood effects	Project
Capricorn Highway (Rockhampton to Duaringa)	Maximum duration of closure on road segment = 17 days <sup>473</sup>	Flood recovery works <sup>474</sup> Undertake miscellaneous works, install/replace signs <sup>475</sup> Construct overtaking lane/s, improve intersection/s <sup>476</sup>
Gregory Highway (Emerald to Clermont)	Maximum duration of closure on road segment = 9.6 days <sup>477</sup>	Flood recovery works <sup>478</sup> Install traffic signals, reseal bitumen <sup>479</sup>

The Commission understands that these works should be viewed in the broader context of the range of projects outlined in the investment program. Reducing road congestion while making provision for population growth (for example, by duplicating carriageways or developing mass transit systems such as busways) and increasing road safety (by widening road pavements and shoulders, improving road alignments, constructing overtaking lanes, upgrading intersections and roundabouts, installing traffic lights, constructing overpasses and rest areas, adding guardrails and better signage or improving access points on major roads) are recurrent themes in the spending priorities identified in the investment program.<sup>480</sup> None of these projects necessarily involves improvements being made to the flood immunity of the road network, but they remain critically important to its functioning.

According to the department's general manager of program delivery and operations, increasing the flood immunity of state-controlled roads is a longer term aim of the department, which would ordinarily be achieved 'only...as part of the [department's] normal infrastructure program'.<sup>481</sup> However, the Queensland Reconstruction Authority sought nominations from the department for projects which will increase road flood immunity to be funded as part of the Natural Disaster Relief and Recovery Arrangements. Six projects have been put forward by the department in response to the reconstruction authority's invitation.<sup>482</sup> A further eight projects, forming part of the department's normal infrastructure program, are intended to improve the road network's flood immunity.<sup>483</sup>

A review of these eight projects indicates that major ones, such as those affecting the Bruce Highway, involve significant expense and are very much long-term in nature. Section C of the Cooroy to Curra upgrade (from Traveston to Keefton Roads south of Gympie) is one part of a four stage upgrade to the Bruce Highway between Cooroy and Curra, which will involve an extensive re-alignment of the route and provide a four lane highway that bypasses Gympie. Section C is still in the planning stage.<sup>484</sup> Although the improvement in flood immunity expected to result from this project is not revealed by the information before the Commission, a part of this section of the highway was closed for five and a half days during the floods.<sup>485</sup> This upgrade is described as being one of Queensland's highest priority road projects.<sup>486</sup>

South of Rockhampton, the Bruce Highway crosses the Yeppen floodplain. During the 2010/2011 floods, this section of the highway was closed as a result of inundation for about two weeks, cutting access to Rockhampton by this route. The highway at this point will currently escape inundation in a flood that has an average recurrence interval of 20 years or less. It is expected that the upgrade, which is currently in the planning and preliminary design phase, will ensure it is not cut in floods with an average recurrence interval up to 100 years.<sup>487</sup> While the Bruce Highway upgrade strategy indicates that the Yeppen floodplain upgrade should occur within the next five to 10 years, it is possible that this could be delayed until 2021 – 2031.<sup>488</sup>

Yellow Gin Creek, which passes under the Bruce Highway between Bowen and Ayr, is on the southern extremity of the Burdekin River floodplain. The location will be inundated with an average recurrence interval of more than 2 years. A business case in support of an upgrade has been prepared for submission to the Commonwealth Government. The proposal involves building a new bridge with higher approaches to replace the existing concrete floodway; the new bridge will be above the level of a flood with an average recurrence interval of 20 years. No higher level could be achieved because of the increased risk of flooding to the railway line located upstream.<sup>489</sup>

Funding availability and the need to minimise the risk of causing upstream flooding are the two greatest constraints on achieving greater flood immunity across the road network. The budgetary constraints are the product of the significant financial cost that often accompanies projects incorporating improved flood immunity and the vast range of other projects that have a legitimate claim on the public purse, such as those which are designed to increase network efficiency, by reducing congestion, and improve road safety.

For flood immunity improvements to the existing road network, these pressures are acute. Whether they are less so for new roads in so-called 'greenfield areas' is perhaps doubtful. However, the opportunity to construct roads to an optimal level of flood immunity, even taking into account potential upstream effects, may be greater.

Recognising the competing considerations which underlie decisions as to what roadworks should be undertaken, the Commission, while emphasising the importance of maximising flood immunity for all roads, particularly those in new transport corridors, does not consider it appropriate to make any recommendation as to the priority to be given to that aim.

## 10.5.2 Rail

### Queensland Rail

Queensland Rail owns and operates rail infrastructure in all parts of the state except for the central Queensland coalfields. It also operates passenger services throughout the state.

Queensland Rail has a corporate plan which includes various risk identification and mitigation strategies designed to protect its infrastructure from damage which may result in a loss of services. This plan resulted in the development of the company's General Risk Framework and the Safety Risk Framework. The frameworks require risks to be identified and cross-referenced to safety manuals with mechanisms for responding to the risks in question.<sup>490</sup>

At a practical level, these processes saw Queensland Rail staff in Toowoomba close the Toowoomba range line the day before it was washed away by flash flooding. The line had previously been identified as a location at risk of damage in the event of flooding. When faced with the prediction of a major storm the following day, Queensland Rail closed the line.<sup>491</sup> It seems that as a result of rail lines at risk from flooding being identified in this way, no trains were running on lines when they became flooded and no Queensland Rail rolling stock was damaged or derailed.<sup>492</sup>

Other steps taken included moving rolling stock away from areas of possible flooding<sup>493</sup> and removing electric points machines from rail yards that were likely to be flooded, such as the one located in Rockhampton.<sup>494</sup> Queensland Rail has acknowledged, however, that in some cases it only managed to stow its rolling stock safely because of the local knowledge of its staff, and not because of established risk management procedures. It has resolved to learn from this experience.<sup>495</sup>

The 2010/2011 floods affected over 3000 kilometres of Queensland Rail track across the state in some way.<sup>496</sup>

The most severe disruption occurred on the West Moreton line as a result of the track largely being washed away at Spring Bluff. This was the only part of Queensland Rail's network that was destroyed as a result of the floods. However, the Toowoomba range rail corridor, the worst-affected part of the West Moreton line, was entirely rebuilt within 12 weeks.<sup>497</sup>

In Brisbane, the passenger network was almost entirely operational within six hours of the flood, and all services had resumed by 10.00 am on Thursday, 13 January 2011, with the exception of those on the Ipswich line between Darra and Rosewood. This part of the network became operational again on Wednesday, 19 January 2011.<sup>498</sup>

Queensland Rail seeks to make its network infrastructure 'flood free' where possible. This means building it above the 1 in 100 flood level. Where it is not cost effective to achieve flood free status, Queensland Rail tries to make its infrastructure 'flood-proof' to the greatest possible extent. Even if floodwaters submerge its infrastructure, it can be promptly recommissioned, as it was designed to withstand water flows associated with a range of flood events. The Brisbane Airport line, which sits on concrete pylons above the floodplain, is designed to be flood free. Achieving this across the whole of the state's rail network is simply not viable; however, it is viable for Queensland Rail to undertake flood-proofing. This would see the flood-proofed lines requiring only minor works after a flood to restore them to operational capacity in a relatively short time.<sup>499</sup>

Queensland Rail's priority after floodwaters had receded was to resume rail services as quickly as possible in the affected areas. In reality, this meant restoring the network to its former 'flood-proof' status without making improvements to the flood immunity of any of its railways. The one exception to this approach was in Emerald, where 10 additional pipes were installed under the railway line to prevent floodwaters from overflowing and causing scouring. No other specific improvements were seen as being necessary, on either the metropolitan or the regional track systems, including on the West Moreton line running through the Lockyer Valley from Rosewood to Toowoomba.<sup>500</sup>

Since the floods, Queensland Rail has moved some critical equipment to higher ground, particularly in the Brisbane metropolitan area. At Goodna railway station, on the Ipswich line, the communication and signalling equipment rooms have both been raised a metre above the highest known flood level at that location.<sup>501</sup> The Commission endorses these measures.

## QR National

QR National operates approximately 2300 kilometres of largely dedicated and purpose-built heavy haul rail infrastructure known as the Central Queensland Coal Network.<sup>502</sup>

Flooding occurred in various parts of this network between December 2010 and early January 2011.<sup>503</sup> QR National's response to these events included:

- initiating its safety plan for large-scale disasters
- purchasing specialised meteorological advice to guide the making of operational decisions
- moving locomotives and wagons to higher ground
- establishing a flood recovery taskforce to oversee the recovery effort.<sup>504</sup>

These steps were both appropriate and effective, with no damage being sustained to rolling stock.<sup>505</sup>



*Comet River overflow (photo courtesy QR National)*

Parts of the rail network itself were damaged when flooding occurred and were closed until necessary repairs could be carried out. Worst affected were:

- The Moura System – after a temporary closure in early December 2010 due to heavy rainfall and flash flooding, the system was closed again between 27 December 2010 and 6 January 2011 as a result of flooding. The system reopened with speed restrictions to protect the track while repairs were continuing, and became fully operational on 13 January 2011.<sup>506</sup>
- The Blackwater System – a temporary closure also occurred on this system in early December, followed by a more lengthy closure between 27 December 2010 and 19 January 2011 as a result of extensive flooding. Operations were progressively re-instated between 19 and 26 January 2011, except in the case of the Rolleston spur line, which was the most severely damaged part of QR National's network. This part of the system became fully operational again on 8 March 2011.<sup>507</sup>

Repairs to QR National's rail network were completed within three to six weeks, enabling operations to return to full capacity. However, QR National found that it had more train services available to haul coal than were required, because of a fall in production from the mines.<sup>508</sup>

QR National uses Queensland Rail's West Moreton Line to haul grain, general freight and coal from areas west and south-west of Brisbane. Damage to this line on the Toowoomba Range caused the longest disruption to QR National's freight services. In this instance, road transport was used in an attempt to meet haulage obligations.<sup>509</sup>

QR National's rail network in central Queensland is built for tropical environmental conditions.<sup>510</sup> This does not mean that the system is immune from inundation; rather, it is designed to withstand the effects of flooding so that repairs can be effected quickly. In most areas of the network, track structure remained intact, with only the ballast being displaced. This enabled the main line of the Blackwater System to be reopened to traffic (without signalling) only seven days after floodwaters had receded.<sup>511</sup>

## Recommendation

10.23 Queensland Rail and QR National should continue to investigate opportunities for increasing the flood resilience of their networks, including raising the height of critical equipment.

## (Endnotes)

- 1 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p7: para 28].
- 2 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p6: para 27].
- 3 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p4: para 20].
- 4 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p7: para 35]; Appendix A.
- 5 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p8: para 40]; Appendix C.
- 6 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p8: para 42].
- 7 Exhibit 289, Statement of Colin Jensen, 19 April 2011, Attachment CDJ-28.
- 8 Exhibit 289, Statement of Colin Jensen, 19 April 2011, Attachment CDJ-16; CDJ-27.
- 9 Exhibit 289, Statement of Colin Jensen, 19 April 2011, Attachment CDJ-16 [p528].
- 10 Exhibit 864, Statement of Paul Belz, 25 October 2011 [p2: para 7].
- 11 Exhibit 863, Statement of Paul Belz, 21 October 2011 [p2: para 8-9].
- 12 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p8: para 44-45].
- 13 Exhibit 863, Statement of Paul Belz, 21 October 2011 [p3: para 10-13].
- 14 Transcript, Diane Robertson, 3 October 2011, Brisbane [p3476: line 10].
- 15 Exhibit 863, Statement of Paul Belz, 21 October 2011 [p2: para 3-6].
- 16 Transcript, Paul Belz, 25 October 2011, Brisbane [p4268: line 13].
- 17 Statement of John Kersnovski, 16 September 2011 [p2].
- 18 Statement of John Kersnovski, 16 September 2011 [p2].
- 19 Exhibit 777, Statement of Ronald Smith, 12 September 2011 [p2, 5].
- 20 Exhibit 777, Statement of Ronald Smith, 12 September 2011 [p5]; Exhibit 770, Statement of Robert Savage, 12 September 2011 [p9, 11].
- 21 Statement of Mark Pitt, 12 September 2011 [p4: para 6]; Exhibit 777, Statement of Ronald Smith, 12 September 2011 [p2].
- 22 Exhibit 777, Statement of Ronald Smith, 12 September 2011 [p3].
- 23 Exhibit 270, Statement of Scott Norman, 1 April 2011 [p5].
- 24 Exhibit 463, Statement of Collin Head, 5 April 2011 [p12].
- 25 Exhibit 463, Statement of Collin Head, 5 April 2011, Attachment 6 [p43].
- 26 Exhibit 470, Statement of Desmond Howard, 1 April 2011 [p3].
- 27 Exhibit 775, Statement of Michael Clerke, 18 March 2011 [p13: para 84].
- 28 Exhibit 775, Statement of Michael Clerke, 18 March 2011 [p13: para 84].
- 29 Exhibit 750, Statement of Goodwin McLeod, 29 September 2011 [p3: para 19].
- 30 Transcript, Goodwin McLeod, 10 October 2011, Bundaberg [p3858: line 45].
- 31 Statement of Phil Bering, 25 March 2011 [p11].
- 32 Statement of Phil Bering, 25 March 2011 [p10].
- 33 Transcript, Robert Fredman, 13 October 2011, Gympie [p4058: line 33].
- 34 Transcript, Robert Fredman, 13 October 2011, Gympie [p4058: line 56].
- 35 Transcript, Thomas Thomas, 13 October 2011, Gympie [p4082: line 35; p4084: line 21]; Exhibit 823, Statement of Thomas Thomas, 28 September 2011 [p5: para 14].

- 36 Exhibit 823, Statement of Thomas Thomas, 28 September 2011 [p5: para 15].
- 37 Statement of Jonathan Black, 16 September 2011 [p2: para 6]; Annexure JB-01.
- 38 Exhibit 249, Statement of Rodney Ferguson, 14 April 2011 [p3: para 27].
- 39 Exhibit 683, Statement of Bryan Ottone, Central Highlands Regional Council, 6 September 2011 [p4]; Exhibit 670, Statement of Luke Lankowski, 1 September 2011 [p7: para 8.4.2].
- 40 Exhibit 683, Statement of Bryan Ottone, Central Highlands Regional Council, 6 September 2011 [p5].
- 41 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p5: para 22].
- 42 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p5: para 24].
- 43 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p5: para 22].
- 44 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p5: para 20-21].
- 45 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p5: para 20].
- 46 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, Annex 4 [A4.2].
- 47 State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, Annex 3 [A3.1 – A3.2].
- 48 State Planning Policy 1/03 : *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, Annex 5 [A5.1 – A5.2].
- 49 State Planning Policy Guideline 1/03 : *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [6.19].
- 50 Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p21: para 9.1.1].
- 51 Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p22: para 9.1.1.2].
- 52 Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p23: para 9.1.2].
- 53 Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p23: para 9.1.3].
- 54 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p5: para 24]; Transcript, Paul Belz, 25 October 2011 [p4277: line 42].
- 55 Statement of Jonathan Black, 16 September 2011 [p4: para 18].
- 56 Exhibit 777, Statement of Ronald Smith, 12 September 2011 [p6].
- 57 DERM, Planning Guidelines for Water Supply and Sewerage, 2010 [p1]; Introduction.
- 58 Transcript, Paul Belz, 25 October 2011, Brisbane [p4273: line 10].
- 59 Statement of John Kersnovski, 16 September 2011 [p6].
- 60 Exhibit 863, Statement of Paul Belz, 21 October 2011 [p3: para 16-18].
- 61 Transcript, Paul Belz, 25 October 2011, Brisbane [p4274: line 6].
- 62 Exhibit 863, Statement of Paul Belz, 21 October 2011 [p4: para 19-21].
- 63 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p7: para 32].
- 64 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p8: para 38].
- 65 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p7: para 36].
- 66 Statement of Jonathan Black, 16 September 2011 [p3: para 14(a)].
- 67 Statement of Jonathan Black, 16 September 2011 [p3: para 14(b)].
- 68 Statement of Jonathan Black, 16 September 2011 [p3: para 14(d)].
- 69 Statement of Jonathan Black, 16 September 2011 [p4: para 22(a); p5: para 22(d)].
- 70 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p11: para 66].
- 71 Submission of Queensland Urban Utilities, 23 November 2011 [p2: para 4(a)].
- 72 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p10: para 64; p11: para 67]; Submission of Queensland Urban Utilities, 23 November 2011 [p3: para 6(d)].
- 73 Statement of Paul Belz, 15 November 2011 [p3: para 16].
- 74 Exhibit 864, Statement of Paul Belz, 25 October 2011 [p4: para 19].

- 75 Transcript, Paul Belz, 25 October 2011, Brisbane [p4277: line 28].
- 
- 76 Exhibit 864, Statement of Paul Belz, 25 October 2011 [p4: para 20].
- 
- 77 Transcript, Paul Belz, 25 October 2011, Brisbane [p4276: line 37]; Exhibit 864, Statement of Paul Belz, 25 October 2011 [p7: para 55].
- 
- 78 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p5: para 17-19]; Exhibit 864, Statement of Paul Belz, 25 October 2011 [p7: para 55]; Transcript, Paul Belz, 25 October 2011, Brisbane [p4276: line 30].
- 
- 79 Queensland Plumbing and Wastewater Code, 19 January 2011.
- 
- 80 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p8: para 42].
- 
- 81 State Planning Policy Guideline 1/03 : *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, Appendix 5.
- 
- 82 State Planning Policy Guideline 1/03 : *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, Appendix 5 [p59: 5.1].
- 
- 83 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p9: para 48].
- 
- 84 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p9: para 53].
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- 85 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p9: para 51-53].
- 
- 86 Statement of Jonathan Black, 16 September 2011 [p3: para 14(b)].
- 
- 87 Exhibit 864, Statement of Paul Belz, 25 October 2011 [p8: para 66].
- 
- 88 Exhibit 866, Statement of Robin Lewis, 25 October 2011 [p9: para 54].
- 
- 89 Transcript, Paul Belz, 25 October 2011, Brisbane [p4275: line 19].
- 
- 90 Statement of Paul Belz, 15 November 2011 [p3: para 16].
- 
- 91 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p8: para 38].
- 
- 92 Department of Natural Resources NSW, Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas, 2007 [p112-113].
- 
- 93 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p8: para 38].
- 
- 94 Statement of Jonathan Black, 16 September 2011 [p3: para 14(c)].
- 
- 95 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p8: para 38].
- 
- 96 Exhibit 864, Statement of Paul Belz, 25 October 2011 [p4: para 26].
- 
- 97 Exhibit 864, Statement of Paul Belz, 25 October 2011 [p4-5: para 26-29]; Transcript, Paul Belz, 25 October 2011, Brisbane [p4273: line 31].
- 
- 98 Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p8: para 39]; Exhibit 864, Statement of Paul Belz, 25 October 2011 [p14: para 80].
- 
- 99 Exhibit 864, Statement of Paul Belz, 25 October 2011 [p14: para 80].
- 
- 100 Department of Natural Resources NSW, Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas, 2007 [p113].
- 
- 101 Submission from Queensland Urban Utilities, 23 November 2011 [p2: para 5(c)].
- 
- 102 Exhibit 666, Statement of Glen Brumby, 15 September 2011 [p7-8: para 32-33].
- 
- 103 Exhibit 666, Statement of Glen Brumby, 15 September 2011 [p8: para 35].
- 
- 104 Exhibit 1015, Statement of Glen Brumby, 1 November 2011 [p8: para 32; p9: para 36].
- 
- 105 Proposed new part MP3.5 Construction of Buildings in Flood Hazard Areas [p7], available at [www.dlgs.qld.gov.au](http://www.dlgs.qld.gov.au).
- 
- 106 Statement of Glen Brumby, 16 November 2011, Attachment 2 [p2].
- 
- 107 Statement of Glen Brumby, 16 November 2011, Attachment 1 [p4].
- 
- 108 Report of Trevor Johnson, The Queensland Development Code, 23 December 2011 [p6].
- 
- 109 Submission of Queensland Urban Utilities 4 April 2011 [p2: para 8]; Exhibit 578, Statement of Joe Bannan, 8 September 2011 [p4: para 16].
- 
- 110 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p30: para 117]; Exhibit 578, Statement of Joe Bannan, 8 September 2011 [p4: para 16].
- 
- 111 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p31-32: para 118-119].
- 
- 112 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p31: para 119].
-

- 113 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p30: para 118]; Exhibit 866, Statement of Robin Lewis, 12 October 2011 [p11: para 69].
- 
- 114 Exhibit 578, Statement of Joe Bannan, 8 September 2011 [p4: para 17].
- 
- 115 Transcript, Paul Belz, 25 October 2011, Brisbane [p4270: line 3].
- 
- 116 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p31: para 119].
- 
- 117 Statement of Jonathan Black, 16 September 2011 [p5: para 22(b)]; Letter from UnityWater, 9 December 2011 [p1].
- 
- 118 Statement of Edward Denman, 14 November 2011 [p7: para 29-30].
- 
- 119 Statement of Edward Denman, 14 November 2011 [p7: para 33].
- 
- 120 Statement of Edward Denman, 14 November 2011 [p9: para 46]. Mr Denman estimates that the total stormwater outflow for a standard three bedroom dwelling during a rainfall event over a 24 hour period is approximately 50 000 to 100 000 litres.
- 
- 121 DERM, Planning Guidelines for Water Supply and Sewerage, April 2010, Chapter 5, section 5.2.2, table 5.5 [p7].
- 
- 122 Section 116, *Plumbing and Drainage Act 2002*.
- 
- 123 Statement of Edward Denman, 14 November 2011 [p3: para 12].
- 
- 124 Chapter 3, Part 4, Division 2; Chapter 5, Part 2, Division 1, *City of Brisbane Act 2010*; Chapter 3, Part 3, Division 2; Chapter 5, Part 2, Division 1, *Local Government Act 2009*.
- 
- 125 Statement of Edward Denman, 14 November 2011 [p3: para 12; p6: para 23].
- 
- 126 Chapter 5 of the *Water Supply (Safety and Reliability) Act 2008* confers all investigation and enforcement powers under the Act on the Water Supply Regulator, a state government entity.
- 
- 127 Statement of Edward Denman, 14 November 2011 [p10: para 47].
- 
- 128 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p31: para 120-122].
- 
- 129 Section 33, *Water Supply (Safety and Reliability) Act 2008*.
- 
- 130 Section 31, *Water Supply (Safety and Reliability) Act 2008*.
- 
- 131 Transcript, Paul Belz, 25 October 2011, Brisbane [p4269: line 40].
- 
- 132 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p32: para 123-124].
- 
- 133 Letter from Blake Dawson on behalf of Queensland Urban Utilities, 25 November 2011 [p1: para 3(b)].
- 
- 134 Letter from Blake Dawson on behalf of Queensland Urban Utilities, 25 November 2011 [p1: para 3(b)].
- 
- 135 Submission of Queensland Urban Utilities 4 April 2011 [p7: para 38(a)].
- 
- 136 Submission of Queensland Urban Utilities 4 April 2011 [p7: para 38(b)].
- 
- 137 Letter from UnityWater, 9 December 2011 [p3]; Letter from Ipswich City Council, 10 January 2012.
- 
- 138 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p29: para 112].
- 
- 139 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p30: para 113].
- 
- 140 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p33: para 135-136].
- 
- 141 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p33: para 135].
- 
- 142 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p33: para 135].
- 
- 143 Section 11; Schedule 2, *Disaster Management Act 2003*.
- 
- 144 Department of Natural Resources and Water, Queensland Urban Drainage Manual, Volume 1, Second edition, 2007 [p1-3].
- 
- 145 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p3: para 11]; Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2908: line 28].
- 
- 146 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p3: para 13].
- 
- 147 Exhibit 865, Statement of Robin Lewis, 4 May 2011 [p30: para 117]; Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p4: para 16].
- 
- 148 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p3: para 12].
- 
- 149 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2930: line 1]; Exhibit 578, Statement

- of Joseph Bannan, 8 September 2011 [p22: para 72-74].
- 
- 150 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p6: para 18(a)].
- 
- 151 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p7: para 18(e)]; Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2913: line 19].
- 
- 152 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p7: para 18(f)]; Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2913: line 26].
- 
- 153 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p6: para 18(b)]; Joseph Bannan, 21 September 2011, Brisbane [p2911: line 38].
- 
- 154 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p6: para 18(c)]; Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2911: line 46].
- 
- 155 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p6: para 18(d)].
- 
- 156 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p7: para 19]; Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2908: line 45].
- 
- 157 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p7: para 19]; Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2908: line 44].
- 
- 158 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2909: line 1].
- 
- 159 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p3: para 12].
- 
- 160 Exhibit 729, Statement of Russell Cuerel, 14 September 2011 [p4: para 9].
- 
- 161 Department of Natural Resources and Water, Queensland Urban Drainage Manual, Volume 1, Second edition, 2007 [p7-6: Table 7.02.1].
- 
- 162 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2933: line 20].
- 
- 163 Exhibit 853, Statement of Carl Wulff, 2 September 2011 [p18: para 106].
- 
- 164 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p54: section F.1].
- 
- best practice principles and guidelines, SCARM Report 73, 2000 [p54].
- 
- 165 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p54: section F.1].
- 
- 166 Exhibit 853, Statement of Carl Wulff, 2 September 2011 [p19: para 111]; Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p22: para 73]; Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p54: section F.2.2].
- 
- 167 Exhibit 729, Statement of Russell Cuerel, 14 September 2011 [p3: para 8].
- 
- 168 Exhibit 729, Statement of Russell Cuerel, 14 September 2011 [p3: para 8].
- 
- 169 Exhibit 729, Statement of Russell Cuerel, 14 September 2011 [p1: para 3].
- 
- 170 Exhibit 729, Statement of Russell Cuerel, 14 September 2011 [p1: para 3].
- 
- 171 Exhibit 729, Statement of Russell Cuerel, 14 September 2011 [p2: para 8]; Exhibit 793, Statement of Wayne Sweeney, 30 August 2011 [p5: para 14].
- 
- 172 Queensland Development Code, Part 1.8 – Stormwater Drainage, 1 January 2008.
- 
- 173 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p54: para F.2.1].
- 
- 174 Transcript, Carl Wulff, 19 October 2011, Brisbane [p4196: line 49].
- 
- 175 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3520: line 44].
- 
- 176 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2921: line 2].
- 
- 177 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2920: line 35]; Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p2: para 8]; Department of Natural Resources and Water, Queensland Urban Drainage Manual, Volume 1, Second edition, 2007 [p7-10: para 7.03.4].
-

- 178 Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p3: para 9].
- 179 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2920: line 45]; Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p2: para 8].
- 180 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2920: line 50]; Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p2: para 8]; Exhibit 853, Statement of Carl Wulff, 2 September 2011 [p19: para 111].
- 181 Exhibit 729, Statement of Russell Cuerel, 14 September 2011 [p5: para 10].
- 182 Exhibit 729, Statement of Russell Cuerel, 14 September 2011 [p5: para 10].
- 183 Queensland Water Commission, Urban Water Supply Arrangements in South-East Queensland, 2007 [p32].
- 184 Department of Natural Resources and Water, Queensland Urban Drainage Manual, Volume 1, Second edition, 2007 [p3-12: para 3.09.1].
- 185 Exhibit 729, Statement of Russell Cuerel, 14 September 2011 [p4: para 9]; Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p3: para 14; p7: para 19].
- 186 Statement of Andrew Blake, 11 November 2011 [p4: para 11; p5: para 18-19].
- 187 Statement of Subramaniam (Siva) Sivaananthan, 11 November 2011 [p9: para 35]; Transcript, Carl Wulff, 19 October 2011, Ipswich [p4195: line 19]; Exhibit 853, Statement of Carl Wulff, 2 September 2011 [p19: para 111].
- 188 Statement of Subramaniam (Siva) Sivaananthan, 11 November 2011 [p2: para 11].
- 189 Exhibit 962, Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p11: para 22; p27: para 92]; Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3917: line 1].
- 190 Exhibit 962, Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p27: para 93].
- 191 Exhibit 962, Steve Reynolds, *Flood Mapping in Queensland Planning Schemes*, 9 November 2011 [p11: para 22].
- 192 Statement of Andrew Blake, 11 November 2011 [p5: para 19]; Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2910: line 4].
- 193 Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p2: para 1.1.6]; Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3916: line 10].
- 194 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3917: line 7].
- 195 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3921: line 49]; Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p32: para 13.1.1].
- 196 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3922: line 28]; Exhibit 766, Statement of Andrew Fulton, 1 September 2011 [p33: para 13.1.3].
- 197 Exhibit 853, Statement of Carl Wulff, 2 September 2011 [p19: para 114 - p22: para 128].
- 198 Transcript, Wayne Sweeney, 12 October 2011, Maryborough [p3988: line 23]; Exhibit 793, Statement of Wayne Sweeney, 30 August 2011 [p4: para 12].
- 199 Exhibit 311, Statement of Anthony Martini, 4 May 2011 [p2].
- 200 Transcript, Andrew Fulton, 11 October 2011, Bundaberg [p3916: line 2].
- 201 Exhibit 881, Joint Expert Statement of the Brisbane River Flood Frequency Panel, 25 October 2011 [p10: para 27].
- 202 Department of Natural Resources and Water, Queensland Urban Drainage Manual, Volume 1, Second edition, 2007 [p5-3: para 5.03].
- 203 Exhibit 766, Statement of Andrew Fulton, 1 September 2011 Part B: [p39: para 2.1-2.2].
- 204 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2912: line 39].
- 205 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2912: line 50].
- 206 Transcript, Lynn de Lange, 3 October 2011, Brisbane [p3465: line 45].
- 207 Exhibit 596, Statement of Paul Cassels, 14 September 2011 [p3: para 10].
- 208 Transcript, Diane Robertson, 3 October 2011, Brisbane [p3471: line 55].

- 209 Beavis & Cochrane Report, Mirvac – Tennyson Reach Flood Immunity Investigation, 9 September 2011 [p3].
- 
- 210 Transcript, Lynn de Lange, 3 October 2011, Brisbane [p3464: line 19, 36].
- 
- 211 Transcript, Lynn de Lange, 3 October 2011, Brisbane [p3473: line 35].
- 
- 212 Exhibit 576, Statement of Paul Rees, 26 August 2011 [p4: para 8]; Exhibit 740, Statement of Brett Draffen, 26 September 2011 [p4: para 18-21]; Exhibit 596, Statement of Paul Cassels, 14 September 2011 [p3: para 7]; Transcript, Diane Robertson, 3 October 2011, Brisbane [p3471: line 49].
- 
- 213 Exhibit 532, Statement of Gary White, 2 September 2011 [p38, 39: para 201-206]; See also Transcript, Gary White, 19 September 2011, Brisbane [p2755: line 52].
- 
- 214 Transcript, Cassandra Sun, 27 September 2011, Brisbane [p3217: line 44]; Exhibit 544, Statement of Martin Reason, 1 September 2011, Attachment MJR-03.
- 
- 215 Transcript, Cassandra Sun, 27 September 2011, Brisbane [p3214: line 4; p3218: line 12]; Exhibit 630, Brisbane City Council, Draft DART Basement Condition, undated.
- 
- 216 Queensland Development Code, proposed Mandatory Part 3.5, Construction of Buildings in Flood Hazard Areas.
- 
- 217 Submission of the Queensland Board of Urban Places, undated [p3].
- 
- 218 Transcript, Glenn Brumby, 29 September 2011, Brisbane [p3308: line 10].
- 
- 219 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2930: line 2].
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- 220 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2930: line 12].
- 
- 221 Second submission of the Gold Coast City Council, undated [Annexure A: para 2.7].
- 
- 222 Exhibit 793, Statement of Wayne Sweeney, 30 August 2011 [p2: para 7(d)].
- 
- 223 Arnison, P, Gotterson, R, Apelt, C, Independent Review of Brisbane City Council's Response to the January 2011 Flood, 2011 [p66].
- 
- 224 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p14: para 40].
- 
- 225 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2912: line 46].
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- 226 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p16: para 49].
- 
- 227 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2916: line 3].
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- 228 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2931: line 1].
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- 229 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2932: line 12].
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- 230 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p13: para 38].
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- 231 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2917: line 9]; Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p12: para 32].
- 
- 232 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2917: line 53].
- 
- 233 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2918: line 20].
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- 234 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2919: line 18].
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- 235 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p22: para 73-74].
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- 236 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p24: para 79 – p25: para 83].
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- 237 Transcript, Geoffrey Jago, 29 September 2011, Emerald [p3426: line 56]; Transcript, David McCullagh, 28 September 2011, Brisbane [p3303, line 47]; Exhibit 673, Statement of Cresta Richardson, 15 September 2011 [p3: para 16].
- 
- 238 Exhibit 671, Statement of Robert Keogh, 15 September 2011 [p3: para 16, 21]; C&R Consulting, Central Highlands Regional Council Flood Management Report, 12 December 2011, Section B [p26: para 6.3.3 – p29: para 6.3.5].
- 
- 239 Transcript, Bryan Ottone, 29 September 2011, Emerald [p3437: line 18].
- 
- 240 Statement of Andrew Fulton, 3 February 2012, Annexure 5: Murdoch's Road Drain - Preliminary Investigation of Drainage Outlets [p2]; Exhibit 761, Map no. 13 differential rating 2011-2012, with markings. Transcript, Larry Borg, 11 October 2011, Bundaberg [p3897: line 8]; Exhibit 762, 1972 Map of Parish of North Kolan. Exhibit 760, Statement of Larry Borg, 19 August

- 2011 [p4: para 8; p9: para 20]; Transcript, George Shuter, 10 October 2011, Bundaberg [p3880: line 46]. Submission of Maryann Borg, 29 January 2012; Statement of Andrew Fulton, 30 January 2012.
- 
- 241 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2920: line 9]; Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06 [p7]; Transcript, Maxwell Winders, 25 October 2011, Brisbane [p4297: line 5].
- 
- 242 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2919: line 53]; Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06 [p6].
- 
- 243 Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06 [p9-10].
- 
- 244 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2920: line 1-5]; Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p2: para 5]; Exhibit 869, Statement of Maxwell Winders, 5 October 2011, Attachment MFW-05 [section 1].
- 
- 245 Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p2: para 5].
- 
- 246 Transcript, Stephen James Bolland, 22 September 2011, Brisbane [p3032: line 13].
- 
- 247 Transcript, Victoria Joy Ashworth, 20 September 2011, Brisbane [p2871: line 33].
- 
- 248 Transcript, Peita McCulloch, 20 September 2011, Brisbane [p2875: line 58].
- 
- 249 Transcript, Mark Anthony Middendorp, 21 September 2011, Brisbane [p2957: line 12].
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- 250 Transcript, Lyn de Lange, 3 October 2011, Brisbane [p3465: line 1].
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- 251 Transcript, Diane Robertson, 3 October 2011, Brisbane [p3471: line 18].
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- 252 Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p2: para 5].
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- 253 Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06 [p4].
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- 254 Transcript, Maxwell Winders, 25 October 2011, Brisbane [p4302: line 27].
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- 255 Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p4: para 13].
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- 256 Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p4: para 13]; Transcript, Maxwell Winders, 25 October 2011, Brisbane [p4303: line 2]; Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2921: line 24].
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- 257 Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p4: para 14].
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- 258 Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p4: para 16].
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- 259 Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06 [p33].
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- 260 Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06 [p7].
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- 261 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p10: para 25].
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- 262 Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06 [p45].
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- 263 Exhibit 793, Statement of Wayne Sweeney, 30 August 2011 [p3: para 7(e)].
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- 264 Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06.
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- 265 Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011.
- 
- 266 Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06 [p10]; Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p5: para 20].
- 
- 267 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2923: line 15].
- 
- 268 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2924: line 18]; Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p6: para 21]; Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06 [p10].
- 
- 269 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2924: line 41]; Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p6: para 21].
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- 270 Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06 [p12].
- 271 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2924: line 55]; Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p7: para 22].
- 272 Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p7: para 22].
- 273 Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06 [p11-12].
- 274 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2925: line 32]; Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p7: para 24].
- 275 Exhibit 870, Statement of Maxwell Winders, 18 October 2011, Attachment MFW-06 [p91: para 10].
- 276 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2926: line 32].
- 277 Transcript, Joseph Bannan, 21 September 2011, Brisbane [p2925: line 46]; Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p7: para 25].
- 278 Exhibit 578, Statement of Joseph Bannan, 8 September 2011 [p28: para 104].
- 279 Exhibit 868, Trevor Johnson, *Queensland Floods 2011 Stormwater Backflow*, September 2011 [p8: para 28]; Exhibit 869, Statement of Maxwell Winders, 5 October 2011, Attachment MFW-05 [p2: para 5].
- 280 Report of Trevor Johnson, *The Queensland Development Code*, 23 December 2011 [p2].
- 281 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p3: para 20-21].
- 282 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p218].
- 283 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p1: para 7-9].
- 284 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p1: para 6].
- 285 Submission from Ergon Energy, 11 March 2011 [p4: para 3.2].
- 286 Submission from Ergon Energy, 11 March 2011 [p4: para 3.4-3.5].
- 287 Submission from Ergon Energy, 11 March 2011 [p4: para 3.7].
- 288 Submission from Energex Limited, Planning Term of Reference [p2: para 7(c)].
- 289 Submission from Energex Limited, Planning Term of Reference [p2: para 7(a), 7(b)].
- 290 Submission from Energex Limited, Planning Term of Reference [p2: para 7(a)].
- 291 Submission from Energex Limited, Planning Term of Reference [p2: para 7(b)].
- 292 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p4: para 28].
- 293 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p3: para 17-18].
- 294 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p5: para 38].
- 295 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p5: para 39].
- 296 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p5: para 43].
- 297 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p5: para 40].
- 298 Transcript, Chris Arnold, 13 May 2011, Brisbane [p1967: line 8].
- 299 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p8: para 62].
- 300 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p17: para 128].
- 301 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p8: para 62].
- 302 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p17: para 129].
- 303 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p18: para 140-141].
- 304 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p5: para 35].
- 305 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p5: para 35-37].
- 306 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p6: para 45-49].
- 307 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p6: para 46].

- 308 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p6: para 47].
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- 309 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p6: para 48].
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- 310 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p20: para 158].
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- 311 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p6: para 49].
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- 312 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p6: para 51].
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- 313 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p6: para 52].
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- 314 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p6: para 52].
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- 315 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p6: para 54].
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- 316 Submission from Energex Limited, Planning Term of Reference [p7: para 52].
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- 317 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p6: para 58-59].
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- 318 Exhibit 366, Statement of Chris Arnold, 5 April 2011 [p7: para 60 -61].
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- 319 Submission from Ergon Energy, 11 March 2011 [p8: para 5.1].
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- 320 Submission from Ergon Energy, 11 March 2011 [p8: para 5.2].
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- 321 Submission from Ergon Energy, 11 March 2011 [p8: para 5.4].
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- 322 As at 11 March 2011. Submission of Ergon Energy, 11 March 2011 [p8: para 5.5].
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- 323 Submission from Ergon Energy, 11 March 2011 [p8: para 5.5].
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- 324 Submission from Ergon Energy, 11 March 2011 [p8: para 5.4].
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- 325 Submission from Ergon Energy, 11 March 2011 [p8: para 5.6].
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- 326 Submission from Ergon Energy, 11 March 2011 [p8: para 5.6].
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- 327 Transcript, Chris Arnold, 13 May 2011, Brisbane [p1967: line 7].
- 
- 328 Item 9, Table 5, Schedule 4, *Sustainable Planning Regulation 2009*.
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- 329 Section 10, *Sustainable Planning Regulation 2009*.
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- 330 Section 232(2), *Sustainable Planning Act 2009*.
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- 331 Sections 235(1) and (2), *Sustainable Planning Act 2009*.
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- 332 Sections 8 and 12(3)(c), *Electricity Act 1994*.
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- 333 Statement of Andrea Kenafake, 21 November 2011 [p8: para 35].
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- 334 Section 202, *Sustainable Planning Act 2009*. Use of designated land contrary to a requirement is an offence under section 582(b)(ii).
- 
- 335 Transcript, Chris Arnold, 25 October 2011, Brisbane [p4282: line 19].
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- 336 Transcript, Chris Arnold, 25 October 2011, Brisbane [p4282: line 18].
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- 337 Submission from Energex Limited, Planning Term of Reference [p5: para 32].
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- 338 Transcript, Chris Arnold, 25 October 2011, Brisbane [p4287: line 15].
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- 339 State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, Appendix 9.
- 
- 340 Section 82, *Electricity Act 1994*.
- 
- 341 Submission from Energex Limited, Planning Term of Reference, [p5: para 31].
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- 342 Statement of Chris Arnold, 21 November 2011 [p2: para 13-15].
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- 343 Statement of Chris Arnold, 21 November 2011 [p2: para 9].
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- 344 Statement of Chris Arnold, 21 November 2011 [p2: para 10-11].
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- 345 Statement of Damien Walker, 16 December 2011 [p2: para 5].
- 
- 346 Statement of Donald Rivers, 12 December 2011, DR-1 [p18].
- 
- 347 Statement of Chris Arnold, 21 November 2011 [p2: para 17].
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- 348 Statement of Chris Arnold, 21 November 2011 [p3: para 18].
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- 349 Statement of Chris Arnold, 21 November 2011 [p3: para 19-20].
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- 350 Statement of Andrea Kenafake, 21 November 2011, AMK-07.
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- 351 Statement of Andrea Kenafake, 21 November 2011 [p4: para 16] , AMK-09.
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- 352 Statement of Chris Arnold, 21 November 2011 [p3: para 22-24].
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- 353 Statement of Chris Arnold, 21 November 2011 [p3: para 22].
- 354 Statement of Donald Rivers, 12 December 2011, DR-9 [p1].
- 355 Statement of Donald Rivers, 12 December 2011, DR-10, DR-11.
- 356 Statement of Donald Rivers, 12 December 2011, DR-11.
- 357 Statement of Chris Arnold, 21 November 2011 [p3: para 26].
- 358 Statement of Chris Arnold, 21 November 2011 [p3: para 27].
- 359 Statement of Chris Arnold, 21 November 2011 [p3: para 28].
- 360 Statement of Chris Arnold, 21 November 2011 [p4: para 29].
- 361 Statement of Chris Arnold, 21 November 2011 [p5: para 43].
- 362 Statement of Chris Arnold, 21 November 2011 [p5: para 41-42].
- 363 Statement of Chris Arnold, 21 November 2011 [p5: para 44].
- 364 Statement of Chris Arnold, 21 November 2011 [p5: para 44].
- 365 Statement of Chris Arnold, 21 November 2011 [p6: para 51].
- 366 Statement of Chris Arnold, 21 November 2011 [p6: para 55-56].
- 367 Statement of Neil Lowry, 24 November 2011 [p3: para 2-4].
- 368 Statement of Neil Lowry, 24 November 2011, NL-4.
- 369 Statement of Neil Lowry, 24 November 2011 [p4: para 7].
- 370 Statement of Neil Lowry, 24 November 2011 [p7: para 22].
- 371 Statement of Neil Lowry, 24 November 2011 [p8: para 28].
- 372 Statement of Neil Lowry, 24 November 2011, NL-7.
- 373 Statement of Neil Lowry, 24 November 2011 [p9: para 37].
- 374 Statement of Neil Lowry, 24 November 2011 [para 40].
- 375 Statement of Neil Lowry, 24 November 2011 [para 43].
- 376 Submission, Energex Limited, Planning Term of Reference [p7: para 54; p8: para 58].
- 377 Transcript, Chris Arnold, 13 May 2011, Brisbane [p1965: line 19].
- 378 Transcript, Chris Arnold, 13 May 2011, Brisbane [p1965: line 31].
- 379 Statement of Neil Lowry, 24 November 2011 [p9: para 35].
- 380 Transcript, John McLeod, 4 October 2011, Brisbane [p3550: line 40].
- 381 Transcript, John McLeod, 4 October 2011, Brisbane [p3551: line 17].
- 382 Transcript, John McLeod, 4 October 2011, Brisbane [p3551: line 23; p3552: line 1].
- 383 Transcript, John McLeod, 4 October 2011, Brisbane [p3552: line 36].
- 384 Transcript, John McLeod, 4 October, Brisbane [p3552: line 50].
- 385 Transcript, John McLeod, 4 October 2011, Brisbane [p3553: line 36]; Exhibit 701, Statement of John McLeod, [p3: para 6].
- 386 Transcript, John McLeod, 4 October 2011, Brisbane [p3553: line 4].
- 387 Transcript, John McLeod, 4 October 2011, Brisbane [p3554: line 44].
- 388 Transcript, John McLeod, 4 October [p3554: line 51 - p3555: line 10].
- 389 Exhibit 629, Statement of Cassandra Sun, 14 September 2011 [p3: para 9].
- 390 Transcript, Lynn de Lange, 3 October 2011, Brisbane [p3463: line 47 – p3464: line 7].
- 391 Transcript, Lynn de Lange, 3 October 2011, Brisbane [p3463: line 40].
- 392 Transcript, Lynn de Lange, 3 October 2011, Brisbane [p3464: line 1].
- 393 See in particular Section 59, *Electricity Regulation 2006*.
- 394 State Planning Policy 1/03: *Mitigating the Adverse Effects of Flood, Bushfire and Landslide*, Annex 3, A4.2.
- 395 Table 5, Brisbane City Council Temporary Local Planning Instrument 01/11.

- 396 Exhibit 847, Ipswich City Council Temporary Local Planning Instrument 01/2011, Part 7, 7.2, Attachment 2.
- 
- 397 Queensland Reconstruction Authority, Planning for stronger, more resilient electrical infrastructure, 2011 [p15].
- 
- 398 Submission, Energex Limited, Planning Term of Reference [p5: para 26].
- 
- 399 Transcript, Chris Arnold, 25 October 2011, Brisbane [p4287: line 45].
- 
- 400 Transcript, Chris Arnold, 25 October 2011, Brisbane [p4287: line 45].
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- 401 Submission of Energex Energy, Planning Term of Reference [p24: para 13].
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- 402 Submission of Energex Energy, Planning Term of Reference [p17: p24: para 13].
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- 403 Submission of Energex Energy, Planning Term of Reference [p24: para 13].
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- 404 Submission of Energex Energy, Planning Term of Reference [p24: para 15-20].
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- 405 Exhibit 867, Statement of Chris Arnold, 6 October 2011 [p1: para 6-7].
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- 406 Exhibit 867, Statement of Chris Arnold, 6 October 2011 [p1: para 8].
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- 407 Exhibit 688, Statement of Lynn de Lange, 13 September 2011 [p1: para 3].
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- 408 Transcript, Chris Arnold, 25 October 2011, Brisbane [p4293: line 38].
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- 409 Transcript, Lynn de Lange, 3 October 2011, Brisbane [p3464: line 16].
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- 410 Transcript, Lynn de Lange, 3 October 2011, Brisbane [p3464: line 19].
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- 411 Transcript, Lynn de Lange, 3 October 2011, Brisbane [p3464: line 35].
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- 412 Transcript, Lynn de Lange, 3 October 2011, Brisbane [p3464: line 27].
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- 413 Transcript, Cassandra Sun, 27 September 2011, Brisbane [p3211: line 35].
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- 414 Transcript, Cassandra Sun, 27 September 2011, Brisbane [p3211: line 57 - p3212: line 7].
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- 415 Exhibit 596, Statement of Paul Cassels, 14 September 2011 [p1: para 2].
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- 416 Exhibit 596, Statement of Paul Cassels, 14 September 2011 [p2: para 5].
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- 417 Transcript, Paul Cassels, 22 September 2011, Brisbane [p3022: line 44].
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- 418 Exhibit 867, Statement of Chris Arnold, 6 October 2011 [para 18].
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- 419 Transcript, Chris Arnold, 25 October 2011, Brisbane [p4290: line 39].
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- 420 Exhibit 867, Statement of Chris Arnold, 6 October 2011 [para 18].
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- 421 Transcript, Chris Arnold, 25 October 2011, Brisbane [p4290: line 47].
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- 422 Transcript, Chris Arnold, 25 October 2011, Brisbane [p4290: line 47].
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- 423 Transcript, Chris Arnold, 25 October 2011, Brisbane [p4291: line 2].
- 
- 424 Australian Building Codes Board, Draft Standard for Construction of Buildings in Flood Hazard Areas, Version 7, October 2011.
- 
- 425 Exhibit 666, Statement of Glen Brumby, 15 September 2011 [p9: para 36].
- 
- 426 Australian Building Codes Board, Draft Standard for Construction of Buildings in Flood Hazard Areas, Version 7, October 2011, 2.12.2(b).
- 
- 427 Exhibit 666, Statement of Glen Brumby, 15 September 2011 [p11: para 48].
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- 428 Exhibit 867, Statement of Chris Arnold, 6 October 2011 [p3: para 18]; Transcript, Chris Arnold, 25 October 2011, Brisbane [p4293: line 4].
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- 429 Exhibit 215, Supplementary submission of Telstra, 8 April 2011 [p9: para 41].
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- 430 While both ‘carriers’ and ‘carriage service providers’ provide telecommunications services to the public, only carriers install and own telecommunications network infrastructure (Australian Communications and Media Authority, Carrier and service provider requirements, 2011).
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- 431 Exhibit 215, Supplementary submission of Telstra, 8 April 2011 [p8: para 37]; Exhibit 214, Supplementary submission of Optus, undated [p2: para 4].
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- 432 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p221].
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- 433 Under section 7 of the *Telecommunications Act 1997*, a facility is any part of the infrastructure of a telecommunications network or any line, equipment, apparatus, tower, mast, antenna,

tunnel, duct, hole, pit, pole or other structure or thing used, or for use, in or in connection with a telecommunications network. A telecommunications network means a system, or a series of systems, that carries or is capable of carrying, communications by means of guided and/or unguided electromagnetic energy.

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- 434 Schedule 3 Division 3 Section 6(3), *Telecommunications Act 1997* (Cth).
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- 435 Schedule, part 1(5A), *Telecommunications (Low-impact facilities) Determination 1997*.
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- 436 Schedule, part 1(4), *Telecommunications (Low-impact facilities) Determination 1997*.
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- 437 Schedule, part 5(1-2), *Telecommunications (Low-impact facilities) Determination 1997*.
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- 438 Schedule, part 1(9), *Telecommunications (Low-impact facilities) Determination 1997*.
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- 439 Schedule 3, Division 5, Section 15(2), *Telecommunications Act 1997* (Cth).
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- 440 These industry codes and standards must be registered with the Australian Communications and Media Authority (ACMA).
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- 441 Communications Alliance (formerly Australian Communications Industry Forum), *Industry code ACIF C564:2004 Deployment of mobile phone network infrastructure*, 2005.
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- 442 Communications Alliance (formerly Australian Communications Industry Forum), *Industry code ACIF C564:2004 Deployment of mobile phone network infrastructure*, 2005 [p12: para 5.1].
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- 443 Communications Alliance (formerly Australian Communications Industry Forum), *Industry code ACIF C564:2004 Deployment of mobile phone network infrastructure*, 2005 [p12: para 5.1.4(c-d)].
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- 444 State Planning Policy 1/03 Guideline, *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* [p59: para 5.1-5.2].
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- 445 Brisbane City Council, City Plan 2000, 2011 [p253-254].
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- 446 Brisbane City Council, City Plan 2000, 2011, Appendix 2 [p169-171].
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- 447 For instance, assessable development for telecommunications infrastructure may also enliven the Brisbane City Council's Subdivision and Development Guidelines. Flood risk may be considered under Chapter 1 of the guidelines, though they do not recommend a specific flood level for communication network facilities (which are defined as a type of 'community infrastructure') and only require that development proponents ensure that the infrastructure is 'optimally located and designed to achieve suitable levels of service' (Brisbane City Council, Subdivision and Development Guidelines, 2008, Chapter 1 [p6]).
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- 448 Australian Communications and Media Authority, Guide to applying for a facility installation permit, 2007 [p2].
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- 449 Schedule 3 Division 6 section 21(1), *Telecommunications Act 1997* (Cth).
- 
- 450 Australian Communications and Media Authority, Guide to applying for a facility installation permit, 2007 [p2].
- 
- 451 Schedule 3 Division 6 section 27(1), *Telecommunications Act 1997* (Cth).
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- 452 Exhibit 213, Submission of Optus, 4 April 2011 [p11: para 7.3].
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- 453 Exhibit 213, Submission of Optus, 4 April 2011 [p11: para 7.1].
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- 454 Exhibit 213, Submission of Optus, 4 April 2011 [p11: para 7.2].
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- 455 Exhibit 213, Submission of Optus, 4 April 2011 [p11: para 7.4].
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- 456 Exhibit 215, Supplementary submission of Telstra, 8 April 2011 [p11: para 49-50].
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- 457 Exhibit 215, Supplementary submission of Telstra, 8 April 2011 [p11: para 50].
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- 458 The term "immunity" is used in a relative sense. For example, a road that is immune to a 1% AEP flood would not be immune to a 0.5% AEP flood. Further works might be undertaken on such a road to improve its immunity so that it was immune to a 0.5% AEP flood.
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- 459 Statement of Miles Vass, 8 September 2011 [p2: para 8-9].
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- 460 Statement of Miles Vass, 8 September 2011 [p2: para 10-11]; Attachments B and C.
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- 461 Statement of Miles Vass, 8 September 2011 [p3: para 13]; Attachment D.
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- 462 Statement of Miles Vass, 14 November 2011 [p3: para 11-12].
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- 463 Statement of David Stewart, 18 April 2011 [p6: para 41, 44].
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- 464 Queensland Transport and Roads Investment Program 2011-12 to 2014-15 [p ii].
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- 465 Queensland Transport and Roads Investment Program 2011-12 to 2014-15 [p30].
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- 466 Statement of Miles Vass, 8 September 2011, Attachments E and F.
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- 467 Statement of David Stewart, 18 April 2011 [p6-7: para 41-43] and Attachments D and E; Statement of Miles Vass, 8 September 2011 [p3: para 15].
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- 468 Statement of David Stewart, 18 April 2011 [p7-9: para 44-53] and Attachment G; Statement of Miles Vass, 8 September 2011 [p4: para 15].
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- 469 Statement of David Stewart, 18 April 2011 [p9: para 54-56]; Statement of Miles Vass, 8 September 2011 [p4: para 15].
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- 470 Statement of Miles Vass, 8 September 2011 [p4: para 15].
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- 471 Queensland Transport and Roads Investment Program 2011-21 to 2014-15 [p30].
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- 472 Statement of Miles Vass, 8 September 2011 [p4: para 15]; Statement of Emma Thomas, 4 May 2011 [p7: para 28-29].
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- 473 Statement of Miles Vass, 8 September 2011, Attachment F, road segment 16A [p10].
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- 474 Queensland Transport and Roads Investment Program 2011-21 to 2014-15 [p118].
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- 475 Queensland Transport and Roads Investment Program 2011-21 to 2014-15 [p123].
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- 476 Queensland Transport and Roads Investment Program 2011-21 to 2014-15 [p125].
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- 477 Statement of Miles Vass, 8 September 2011, Attachment F, road segment 27B [p12].
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- 478 Queensland Transport and Roads Investment Program 2011-21 to 2014-15 [p117].
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- 479 Queensland Transport and Roads Investment Program 2011-21 to 2014-15 [p124].
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- 480 Queensland Transport and Roads Investment Program 2011-21 to 2014-15 [p29-30, 51-52, 67-68, 83-84, 95-96, 115-116, 131-132, 145-146, 159-160, 173-174, 187-188].
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- 481 Statement of Miles Vass, 8 September 2011 [p4: para 16].
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- 482 Statement of Miles Vass, 8 September 2011 [p4-5: para 17-20]; Statement of Miles Vass, 14 November 2011 [p3: para 13-14].
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- 483 Statement of Miles Vass, 8 September 2011 [p5: para 21-22]; Attachment G.
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- 484 Statement of Miles Vass, 8 September 2011 [p5: para 22]; Attachment G [p3]; Queensland Transport and Roads Investment Program 2011-21 to 2014-15 [p95, 100].
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- 485 Statement of Miles Vass, 8 September 2011 [p3: para 14(a)]; Attachment E, Map – Flooding of Priority 1 Road Network – Duration of Closure, 1 December 2010 to 30 April 2011; Attachment F, road segment 10A [p9].
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- 486 Queensland Transport and Roads Investment Program 2011-21 to 2014-15 [p95].
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- 487 Statement of Miles Vass, 8 September 2011 [p5: para 22]; Attachment G [p1].
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- 488 Bruce Highway Upgrade Strategy – July 2011 [p16]; Statement of Amanda Yeates, 14 November 2011 [p3: para 9-11]; Attachment B.
- 
- 489 Statement of Miles Vass, 8 September 2011 [p5: para 22]; Attachment G [p3].
- 
- 490 Response to Requirement to Provide Information, Greg Ford, 25 March 2011, Schedule 3 [p85-87].
- 
- 491 Response to Requirement to Provide Information, Greg Ford, 25 March 2011, Schedule 3 [p87-88]; Greg Ford and Theresa Timmins, Queensland Rail, Review and debrief report into the planning, preparation and response by Queensland Rail – Queensland floods and Cyclone Yasi, September 2011 [p47-50].
- 
- 492 Response to Requirement to Provide Information, Greg Ford, 25 March 2011, Schedule 3 [p88: 3.2(b)].
- 
- 493 Response to Requirement to Provide Information, Greg Ford, 25 March 2011, Schedule 4 [p91].
- 
- 494 Greg Ford and Theresa Timmins, Queensland Rail, Review and debrief report into the planning, preparation and response by Queensland Rail – Queensland floods and Cyclone Yasi, September 2011 [p32].
- 
- 495 Response to Requirement to Provide Information, Greg Ford, 25 March 2011, Schedule 4 [p91]; Greg Ford and Theresa Timmins, Queensland Rail, Review and debrief report into the planning, preparation and response by Queensland Rail – Queensland floods and Cyclone Yasi, September 2011 [p340: para (e)].
- 
- 496 Greg Ford and Theresa Timmins, Queensland Rail, Review and debrief report into the planning,

preparation and response by Queensland Rail – Queensland floods and Cyclone Yasi, September 2011 [p9].

- 
- 497 Statement of Graham Brown, 18 October 2011 [p20: para 75; p21: para 78]; Greg Ford and Theresa Timmins, Queensland Rail, Review and debrief report into the planning, preparation and response by Queensland Rail – Queensland floods and Cyclone Yasi, September 2011 [p10].
- 
- 498 Greg Ford and Theresa Timmins, Queensland Rail, Review and debrief report into the planning, preparation and response by Queensland Rail – Queensland floods and Cyclone Yasi, September 2011 [p10].
- 
- 499 Statement of Graham Brown, 18 October 2011 [p7: para 35; p18-19: para 68-69].
- 
- 500 Statement of Graham Brown, 18 October 2011 [p18: para 66; p19: para 70-71; p20-21: para 74-77].
- 
- 501 Statement of Graham Brown, 18 October 2011 [p17: para 64c] and Annexure 5 [p254].
- 
- 502 Exhibit 1014, Statement of Martin Moore, 4 April 2011 [p5].
- 
- 503 Exhibit 1014, Statement of Martin Moore, 4 April 2011, Appendix 1e [p24].
- 
- 504 Exhibit 1014, Statement of Martin Moore, 4 April 2011 [p13-15, 19]; Statement of Martin Moore, 18 November 2011 [p7].
- 
- 505 Exhibit 1014, Statement of Martin Moore, 4 April 2011 [p19].
- 
- 506 Exhibit 1014, Statement of Martin Moore, 4 April 2011 [p8].
- 
- 507 Exhibit 1014, Statement of Martin Moore, 4 April 2011 [p9]; Appendix 1f [p25-26].
- 
- 508 Exhibit 1014, Statement of Martin Moore, 4 April 2011 [p7-8, 9].
- 
- 509 Exhibit 1014, Statement of Martin Moore, 4 April 2011 [p10].
- 
- 510 Statement of Martin Moore, 18 November 2011 [p5-6].
- 
- 511 Statement of Martin Moore, 18 November 2011 [p19].

# 11

## 11 Buy-backs and land swaps

### 11.1 Property buy-backs

Property buy-back programs differ from compulsory resumption programs. In a buy-back program, the property owner willingly sells his or her property, usually to the local or state government. Some councils in Queensland operate formal programs under which they purchase privately owned properties and re-use the land for purposes other than residential. This may occur as part of a broader floodplain management plan or on an ad hoc basis. The programs are usually referred to as 'voluntary purchase schemes' or 'property buy-back programs'.

The buy-back of properties often provides the ideal solution to the problem of mitigating the impact of damage to existing buildings in areas particularly exposed to natural hazards such as floods. It enables the clearing of potential obstructions in the floodplain, including residential and other structures, with the objective of mitigating risk to life through flood,<sup>1</sup> and may, in some circumstances, be 'the only feasible and economically justified management measure for the more hazardous areas of the floodplain'.<sup>2</sup>

However, property buy-back programs are expensive to administer, and the lack of available funding is a major limiting factor to their implementation as a flood risk mitigation measure.<sup>3</sup> Given the cost involved, property acquisitions by governments tend only to occur in very high risk areas and only where other flood risk mitigation measures are insufficient to protect lives. In some circumstances, a number of properties may need to be relocated from particularly exposed areas of the floodplain to other locations, as occurred at Grantham in the Lockyer Valley following the catastrophic flooding there on 10 January 2011.

#### 11.1.1 Benefits and limitations

The benefit to the community of a property buy-back program, and the consequential removal of structures in the floodplain, is the minimisation of the risk posed by flood to life and property. Property buy-backs afford the owners of properties the benefit of eliminating the costs of repair or rebuilding after flooding as well as the opportunity to sell a potentially unattractive asset, given its exposure to the flood hazard.

Without appropriate planning to accompany property buy-backs, land may remain unused for any purpose for an extended period of time. The removal of buildings from the flood affected area, coupled with a moratorium on any new development, can amount to 'sterilisation' of the land. Decisions should be made for the future use of the land from which properties have been removed, recognising and accommodating the flood hazard. There may be opportunities to use the land for purposes that do not pose a risk to the health and safety of prospective users and which are commensurate with the risk posed by flood, such as the establishment of nature conservation and recreational areas.

## 11.1.2 Current arrangements

The Queensland Government does not currently operate a state administered buy-back program for properties at a high risk of flooding. In the past, there have been acquisitions of certain properties through joint Commonwealth/Queensland government schemes, but these have occurred on an ad hoc basis around the state, rather than through a targeted risk reduction program.<sup>4</sup>

Since 2007 the Queensland Government has received five applications for funding for property buy-backs from the Ipswich Rivers Improvement Trust.<sup>5</sup> Each of these proposals sought funding to acquire, through a voluntary purchase scheme, houses in Goodna on the basis that they were highly susceptible to flooding from the nearby Woogaroo Creek. Funding was provided for one of the acquisition projects in the 2008/2009 financial year.<sup>6</sup>

The Natural Disaster Resilience Program provides a possible source of funding for councils wishing to buy back properties in high risk areas. It is a funding program administered in partnership by the Queensland Government (Department of Community Safety) and the Commonwealth Government, and is aimed at improving resilience to natural disasters through mitigation works, measures and related activities.<sup>7</sup> Funding for eligible projects usually occurs through equal contributions by the applicant (for example, a council), the Queensland Government and the Commonwealth Government. Exceptions to that funding model are considered by the Queensland Government on a case by case basis.<sup>8</sup> Funding applications must meet specific guidelines and even though an application may be technically eligible, the limited availability of funding (which is approximately \$11 million per year) may mean that it fails.<sup>9</sup> Councils are unable to obtain funds directly from the Natural Disaster Resilience Program: it is for the Queensland Government to determine each application's eligibility for funding.<sup>10</sup>

Some councils in Queensland have introduced strategies to purchase high risk properties so that the land can be used for non-residential purposes (for example, for use as a public park or for drainage easements).<sup>11</sup> However, given the expense of such programs, council buy-back programs have generally only been adopted in larger councils, and even then, only on a small scale.

## 11.1.3 Council buy-back programs

Following the 1974 Brisbane flood, the Brisbane City Council participated with the Queensland and Commonwealth governments in a jointly funded compulsory and voluntary house purchasing scheme.<sup>12</sup> More recently, and in response to a priority recommendation contained in a 2005 report,<sup>13</sup> the Brisbane City Council has instituted a residential property buy-back scheme: the 'Voluntary Home Purchase Scheme'. As its title suggests, it operates solely on a voluntary basis: selling is at the owner's discretion and there is no forced resumption by the council. Each year the council allocates funding to purchase residential properties that are at risk of frequent flooding. The council identifies eligible houses for the scheme,<sup>14</sup> and prioritises which properties will be purchased based on the predicted frequency and depth of future flooding. The buy-back scheme operates in accordance with four eligibility criteria:

- the property is flooded during a flood with an average recurrence interval of two years
- the property is in a residential zone
- floodwaters inundate the residential dwelling on the property
- there is no other viable infrastructure solution (such as pipes) available to remove the flooding problem.<sup>15</sup>

As at May 2011 there were approximately 525 properties within the Brisbane City Council area that could be adversely affected during a creek flood with an average recurrence interval of two years.<sup>16</sup> The council has approached the owners of some 242 properties to participate in the scheme, which has resulted in acceptance in respect of 55 properties. Those 55 properties were purchased for a total cost of \$24.21 million.<sup>17</sup>

There have been some concerns raised about the criteria applied by the council. The current eligibility criterion that the property be inundated by a flood with an average recurrence interval of two years may be overly restrictive: many properties are ruled as ineligible even though they flood frequently. An independent review panel has acknowledged this limitation and suggested that the council should consider an extension of the scheme to cover less frequent flooding, noting, however, that this would require a 'very substantial increase' in the program's funding.<sup>18</sup> The council has previously sought funding from the Queensland and Commonwealth governments to support the scheme, but the funding requests have either been rejected or ignored.<sup>19</sup> A councillor raised, by submission to the Commission, the concerns of residents of his ward affected by the 2010/2011 floods about the

process' being too slow and inadequately funded, although a number still desired to use the program so they could sell their properties and move elsewhere.<sup>20</sup>

Apart from its property buy-back scheme, the council has purchased riverfront land at Tennyson Reach which was substantially inundated in the January 2011 floods. This land had been part of a parcel on which the council had approved a multi-storey residential development, but because of the developer's difficulties in selling the units, compounded by the flooding, the continuation of the development project became economically unviable. As part of the council's agreement to acquire the piece of riverfront land,<sup>22</sup> the property developer has agreed to develop a park on the site for public use.<sup>23</sup>

A 2002 report prepared for the Ipswich City Council suggested that the council, as part of a long-term flood risk prevention strategy, consider the acquisition and removal of properties within the primary flow area of the floodplain.<sup>24</sup> The report noted that to acquire all such properties would cost in the order of \$112 million and that the council would require significant external funding to embark on such a program. At the time, the council considered the proposal difficult to implement, for financial reasons. It has suggested in evidence to the Commission that the Queensland and Commonwealth governments should provide increased financial assistance to enable it to acquire high risk land that would be inundated by a flood with an average recurrence interval of 20 years.<sup>25</sup> The council currently estimates that the cost to purchase land at this risk level within its council boundary would be in the order of hundreds of millions of dollars.<sup>26</sup> The council's chief executive officer explained, too, that in some instances the problem of inundation in some of the older areas of the city could only be solved by the acquisition of properties and the removal of buildings to create overland flow paths.<sup>27</sup>

The Bundaberg Regional Council has indicated that it would like to discuss with the Queensland and Commonwealth governments the possibility of a collaborative program to buy back flood prone homes.<sup>28</sup> The council has previously had a policy in place under which it has, over time, acquired some properties along drainage lines and created public parklands. Under this arrangement the council provided one third of the funding, with the rest provided by the Queensland and Commonwealth governments in equal measure.<sup>29</sup> The council considers this approach to be a cost-effective solution for low-lying properties in the long term, but the financial commitment the council can make to the program requires annual review.<sup>30</sup> It has also identified the need to extend future buy-backs to areas susceptible to flood that are outside of the city, but within the council's boundary.<sup>31</sup>

Residents of the Moreton Bay Regional Council area have been lobbying for a buy-back program, similar to that operated by the Brisbane City Council, to be introduced by their council.<sup>32</sup> The council is currently preparing a draft buy-back policy for flood affected properties.<sup>33</sup> Development of the policy will entail consideration of issues such as the risk to life and the velocity of rivers in certain areas.<sup>34</sup> It may take some time to finalise.<sup>35</sup>

### 11.1.4 Future considerations

Many submissions received by the Commission recognised the financial implications for the various levels of government responsible for administering a buy-back scheme. A number proposed a long-term approach.<sup>36</sup> An urban designer recommended a 'flood retreat' program, entailing a 'phased reduction in the number of people, properties and infrastructure assets' exposed to flood risk,<sup>37</sup> as part of a master plan process.<sup>38</sup> This long-term view was echoed by another expert in environmental planning who suggested that freehold land in flood prone areas should revert to the public estate, noting that it would require strong political leadership.<sup>39</sup> One Brisbane Valley resident in the Somerset Regional Council area pointed out that it was 'bad economics' to repeatedly rebuild residential and commercial buildings after floods.<sup>40</sup>

A number of local government representatives appearing before the Commission said that property buy-backs were appropriate in certain circumstances, and were being considered by their councils as a flood mitigation option.<sup>41</sup> The Commission notes a uniformity of view, both in the evidence before the Commission and more generally, as to the need for support, including funding, from the Queensland and Commonwealth governments.<sup>42</sup> As discussed, the Natural Disaster Resilience Program presents a potential source of funding for councils but, being a competitive grants program with a defined budget, has limited ability to meet funding applications.

Best practice approaches to floodplain management require that all levels of government take a long-term view of land planning measures (20 to 30 years),<sup>43</sup> including property buy-backs, in areas that are significantly exposed to flood hazard. Given the voluntary nature of buy-back programs and the fact that in areas particularly susceptible to flood there may be a need to acquire a large number of properties, councils in particular may need to regard

buy-backs as part of their longer-term broader floodplain management strategy. A longer-view approach has been adopted by the Gold Coast City Council, which, as part of its sustainable flood management strategy, is reviewing the current buy-back practices of other local authorities. However, the council does not expect to complete its assessment until 2015 and has not confirmed that it will implement a formal buy-back program.<sup>44</sup>

Property buy-back programs can, in some circumstances, provide an effective long-term solution for properties that are particularly exposed to the flood hazard. As noted above, they have been successfully implemented by some councils in areas at serious flood risk. Other councils should consider buy-backs as part of a strategic floodplain management program, obtaining funding, where possible, through the Natural Disaster Resilience Program.

## Recommendation

- 11.1 Councils should consider implementing a property buy-back program in areas that are particularly vulnerable to regular flooding, as part of a broader floodplain management strategy, where possible obtaining funding from the Natural Disaster Resilience Program for this purpose.

## 11.2 Rebuilding Grantham

In response to the loss of life and property in Grantham caused by the 2010/2011 floods, and particularly the events of 10 January, the Lockyer Valley Regional Council committed to developing a master plan and land swap program for the Grantham area.

To enable it to quickly relocate willing residents to higher ground, the council asked the Premier and Minister for Reconstruction to declare Grantham a reconstruction area under the *Queensland Reconstruction Authority Act 2011*.<sup>45</sup> This declaration was made on 8 April 2011.<sup>46</sup> Its effect was to give the Queensland Reconstruction Authority primary responsibility for co-ordinating and managing the rebuilding and recovery of Grantham. To do so, the authority created a new development scheme for the Grantham reconstruction area.



Grantham house being relocated to higher ground (photo courtesy Lockyer Valley Regional Council)

## 11.2.1 Land swap program

In late March 2011, the Lockyer Valley Regional Council entered into a contract to purchase 18 parcels of freehold land, covering an area of approximately 378 hectares, to enable the voluntary relocation of displaced residents.<sup>47</sup> The tract of land is situated directly north of the existing town of Grantham and is elevated above the January 2011 flood levels.<sup>48</sup> Its purchase enabled the council to implement a land swap program.

Broadly speaking, this program allows eligible property owners in the Lockyer Valley towns of Grantham, Helidon, Murphys Creek, Postman's Ridge and Withcott to 'swap' their land for part of the newly purchased council land.<sup>49</sup> The program is governed by the Grantham Relocation Policy.<sup>50</sup> The key features of the policy are that:

- landowners who meet the eligibility criteria participate voluntarily<sup>51</sup>
- the council offers unencumbered residential allotments to eligible landowners at no cost in exchange for their transferring ownership of their land, unencumbered, to council<sup>52</sup>
- blocks of comparable size are offered, up to 10 000 square metres; if a landowner elects to take a smaller block than his or her existing one, no compensation is paid for the difference<sup>53</sup>
- landowners are responsible for meeting the cost of building their homes on the new blocks<sup>54</sup>
- the process is a staged one: initial stages accommodate affected members of the community while later stages allow other lots to be developed and sold to provide revenue to council to help offset the cost of the land offer program<sup>55</sup>
- the timeframes are short, so that allotments were able to be allocated to eligible landowners in July 2011, with the land offer program expected to terminate on 1 July 2012.<sup>56</sup>

The Lockyer Valley Regional Council's land swap program is a unique use of a planning measure to guard against the repetition of a disaster. Like a buy-back scheme, it facilitates the relocation of uses and people away from high flood hazard land. However, unlike a buy-back scheme, it also enables the collective relocation of a community, which carries social benefits as well as achieving floodplain management goals.

## 11.2.2 Grantham Development Scheme

Commencing in February 2011, the council began extensive community consultations to inform its master planning exercise for the Grantham area.<sup>57</sup> The master plan formed the basis of the development scheme prepared by the Queensland Reconstruction Authority for the Grantham reconstruction area.<sup>58</sup>

The development scheme was given effect on 4 August 2011.<sup>59</sup> The pace at which the scheme was developed and delivered was one of its advantages.<sup>60</sup> In making the Grantham Development Scheme, the authority engaged in similar processes to those that apply to making a planning scheme under the *Sustainable Planning Act 2009* (for example consulting state agencies and giving public notification of the proposed scheme), but it completed these tasks within significantly condensed timeframes.<sup>61</sup>

Grantham previously fell within the scope of the Gatton Planning Scheme, but that scheme's operation is now suspended for the Grantham reconstruction area, except for any provision expressly referred to in the Grantham Development Scheme.<sup>62</sup> The Lockyer Valley Regional Council is responsible for administering the development scheme and determining any application lodged under it.

The development scheme was created primarily to expedite the rebuilding required within the Grantham reconstruction area.<sup>63</sup> The scheme achieves this by regulating development so as to encourage the relocation of residents participating in the council's land swap program to higher ground and meet many of the other reconstruction needs of the community, such as rebuilding of the main street, within two years.<sup>64</sup> For example, under the Grantham Development Scheme, the following are exempt development, not requiring any approvals:

- reconfiguring a lot within the residential living zone, provided the lot complies with the Residential Living Zone Code, is owned by council and accords with the lot layout master plan determined by council<sup>65</sup>
- a house in the residential living zone if it accords with the Residential Living Zone Code.<sup>66</sup>

(The Residential Living Zone Code merely specifies minimum lot frontages and areas, and for buildings and structures, maximum heights and minimum setbacks.)<sup>67</sup>

The flood-devastated area of Grantham is designated ‘Limited Development (Constrained Land)’ under the Grantham Development Scheme.<sup>68</sup> This designation allows residents who want to rebuild on the land they owned on 10 January 2011 to do so, provided the habitable flood level is 300 millimetres above the defined flood level.<sup>69</sup> However, any new residential development in the area significantly affected by the flash flooding of 10 January 2011 is discouraged:

- The purpose of the zone is expressed as identifying land known to be significantly affected by one or more development constraints, such as flooding, which severely restrict the land’s ability to be developed for residential purposes.<sup>70</sup>
- No new subdivision of lots is intended in the zone, while amalgamation of lots is encouraged so that existing lots can be aggregated for agricultural uses.<sup>71</sup>
- The table of assessment provides that any new residential development will be impact assessable.<sup>72</sup>

The Grantham Development Scheme is the first planning instrument in Queensland to apply the Queensland Planning Provisions (version 2.0), created under the *Sustainable Planning Act 2009*.<sup>73</sup> This will ease the incorporation of the Grantham Development Scheme into any future *Sustainable Planning Act* compliant planning scheme for the Lockyer Valley area.<sup>74</sup> Until such a scheme for the Lockyer Valley is given effect, the Grantham Development Scheme will continue to apply to the Grantham area.<sup>75</sup>

In making the Grantham Development Scheme, the Queensland Reconstruction Authority was required to consider State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, but was not bound to comply with it.<sup>76</sup> The authority’s general manager of land use planning is of the view that the development scheme reflects State Planning Policy 1/03 in principle;<sup>77</sup> the Commission agrees. The primary way in which the development scheme deals with flooding is by reference to the extent of the 10 January 2011 flooding, for example:

- residential zones are located outside the area affected by the 10 January 2011 flood
- the scheme incorporates a defined flood level and provides that this level is as determined by the Lockyer Valley Regional Council having regard to the flooding on 10 January 2011.<sup>78</sup>

Given these aspects, the Commission views the Grantham Development Scheme as an appropriate instrument to direct and regulate the development of the Grantham reconstruction area until such time as the new Lockyer Valley Planning Scheme and the Lockyer Valley Regional Council’s floodplain management study are completed. (In forming this view, the Commission has taken into account the evidence of the council officer responsible for overseeing the redevelopment of Grantham that the development scheme may require some modification to clarify and streamline its provisions over the long term.<sup>79</sup>)

### 11.2.3 Suitability of the Grantham response for other areas

The Lockyer Valley Regional Council’s land swap program, coupled with the Queensland Reconstruction Authority’s development scheme, is a timely and effective floodplain management response to the unique circumstances of Grantham.

Whether other councils are able to implement a land swap program similar to the Lockyer Valley Regional Council’s program, in isolation or together with zoning controls, and whether it would be appropriate for them to do so, will depend on the circumstances they face. Relevant matters include views of the community, the availability of close, undeveloped and unconstrained land, council’s financial resources and whether floodplain management principles justify restricting development of the land within the floodplain.

The success of the Grantham project, however, provides a template for a response to floodplain management which other councils in similar circumstances may wish to adopt.

## (Endnotes)

- 1 Smith, DI, Handmer, JW, McKay, JM, Switzer, MAD & Williams, BJ 1995, Non-structural Measures for Flood Mitigation—Current Adoption in Urban Areas, Volume 1, Report to the National Landcare Programme, CRES, ANU, Canberra [p39].
- 2 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p7: para: 2.3.2.1].
- 3 Financial considerations associated with property buy-backs, such as the benefit-cost ratio, have not been canvassed by the Commission. Other publications deal with this matter in some detail; see, for example, Department of Transport and Regional Services, Benefits of flood mitigation in Australia, 2002.
- 4 For example, in 2002/2003 under its regional flood mitigation program the Commonwealth Government provided \$250 000 financial assistance to (then) Thuringowa City Council to acquire six flood prone properties which did not meet council's flood related development controls and which were subject to inundation and damage.
- 5 A river improvement trust is a statutory authority that has, as one of its functions, the prevention or mitigation of flooding of land by riverine flood. Applications for funding were made under the Natural Disaster Resilience Program and its predecessor, the Natural Disaster Mitigation Program.
- 6 Correspondence from the Queensland Government, Natural Disaster Resilience Program funding and property buy-backs, 2 December 2011 [p8].
- 7 Exhibit 500, Natural disaster program partnership agreement implementation plans, Covering letter [p1].
- 8 Exhibit 534, Statement of Gary Mahon, 7 September 2011 [p24: para 118].
- 9 Correspondence from the Queensland Government, Request for further information: Natural Disaster Resilience Program and property buy-backs, 6 January 2012 [p1-2].
- 10 Exhibit 500, Natural disaster program partnership agreement implementation plans, Covering letter [p2].
- 11 For example, this is a feature of the scheme operated by Brisbane City Council.
- 12 Lord Mayor's Taskforce on suburban flooding: Strategies to reduce the effect of significant rain events on areas of Brisbane prone to flooding, 2005 [p9].
- 13 Lord Mayor's Taskforce on suburban flooding: Strategies to reduce the effect of significant rain events on areas of Brisbane prone to flooding, 2005.
- 14 Transcript, Rory Kelly, 3 October 2011, Brisbane [p3523, line 53].
- 15 Submission of Brisbane City Council, 11 March 2011, Attachment 4: Be FloodWise Fact Sheet – Voluntary Home Purchase Scheme.
- 16 Arnison, P, Gotterson, R, Apelt, C, 2011, Independent Review of Brisbane City Council's Response to the January 2011 Flood [p59].
- 17 Exhibit 946, Statement of Julie McLellan, 4 November 2011 [p36: para 149].
- 18 Arnison, P, Gotterson, R, Apelt, C, 2011, Independent Review of Brisbane City Council's Response to the January 2011 Flood [p59].
- 19 Submission of Brisbane City Council, 11 March 2011, Appendix 5 [p8].
- 20 Submission of Councillor Steve Griffiths, undated [p9].
- 21 Exhibit 739, Statement of Brett Draffen, 26 September 2011 [p15: para 103-106].
- 22 Transcript, Colin Jensen, 10 November 2011, Brisbane [p4915: line 10].
- 23 Exhibit 955, Statement of Colin Jensen, 20 October 2011 [p3: para 1.9].
- 24 Exhibit 855, Ipswich City Council Natural Disaster Risk Management Studies Program, Stage 3: Risk Evaluation and Treatment, August 2002 [p35: para: 3.2.2].
- 25 Exhibit 912, Statement of John Stephen Adams, 25 October 2011 [p9: para 20].
- 26 Exhibit 912, Statement of John Stephen Adams, 25 October 2011 [p9: para 22].

- 27 Transcript, Carl Wulff, 19 October 2011, Ipswich [p4195: line 20-29]; Exhibit 853, Statement of Carl Wulff, 2 September 2011 [p19: para 111-112].
- 28 Transcript, Peter Byrne, 11 October 2011, Bundaberg [p3906: line 16].
- 29 Transcript, Peter Byrne, 11 October 2011, Bundaberg [p3906: line 20].
- 30 Transcript, Peter Byrne, 11 October 2011, Bundaberg [p3906: line 29].
- 31 Exhibit 764, Submission of the Bundaberg Regional Council, 18 March 2011 [p14: para 13].
- 32 Submission of Wyatt Roy MP, March 2011 [p4: para 5].
- 33 Transcript, John Rauber, 26 September 2011, Brisbane [p3148: line 16; p3148: line 21].
- 34 Transcript, John Rauber, 26 September 2011, Brisbane [p3148: line 26].
- 35 Transcript, John Rauber, 26 September 2011, Brisbane [p3148: line 33].
- 36 Submission of Gretchen Young, 24 April 2011 [p2]; Submission of Dennis Sharkey, 12 February 2011 [p4]; Submission of Chas Keys, undated [p1, 9].
- 37 Submission of Roy Barrett, March 2011 [p3: para 4(2)].
- 38 Submission of Roy Barrett, March 2011 [p9].
- 39 Submission of Darryl Low Choy, 30 March 2011 [p4].
- 40 Submission of Fred Williams, 23 February 2011 [p2].
- 41 Transcript, Peter Byrne, 11 October 2011, Bundaberg [p3906: line 20]; Transcript, Carl Wulff, 19 October 2011, Brisbane [p4195: line 25]; Transcript, John Rauber, 26 September 2011, Brisbane [p3148: line 16].
- 42 Transcript, Peter Byrne, 11 October 2011, Bundaberg [p3906: line 16]; Exhibit 912, Statement of John Stephen Adams, 25 October 2011 [p9: para 20]; Arnison, P, Gotterson, R, Apelt, C, 2011, Independent Review of Brisbane City Council's Response to the January 2011 Flood [p59]; Submission of Wyatt Roy MP, March 2011 [p5]; Brisbane Lord Mayor's Budget Speech, 8 June 2011 [p10]; Submission of the Local Government Association of Queensland, 7 April 2011 [p5: para 2.18].
- 43 Exhibit 1007, Standing Committee on Agriculture and Resource Management (SCARM), Floodplain management in Australia: best practice principles and guidelines, SCARM Report 73, 2000 [p3: para 1.4].
- 44 Second submission of the Gold Coast City Council, undated [p31].
- 45 Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p3: para 14].
- 46 Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p4: para 26].
- 47 Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p3: para 15].
- 48 Exhibit 602, Grantham Relocation Policy, 11 May 2011 [p2].
- 49 Transcript, Jamie Simmonds, 22 September 2011, Brisbane [p3055: line 58]; Exhibit 601, Statement of Jamie Simmonds, 18 September 2011 [p1: para 1].
- 50 Transcript, Jamie Simmonds, 22 September 2011, Brisbane [p3055: line 55]; Exhibit 601, Statement of Jamie Simmonds, 18 September 2011 [p3: para 12]; Exhibit 602, Grantham Relocation Policy, 11 May 2011.
- 51 Exhibit 602, Grantham Relocation Policy, 11 May 2011 [p2: para 1.2.4; p4: para 1.2.6, 1.2.7].
- 52 Transcript, Jamie Simmonds, 22 September 2011, Brisbane [p3056: line 41; page 3057: line 1]; Exhibit 602, Grantham Relocation Policy, 11 May 2011 [p5: para 1.2.9; p7: para 1.2.17].
- 53 Transcript, Jamie Simmonds, 22 September 2011, Brisbane [p3056: line 44]; Exhibit 602, Grantham Relocation Policy, 11 May 2011 [p5: table 1; p7: para 1.2.13].
- 54 Transcript, Jamie Simmonds, 22 September 2011, Brisbane [p3056: line 52].
- 55 Exhibit 602, Grantham Relocation Policy, 11 May 2011 [p4: para 1.2.1].
- 56 Exhibit 602, Grantham Relocation Policy, 11 May 2011 [p10: table 2].
- 57 Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p2: para 5 – p3 para 13; p 13: para 65].
- 58 Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p5: para 30]; Exhibit 601,

- Statement of Jamie Simmonds, 18 September 2011 [p1: para 2].
- 
- 59 Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p7: para 40].
- 
- 60 Exhibit 601, Statement of Jamie Simmonds, 18 September 2011 [p3: para 18].
- 
- 61 Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p5: para 30 – p6 para 40].
- 
- 62 Section 78(2), *Queensland Reconstruction Authority Act 2011*; Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p8: para 46; p13: para 66]; Exhibit 601, Statement of Jamie Simmonds, 18 September 2011 [p2: para 8].
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- 63 Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p14: para 71].
- 
- 64 Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p11: para 55, 58] and Annexure BJJN-07 [p5; p52].
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- 65 Exhibit 538, Statement of Brendan Nelson, 15 September 2011, Annexure BJJN-07 [p34].
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- 66 Exhibit 538, Statement of Brendan Nelson, 15 September 2011, Annexure BJJN-07 [p34].
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- 67 Exhibit 538, Statement of Brendan Nelson, 15 September 2011, Annexure BJJN-07 [p35].
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- 68 Exhibit 538, Statement of Brendan Nelson, 15 September 2011, Annexure BJJN-07 [p21-23].
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- 69 Exhibit 538, Statement of Brendan Nelson, 15 September 2011, Annexure BJJN-07 [p22].
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- 70 Exhibit 538, Statement of Brendan Nelson, 15 September 2011, Annexure BJJN-07 [p21].
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- 71 Exhibit 538, Statement of Brendan Nelson, 15 September 2011, Annexure BJJN-07 [p21].
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- 72 Exhibit 538, Statement of Brendan Nelson, 15 September 2011, Annexure BJJN-07 [p22].
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- 73 Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p13: para 67] and Annexure BJJN-07 [p52]; Exhibit 601, Statement of Jamie Simmonds, 18 September 2011 [p2: para 9].
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- 74 Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p14: para 73]; Annexure BJJN-07 [p52].
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- 75 Sections 112 and 138, *Queensland Reconstruction Authority Act 2011*; Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p8: para 47]; Exhibit 601, Statement of Jamie Simmonds, 18 September 2011 [p3: para 16].
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- 76 Section 63(4), *Queensland Reconstruction Authority Act 2011*; Statement of Brendan Nelson, 15 September 2011 [p14: para 74 – p15: para 75].
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- 77 Exhibit 538, Statement of Brendan Nelson, 15 September 2011 [p14: para 7]; Annexure BJJN-07 [Map 2].
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- 78 Exhibit 538, Statement of Brendan Nelson, 15 September 2011, Annexure BJJN-07 [p42].
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- 79 Transcript, Jamie Simmonds, 22 September 2011, Brisbane [p3053:line 19]; Exhibit 601, Statement of Jamie Simmonds, 18 September 2011 [p3: para 17].
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# 12

## 12 Performance of private insurers

For thousands of people whose homes were ruined and possessions destroyed or lost, insurance was an important issue in the aftermath of the 2010/2011 floods. It received significant public attention, a great deal of it critical of insurance companies. Some fundamental aspects of flood insurance – aspects which caused many policy-holders considerable stress – were also brought into sharp focus:

- Many insurance policies did not provide cover for damage caused by flood, but did provide cover for stormwater damage – or, in some cases, stormwater damage and flash flood – and other natural disasters.
- Many people did not believe or did not realise that their policies excluded flood from cover.
- Definitions of ‘flood’ in policies varied and were generally complicated.

The Commission was given a term of reference requiring it to examine ‘the performance of private insurers in meeting their claims responsibilities’. The term of reference is focussed specifically on the question of how insurers performed in dealing with claims which arose from the 2010/2011 floods and for which they were responsible, beginning at the point at which policy-holders contacted their insurers to make a claim. The Commission’s task did not extend to considering the broader issues of the availability and affordability of flood insurance, definitions of ‘flood’ or policy-holders’ awareness and understanding of the terms of their cover. Other reviews were established to consider these issues.

### 12.1 Other reviews

Three different reviews commenced at the federal level in the months after the 2010/2011 floods: the Natural Disaster Insurance Review, and reviews conducted by the Commonwealth Treasury and the House of Representatives Standing Committee on Social Policy and Legal Affairs.

The first, the Natural Disaster Insurance Review, was established on 4 March 2011, principally because of ‘the absence of flood insurance for many policy-holders, particularly in Brisbane and Ipswich’.<sup>1</sup> Its central focus was on ways of improving the availability and affordability of insurance for flood and other natural disasters. It considered other matters also, including measures to improve policy-holders’ understanding of the cover provided by insurance policies, and possible improvements to insurers’ claims management and dispute resolution processes. The second topic was relevant to the Commission’s inquiry, and the Commission and the review exchanged information where appropriate during the course of 2011.

The Natural Disaster Insurance Review provided a report to the Commonwealth Government on 30 September 2011 which was released to the public on 14 November 2011. The report contained 47 recommendations. One of the most significant was a recommendation that all home building, home unit and home contents insurance policies

include flood cover,<sup>2</sup> with recommendations for the establishment of arrangements to make that cover feasible. Of the latter, of particular interest to the Commission was the review's recommendation for a national repository of flood risk information.<sup>3</sup> The Commission has considered a related question, of how information needed for flood studies can be maintained and made accessible: see *2.5.5 Central repository of flood study data*. The review made some recommendations about insurers' handling of claims, which are discussed in the relevant sections of this chapter (see *12.5 Timeliness* and *12.6 Communication with policy-holders*).

The review also endorsed proposals made by the Commonwealth Treasury in its discussion paper, *Reforming Flood Insurance – Clearing the Waters*, released in April 2011.<sup>4</sup> The Treasury discussion paper focussed on two issues outside the Commission's term of reference: the variation in how 'flood' is defined in policies and the problem that some policy-holders were not aware that their policies excluded flood. The paper proposed the introduction of:

- a standard definition of flood
- a requirement that insurers give policy-holders purchasing or renewing a household insurance policy a 'Key Facts Statement' setting out, in effect, what is covered and what is excluded under the policy.

The Commonwealth Government released its response to the Natural Disaster Insurance Review's report on 14 November 2011. It announced, as part of the response, that the Treasury's proposals would be implemented by legislation and, on 23 November 2011, presented the Insurance Contracts Amendments Bill 2011 (Cth) to Parliament. On 9 December 2011, draft regulations for a standard definition of 'flood' were released for public comment. Submissions closed on 3 February 2012. In addition, the Treasury released a second discussion paper in November 2011 proposing that insurers should be required to offer flood cover in home building and home contents insurance policies, for purchasers to choose to take up or decline.<sup>5</sup> Submissions on the proposal close on 30 March 2012.

The House of Representatives Standing Committee on Social Policy and Legal Affairs conducted the third federal inquiry into insurance issues. On 2 June 2011, the Assistant Treasurer and Minister for Financial Services and



Flood cleanup at Auchenflower, Brisbane, January 2011 (photo courtesy Steven Bolland)

Superannuation asked the committee to inquire into and report on the insurance industry's response to the extreme weather events around Australia in 2010/2011. The committee delivered its report on 28 February 2012. The report can be found at [www.aph.gov.au](http://www.aph.gov.au). Its inquiry was not limited to the 2010/2011 floods but also encompassed other recent disasters in Australia, including Cyclone Yasi. The committee's focus, like that of the Commission, was on issues of claims processing, including:

- the adequacy of information insurers provided to policy-holders about making a claim, the progress of the claim and policy-holders' rights to external dispute resolution (see sections 12.2.2 and 12.2.3)
- the reasonableness of the time insurers took to process claims (see section 12.5)
- the effect of the engagement of experts and consultants (such as hydrologists and lawyers) on claims processing (see section 12.7)
- the effectiveness and timeliness of insurers' internal dispute resolution processes (see sections 12.2.2 and 12.2.3)
- the effectiveness of the insurance industry's General Insurance Code of Practice (see section 12.2.3)
- the effectiveness of external dispute resolution by the Financial Ombudsman Service (see sections 12.2.2 and 12.2.3).

The committee held public hearings about these matters in various places, including Brisbane, Ipswich and Toowoomba. The Commission considered the transcripts of the committee's hearings. As the next section explains, aspects of all but the last of the above topics also came within the scope of the Commission's inquiry into the performance of insurers in meeting their claims responsibilities.

## 12.2 Insurers' claims responsibilities

Insurers' claims responsibilities come from the contract of insurance (the policy), legislation and the general law. Most insurers also accept the responsibilities imposed by the industry's voluntary code of practice.

### 12.2.1 Terms of the policy and the general law of insurance

An insurer's foremost responsibility is to meet its obligations under the insurance policy, and in particular, to pay claims for which the policy provides cover. No insurer is required to pay a claim which is outside the terms of its policy or which falls within an exclusion. Notwithstanding, two insurers of which the Commission is aware – RACQ Insurance and CommInsure – made 'compassionate payments' to some policy-holders whose claims were declined because of the operation of the flood exclusion.<sup>6</sup>

In most cases with which the Commission was concerned, policies provided cover for stormwater damage (and in some instances, flash flood) and excluded damage caused by flood, as defined by the policy. The policies of the majority of insurers from which the Commission received information contained that distinction. RACQ Insurance's household policy, for instance, provided cover for 'flash flood and/or stormwater run-off', which was defined as: 'A sudden flood caused by heavy rain that fell no more than 24 hours prior to the flash flood or stormwater run-off.'<sup>7</sup> Flood, excluded under the policy, was defined as: 'Rising water which enters your home as a result of it running off or overflowing from any origin or cause.'<sup>8</sup>

In each case where water had inundated a property, those insurers whose policies drew distinctions of that kind had to establish what type of water inundation had caused damage. (The onus is on the insurer to prove that an exclusion applies.<sup>9</sup>) Determining causation was far from straightforward, often involving complex questions of fact and law. An insurer is liable for loss where the event covered by the insurance policy is its effective or 'proximate cause'.<sup>10</sup> Some of the complexities in resolving claims lay in determining which form of inundation was the proximate cause of the damage. And, in some cases, there were concurrent causes of damage. Where a loss has two or more proximate causes, one of which comes within the scope of the policy, the insurer will be liable, as long as none of the other causes is expressly excluded under the policy.<sup>11</sup> The sequence of events was significant in some cases: if inundation damage was caused in the first instance by waters covered by the policy (for example, stormwater) followed by subsequent inundation by water not covered by the policy, the policy-holder was entitled to recover from the insurer for that damage (for more information, see 12.7.2 *Site-specific hydrology reports*).<sup>12</sup>

Having to resolve such questions inevitably protracted the decision-making process. Hydrology information was needed in most cases. In complex or uncertain cases, site-specific hydrology advice was necessary (for details,

see sections 12.5.1 *Determination of liability* and 12.7 *Assessment process*). Insurers that provided automatic flood cover, such as Suncorp and other insurers in the Suncorp Group, did not need to undertake this task; because their policies covered inundation from any source, the cause of the damage was not contentious.

Some insurers have announced that they will be providing automatic flood cover from February 2012. As already mentioned, the Natural Disaster Insurance Review recommended that all domestic policies include flood cover, and the Commonwealth Treasury has proposed that insurers should have to at least offer flood cover in home building and home contents policies, based on a standard definition of flood.<sup>13</sup> If the proposal is adopted, it will go some way to removing the distinction between policies and the complexities associated with that distinction.

### 12.2.2 The *Insurance Contracts Act 1984*

The Commonwealth Government has power to make laws regulating private insurance policies.<sup>14</sup> In 1984, it passed the *Insurance Contracts Act 1984*.<sup>15</sup> The purpose of the Act is:

to reform and modernise the law relating to certain contracts of insurance so that a fair balance is struck between the interest of insurers, [policy-holders] and members of the public and so that those insurance contracts, and the practices of insurers in relation to such contracts, operate fairly.<sup>16</sup>

The *Insurance Contracts Act 1984* does not contain provisions expressly relating to the performance by insurers of their claims responsibilities, but section 13 implies into the insurance contract a requirement that each party act with ‘utmost good faith’. The utmost good faith requirement requires ‘fair dealing in which the one party puts the interests of the other at least at the same level of protection as his own’.<sup>17</sup> It encompasses notions of fairness, decency and reasonableness.<sup>18</sup> Among other things, the utmost good faith requirement requires insurers not to act with undue delay in processing a policy-holder’s claim. Thus, for claims which are covered by the policy, the duty requires prompt admission of liability and prompt payment.<sup>19</sup>

The Australian Securities and Investments Commission (ASIC) has supervisory and investigatory powers under the *Insurance Contracts Act 1984*, including the power to monitor complaints regarding insurance matters.<sup>20</sup>

The *Corporations Act 2001* requires insurers to have a dispute resolution system that consists of:<sup>21</sup>

- an internal dispute resolution process approved by ASIC, and
- membership of an ASIC approved external dispute resolution scheme.

The ASIC sets requirements for insurers’ internal dispute resolution procedures.<sup>22</sup> One requirement is that insurers should determine complaints within 45 business days.<sup>23</sup> For more information about the timeliness with which insurers dealt with disputes, see section 12.5.3.

The relevant external dispute resolution scheme is the Financial Ombudsman Service. Most insurers are members of this resolution scheme. It resolves disputes between policy-holders and their insurers, usually after the policy-holder has been through the insurer’s internal dispute resolution process. The Financial Ombudsman Service also monitors insurers’ compliance with the General Insurance Code of Practice.<sup>24</sup>

### 12.2.3 General Insurance Code of Practice

The General Insurance Code of Practice is a voluntary industry code developed by the Insurance Council for insurers. It came into operation on 18 July 2006 and is independently reviewed every three years; the last review was completed on 30 October 2009. Although it is not compulsory, more than 90 per cent of general insurance providers have signed up to the code.<sup>25</sup>

The code is to be applied having regard to the duty of utmost good faith.<sup>26</sup> Set out as a series of undertakings to policy-holders, it establishes minimum standards for insurers to meet in handling claims and complaints. The code sets timeframes in which insurers will appoint loss assessors; give policy-holders updates as to the progress of their claims; respond to policy-holders’ requests for information; determine whether claims are payable; and handle complaints.<sup>27</sup> It also requires insurers to give written reasons for declining claims<sup>28</sup> and entitles policy-holders, with certain exceptions, to access any information relied on in the assessment of their claims and the opportunity to correct any mistakes or inaccuracies (for information about what this standard entails, see 12.8.2 *Provision of information*).<sup>29</sup>

The document acknowledges, however, that during times of ‘catastrophe and disaster’ (which includes fires, flooding, earthquakes, cyclones, severe storms and hail)<sup>30</sup> large numbers of claims may prevent insurers from meeting all the prescribed standards.<sup>31</sup> Notwithstanding, insurers undertake to establish internal processes for dealing with catastrophes and disasters, responding in a ‘fast, professional and practical way and in a compassionate manner’.<sup>32</sup>

According to the code, insurers will handle complaints in a fair, transparent and timely manner, responding within set timeframes. If a policy-holder is not satisfied with the insurer’s response, the matter is then treated as a dispute and reviewed by a different employee. The insurer is required to keep the policy-holder informed of the progress of the response and respond within set timeframes, in writing, giving reasons for the decision. The insurer must also advise the policy-holder about his or her right to take the matter to the Financial Ombudsman Service.<sup>33</sup>

In reviewing a policy-holder’s complaint, the Financial Ombudsman Service gives the policy-holder and insurer an opportunity to make submissions. It is not bound by the rules of evidence and may consult industry and consumer advisors or experts. Following this process, the Financial Ombudsman Service may make a recommendation. If both the policy-holder and insurer accept the recommendation, the complaint or dispute is resolved. If the recommendation is not accepted, the Financial Ombudsman Service proceeds to make a determination which is binding on the insurer but not the policy-holder who has the option of commencing legal action.<sup>34</sup>

## 12.2.4 Topics of investigation for the Commission

The Commission’s consideration of the claims responsibilities which arise out of the *Insurance Contracts Act 1984*, the general law, the terms of insurance policies and the General Insurance Code of Practice has focussed on these matters:

- the timeliness of insurers’ decision-making (see *12.5.1 Determination of liability*)
- the adequacy of communication with policy-holders (see *12.6 Communication with policy-holders*)
- the adequacy of the assessment process (see *12.7 Assessment process*)
- the adequacy of information given to policy-holders whose claims were denied (see section *12.8 Information to policy-holders whose claims were denied*)
- the process and timeliness of internal dispute resolution (see *12.5.3 Timeliness of internal dispute resolution* and *12.9 Internal dispute resolution*).

## 12.3 Process of investigation

Fifty-three insurers are members of the Insurance Council of Australia. The Commission focussed its investigation on eight insurers:

- Australian Associated Motor Insurance Ltd (‘AAMI’, part of Suncorp Group Limited)
- Allianz Australia Insurance Limited
- CGU Insurance Limited (part of the Insurance Australia Group Limited)
- CommInsure
- NRMA Insurance (also part of the Insurance Australia Group Limited)
- QBE Insurance (Australia) Limited
- RACQ Insurance Limited
- Suncorp Metway Insurance Limited (‘Suncorp’, also part of the Suncorp Group).

The sample of insurers was chosen on the basis of two sources of information: submissions the Commission received and informal reports from advocates for policy-holders (Legal Aid Queensland and the Caxton Legal Centre). The latter were able to identify problems they had encountered and the insurers involved; of some interest were the numbers of complaints they had received in respect of particular insurers (which may have been a function of the numbers of claims those insurers received).

From those eight insurers the Commission obtained (by way of Requirements under the *Commissions of Inquiry Act 1950*) general information on the topics within the insurance term of reference. The extent to which the Commission could explore issues within its term of reference depended, however, on being able to examine the

way individual claims were dealt with, which in turn depended on policy-holders providing their accounts of their experiences. Unfortunately, the Commission received a limited number of submissions about insurance generally. The number relevant to the Commission's term of reference was even more limited. Most concerned issues outside the scope of the Commission's inquiry. They were provided to the Natural Disaster Insurance Review where they were relevant to the review's inquiry and where the submitter was happy with that course.

The Commission took steps to encourage people to provide information about their experiences with their insurance claims. It wrote to local councillors and members of Parliament and also to a large group of policy-holders represented by Legal Aid Queensland. It invited (by way of media statement) people to provide information on a confidential basis if they preferred to do so. To encourage greater participation, police officers working for the Commission also visited flood-affected areas, including regional areas, from which the Commission received comparatively fewer submissions. Additional submissions were received as a result of these steps. Public hearings in September and October 2011 also prompted more submissions. However, the numbers were still not significant and some of those making them preferred that their information be kept confidential.

There may be a number of reasons for the lack of submissions. It seems likely that policy-holders were concerned with recovering from the effects of the 2010/2011 floods and had too much to contend with, or wanted to get on with their lives and did not want to re-live the experience through making submissions or giving evidence to the Commission. Some may already have given accounts of their experiences to the Commonwealth reviews previously mentioned, and felt disinclined to repeat them. The Commission is also aware that some policy-holders did not want to prejudice ongoing claims or negotiations with their insurers.

The Commission could, of course, have used its powers under the *Commissions of Inquiry Act* to require insurers to provide representative samples of policy-holders' files, but it did not think it appropriate to encroach on individuals' privacy in that way. Similarly, when people who provided submissions were not prepared for the Commission to seek information from their insurers, the Commission respected their wishes. However, the Commission did investigate a number of individual cases where policy-holders had approached the Commission and were willing to have their cases examined. It did so by requiring insurers to provide information about how those claims were handled. This process yielded a useful – albeit limited – body of case examples by which to test some insurers' performance. Some of the cases were examined in the Commission's public hearings. This report does not comment on every case the Commission reviewed or complaint it received. References are made to some of these cases, generally by way of illustration of the point under consideration. In some instances, however, more detailed discussion and specific comment about a case the Commission examined is warranted.

The following points must also be made about the submissions the Commission received, and how they informed the Commission's investigation. As would be expected, most submissions were made by policy-holders who had some complaint against their insurer. The Commission did, however, receive some positive reports.<sup>35</sup> Secondly, the submissions almost entirely concerned household insurance claims (home and contents claims). The investigation concentrated on those kinds of claims as a result.<sup>36</sup>

### 12.3.1 Co-operation of insurers

The Commission required the eight insurers to provide in a limited period of time a large amount of information: general information about the topics under investigation, information about particular claims and data (see section 12.3.2 below). The Commission received a great deal of co-operation and assistance from many of the insurers. In particular, the co-operation of Suncorp and AAMI (both part of the Suncorp Group) and RACQ Insurance, from which extensive information was sought, is acknowledged. Unfortunately, one insurer – CGU – was, in some instances, less meticulous in its responses to the Commission's Requirements (see *Appendix 5 Glossary* for a definition of Requirement).

Some of CGU's responses were incomplete. In one case, CGU was required to produce 'copies of records of all communications' between it and the ASIC and the Financial Ombudsman Service 'concerning any matter relating to insurance claims arising from the Queensland floods'. It is evident that some correspondence was not provided to the Commission, while some correspondence that was provided made reference to telephone conversations or meetings, of which no record was produced.

CGU's correspondence with ASIC and the Financial Ombudsman Service raised questions about the accuracy of a statement by CGU which responded to this question in a Requirement: 'Is CGU or has CGU been the subject

of any investigation by the Financial Ombudsman Service ... or any other regulatory body about the manner in which CGU has dealt with claims relating to the Queensland floods?' CGU said that to the best of its knowledge and belief, it 'had not been subject to such an investigation'. It added, however, that in April 2011 it had 'received correspondence from ASIC requesting information addressing concerns that were raised anonymously to ASIC', it responded to that correspondence, and it did 'not believe that the matter [had] been taken any further'.<sup>37</sup>

It is not accurate that the matter had not been taken any further. After CGU provided its response to ASIC's inquiries,<sup>38</sup> the regulator requested further information in June 2011<sup>39</sup> and then again in August 2011.<sup>40</sup> ASIC wrote to CGU again in September 2011 when it did not receive a response to the latter request.<sup>41</sup> More to the point, however, CGU's statement did not include any reference to inquiries by the Financial Ombudsman Service which commenced in April 2011.<sup>42</sup> It is apparent that by 14 July 2011 CGU was made aware, formally, of an investigation by the ombudsman into a 'possible systemic issue'<sup>43</sup> and possible breach of the code of practice. That investigation resulted in a finding by the ombudsman, notified to CGU on 26 August 2011, of a 'definite systemic issue'.<sup>44</sup> The correspondence indicates that, in fact, CGU had been subject to an investigation by the Financial Ombudsman Service of which it must have been aware when it provided information to the Commission.

Another statement CGU made was shown to be plainly wrong. The insurer stated that all letters advising customers that their claims had been denied 'detail[ed] the reasons for the decision' and 'referenced all material relied upon to come to the decision'.<sup>45</sup> CGU conceded the statement was not correct.<sup>46</sup> The concession was sensible: the insurer's pro forma letters, which were provided to the Commission, did no such thing.

CGU said, by way of explanation, that the shortcomings were inadvertent, the result of pressures of work. The Commission accepts that CGU was put to considerable work in order to comply with the Commission's Requirements (and it must be noted that its legal representatives also had to co-ordinate responses to Requirements issued to NRMA Insurance, which is also part of the Insurance Australia Group). It considers, however, that in those instances, the insurer was neither careful nor diligent in its responses to Requirements.

### 12.3.2 Insurance statistics

The Commission obtained data from the eight insurers as to:

- the number of household claims (home building claims, home contents claims, and home and contents claims) received as a result of the 2010/2011 floods<sup>47</sup>
- the time taken to decide to accept or decline the claims
- the time taken to finalise the accepted claims, whether by way of cash settlement, replacement of goods or repairs
- the number of the claims which were reviewed in the internal dispute resolution process and the time taken to complete the reviews.

The Commission obtained this information on two occasions. Insurers provided an initial set of data at the end of September 2011, with further, updated figures furnished in mid-December 2011. The data presented in this report relates to the period up to and including 1 November 2011.

However, because insurers do not collect and record data uniformly, some of the data was presented to the Commission in different ways. This made it difficult to collate it and to make meaningful comparisons between insurers. By way of example:

- Some insurers count composite home and contents claims as a single claim, while other insurers record them as two separate claims.
- One insurer recorded claims which were accepted in part as declined claims. The other insurers recorded such claims as accepted claims.
- Insurers defined the dates on which claims were accepted and declined differently.
- Insurers defined the dates on which accepted claims were finalised differently.

Where statistics are presented in the report, the qualifications that apply to the data are explained in the text and in endnotes. The statistics must be read with the qualifications in mind. The statistics provide some indication of the performance of eight insurers but little more.

### 12.3.3 The body of evidence

The general information and data the Commission received from insurers and the information derived from examination of particular claims formed a body of evidence which was necessarily limited. The Commission has had to be wary about making broad findings based on an unrepresentative number of cases. It has, however, been able to draw some recommendations it considers useful from the evidence available to it, particularly from the experiences of the people who provided information to the Commission.

There were, in addition, some discrete issues of insurer performance which warranted close attention. Those issues are discussed in some detail in this chapter.

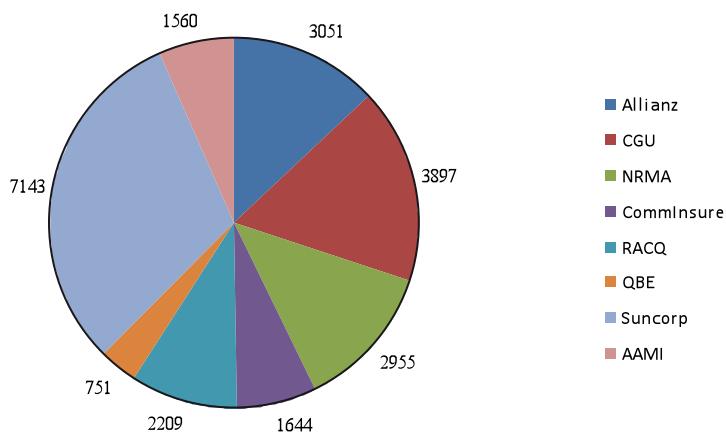
Before discussing any of these matters, however, it is necessary to set out some context.

## 12.4 The picture as a whole

### 12.4.1 The number of claims

Insurers received an exceptionally high volume of claims as a result of the 2010/2011 floods. The Insurance Council of Australia has reported that, as at 24 November 2011, 58 463 residential and commercial claims<sup>48</sup> were made as a result of the 2010/2011 floods.<sup>49</sup> Residential claims (excluding, it seems, contents claims) alone totalled 26 554.<sup>50</sup> Those figures did not include all insurers,<sup>51</sup> but the Insurance Council estimated that its statistics represented 96.8 per cent of all residential and commercial claims made as a result of the 2010/2011 floods and also Cyclone Yasi.<sup>52</sup>

The total household claims (which did include contents claims) of the eight insurers which provided data to the Commission added up to 23 210 claims. The number of household claims each insurer received is presented in Figure 12(a).



**Figure 12(a): Total household claims arising from the 2010/2011 Queensland floods, as at 1 November 2011, across eight insurers (N=23 210)<sup>53</sup>**

These numbers do not, however, give the full picture. Firstly, the figures relate only to household claims. Other kinds of claims insurers had to process, such as business insurance claims and motor vehicle claims, are not included. RACQ Insurance only included in its data what it called ‘inundation claims’: claims for water damage resulting from a ‘flood’ or ‘flash-flood or stormwater run-off’ as defined in its policy. It did not include nearly 3000 claims which related only to storm and rain which occurred during the period of the floods.<sup>54</sup> That is, the insurer received over 5000 household claims from the 2010/2011 floods, more than double the number represented in Figure 12(a).<sup>55</sup>

Insurers also had to deal with claims resulting from other events around the period of the 2010/2010 floods, including Cyclone Yasi. By way of example, as at 31 August 2011, RACQ Insurance had received a total of 11 836 household claims and 3980 motor vehicle claims from storms in Brisbane in mid-December 2010, the 2010/2011

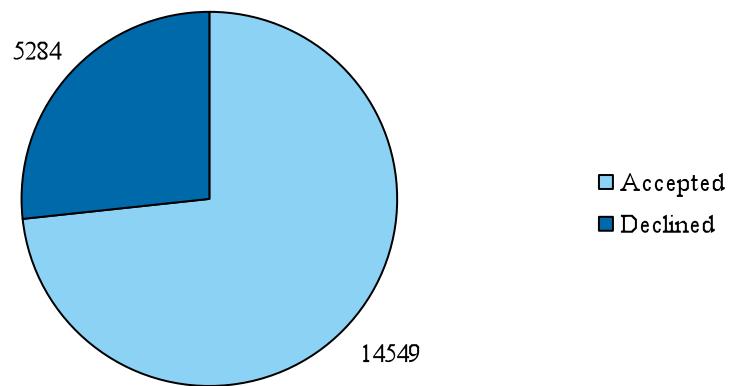
floods and Cyclone Yasi.<sup>56</sup> The Insurance Council has reported that (as at 24 November 2011) 72 203 claims<sup>57</sup> resulted from Cyclone Yasi, of which 41 687 were residential claims. In addition:<sup>58</sup>

- 7952 claims resulted from the floods in Victoria which occurred over the period 13 January 2011 to 18 January 2011
- 49 396 claims resulted from severe storms in Melbourne in early February 2011
- 410 claims resulted from bushfires in Perth in early February 2011.

The Commission accepts that the volume of claims made as a result of the 2010/2011 floods and other events in the period of, or soon after, the floods, put insurers under strain, and contributed to delays in the determination process (for details, see *12.5.1 Determination of liability*).

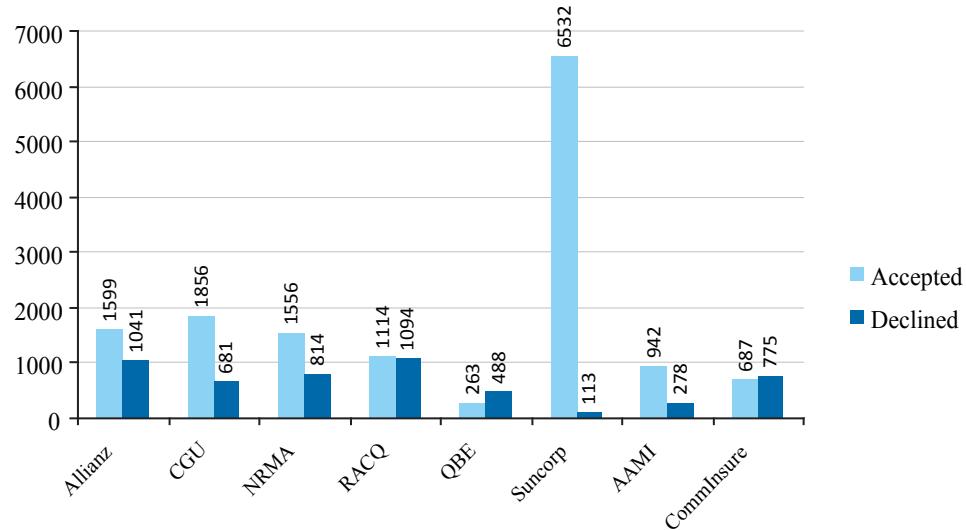
## 12.4.2 Accepted versus declined claims

Figure 12(b) shows that, across the eight insurers which provided data to the Commission, the proportion of accepted claims (73 per cent) far exceeded the proportion of declined claims (27 per cent).



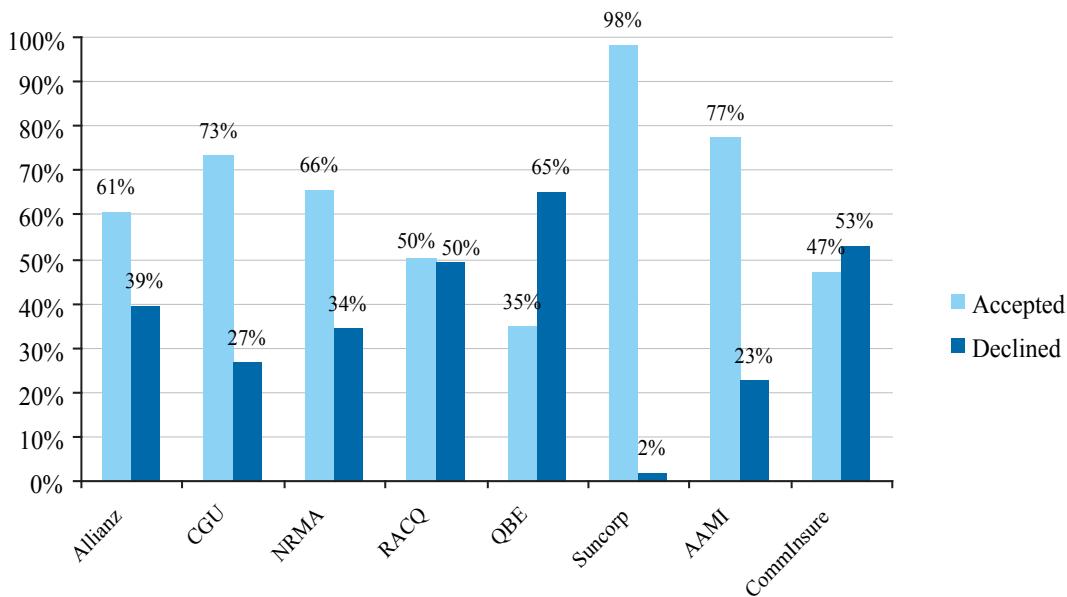
**Figure 12(b):** Total number of accepted and declined household claims arising from the 2010/2011 Queensland floods, as at 1 November 2011, across eight insurers (N=19 833)<sup>59</sup>

The total claims accepted and declined by each insurer are shown in Figure 12(c).



**Figure 12(c):** Total accepted and declined household claims arising from the 2010/2011 Queensland floods, as at 1 November 2011, across eight insurers (N=19 833)<sup>60</sup>

Figure 12(d) shows the proportions of accepted claims and declined claims for each insurer.

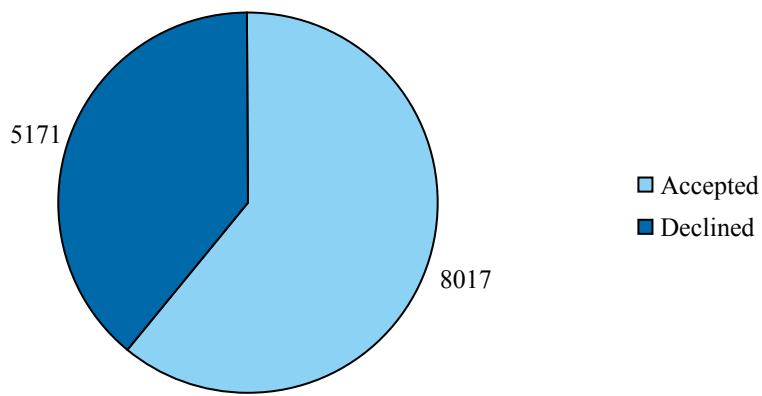


**Figure 12(d):** Total accepted and declined household claims arising from the 2010/2011 Queensland floods, as at 1 November 2011, displayed as a percentage proportion of the total claims decided by each insurer (N=19 833)<sup>61</sup>

The claims represented in figures 12(b), 12(c) and 12(d) were accepted and declined under the following terms (or other policy terms):

- In the case of four insurers – AAMI,<sup>62</sup> Allianz,<sup>63</sup> CGU,<sup>64</sup> NRMA<sup>65</sup> – claims were accepted under terms providing cover for stormwater and declined under a flood exclusion.
- QBE provided cover for stormwater damage but some policies also covered ‘flash flood’ or ‘flood’. Accepted claims shown in figures 12(c) and 12(d) were accepted under those terms. Declined claims were generally declined on the basis of a flood exclusion.<sup>66</sup>
- RACQ Insurance covered damage caused by ‘flash flood and/or stormwater run-off’<sup>67</sup> and excluded damage caused by ‘flood’.<sup>68</sup> Flood cover was offered as an option, however. So, where that option had been taken, claims were accepted under the flood cover; otherwise, they were accepted under cover for ‘flash flood and/or stormwater run-off’. The declined claims in figures 12(c) and 12(d) are claims declined under the flood exclusion.
- CommInsure also provided cover for ‘flash flood’<sup>69</sup> and excluded ‘flood’.<sup>70</sup> The claims represented in figures 12(c) and 12(d) were accepted and declined under those terms.
- Suncorp provided automatic flood cover. Suncorp claims account for 45 per cent of the total accepted claims in Figure 12(b). A very small proportion of claims were declined, as figures 12(c) and 12(d) show. Those claims were declined under an exclusion which applied if a policy was purchased within 72 hours of the event which caused the damage, or because there was no insured loss.

When Suncorp’s claims are removed from the total claims, the proportion of accepted claims (61 per cent) is still higher than the proportion of declined claims (39 per cent), as shown in Figure 12(e).



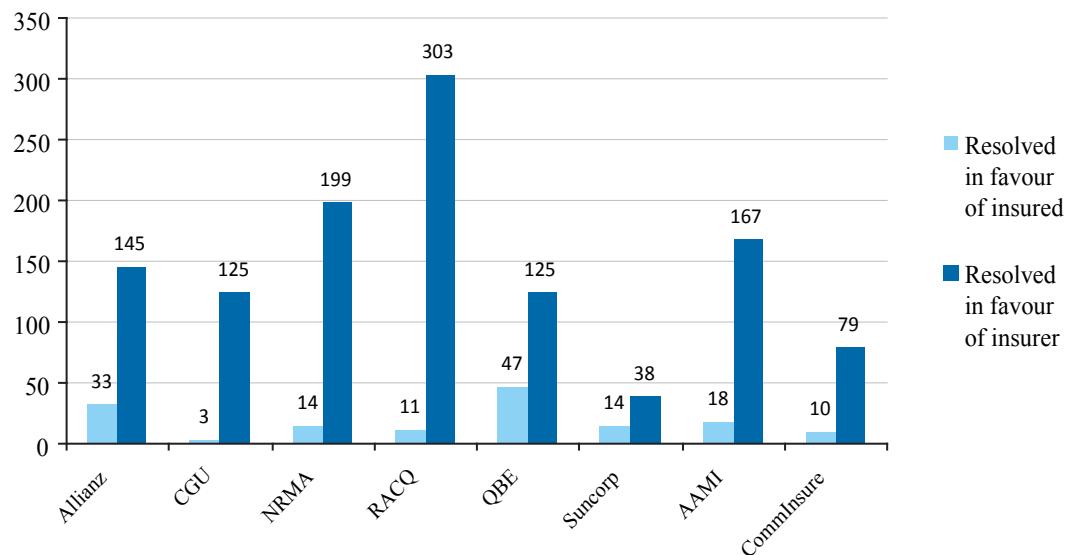
**Figure 12(e):** Total number of accepted and declined household claims arising from the 2010/2011 Queensland floods, as at 1 November 2011, across seven insurers (that is, excluding Suncorp) (N=13 188)<sup>71</sup>

The Commission received submissions both from people whose claims were accepted and from people whose claims were denied, although the majority of submissions were from individuals in the second category. Many of the policy-holders who provided information and gave evidence were, or had been, in dispute with their insurer. As the next section shows, however, on the whole, across the eight insurers, the proportion of claims the subject of dispute was relatively small.

### 12.4.3 Disputed claims

The Financial Ombudsman Service reported in a submission to the Natural Disaster Insurance Review that flood claims yielded a higher level of dispute at its level, because many policies excluded flood. Flood claims raise complex questions of causation which contribute to delays involved in deciding claims and give rise to questions as to whether policy-holders were clearly informed of the exclusion.<sup>72</sup> On the same reasoning, it is likely that flood claims also led to more disputes than usual in insurers' internal dispute resolution processes.

Figure 12(f) shows the number and outcome of claims that went to internal dispute resolutions for each of the eight insurers from which the Commission received data.



**Figure 12(f):** Number and outcome of claims reviewed in internal dispute resolution, as at 1 November 2011, across eight insurers (N=1331)<sup>73</sup>

Across the eight insurers, the total number of claims which were the subject of dispute and referred to internal dispute resolution represents only a small proportion (7 per cent) of the total number of decided claims.<sup>74</sup> In other words, across those insurers, 93 per cent of insurers' decisions were not disputed (keeping in mind, though, that Suncorp did not have to determine whether stormwater damage or flood had occurred). Taking each insurer separately, the proportions of decided claims the subject of dispute were:

- AAMI – 15 per cent
- Allianz Australia Insurance Limited – 7 per cent
- CGU Insurance Limited – 5 per cent
- CommInsure – 6 per cent
- NRMA Insurance – 9 per cent
- QBE Insurance (Australia) Limited – 23 per cent
- RACQ Insurance Limited – 14 per cent
- Suncorp – 0.8 per cent.

The eight insurers also informed the Commission about the number of household cases which had been, or were, the subject of dispute before the Financial Ombudsman Service as at mid-December 2011:

- Eighty-five AAMI claims had been or were the subject of dispute. Seven cases apiece had been determined in favour of the policy-holder and insurer. Four cases were settled without the ombudsman's making a recommendation or determination (and two cases had been withdrawn).
- Forty-nine Allianz claims had been or were the subject of dispute, but 11 cases did not proceed to determination (eight of that group of cases were accepted by Allianz after the policy-holder registered a dispute with the ombudsman). Six disputes had been determined. The policy-holder was successful in two of the cases. The remaining cases were determined in Allianz's favour.
- Fifty-two CGU claims (45 household claims and 7 landlord claims) had been or were the subject of dispute. Thirteen cases had been determined, four in favour of the policy-holder, eight in favour of CGU and one partially in favour of both parties.
- CommInsure was or had been involved in 44 cases. Six had been determined: three apiece in favour of the insurer and policy-holder.
- Eighty-three NRMA claims were or had been the subject of dispute, 14 of which had been determined. Two of those cases were determined in favour of the policy-holder, 11 were determined in NRMA's favour and one was determined partially in favour of both parties.
- QBE had been or was involved in 59 disputes. Five had been determined in favour of the policy-holder, six had been determined in favour of QBE and five were settled before any determination.
- One hundred and forty-three RACQ Insurance claims were or had been the subject of dispute. Five cases had been determined in favour of the policy-holder and six in favour of RACQ Insurance. Thirty-three cases had been withdrawn, the majority of which were resolved by agreement between the policy-holder and insurer.
- Suncorp was or had been involved in 40 disputes. Two disputes had been finalised in the policy-holder's favour, five in Suncorp's favour and 10 were resolved by conciliation or agreement before the ombudsman made a recommendation or determination.

Most of these disputes (other than those which involved Suncorp) were about the insurer's determination that flood was the effective cause of the damage to the policy-holder's property. In cases where policy-holders were successful (in full or part), it was because the ombudsman had arrived at one of three conclusions: he had found that the insurer's evidence was inadequate, because it had not established that the flood exclusion applied; or that stormwater run-off had caused some damage before the property was inundated by floodwater; or that the insurer had failed to show it had clearly informed the policy-holder of the flood exclusion.<sup>75</sup>

## 12.5 Timeliness

### 12.5.1 Determination of liability

One of the main criticisms directed at insurers in public discussion was that they took too long to decide claims. Many policy-holders expressed frustration and distress in complaints to the Commission, and also to the Natural Disaster Insurance Review,<sup>76</sup> about the time taken to determine their claims.

Insurers have an obligation to determine claims in a timely way. It is an aspect of their duty to act with utmost good faith.<sup>77</sup> The General Insurance Code of Practice imposes a 10-day time limit on insurers to determine claims:

- from the date the claim is received if the insurer has all necessary information when the claim is lodged and no further assessment or investigation is required<sup>78</sup>
- otherwise – where further information or investigation is required – from the time the insurer receives all necessary information and all investigations are completed.<sup>79</sup>

The timeframes can be extended by agreement between the insurer and policy-holder.<sup>80</sup> Insurers are not required to adhere to the time limits set in the code when dealing with a large number of claims following a natural disaster.<sup>81</sup>

There is no question that in a large number of cases insurers could not meet the 10-business day timeframe and that delays occurred. The Natural Disaster Insurance Review reported that insurers took, on average, 28 days to accept claims related to the flood in Brisbane, four times more than the average time taken to accept claims which resulted from Cyclone Yasi.<sup>82</sup> One insurer which, on average, determines ‘business as usual claims’ in five business days, told the Commission that the average time it took to determine claims arising from the 2010/2011 floods was 35 business days. (Claims resulting from Cyclone Yasi were determined on average in 14 business days.<sup>83</sup>)

Delays were more extensive in many other cases. The majority of claims which were the subject of a complaint to the Commission were determined in two to four months;<sup>84</sup> the longest period of delay was nearly five months.<sup>85</sup>

The time taken to determine claims must be viewed, however, in the light of the investigations insurers (other than those which provided automatic flood cover) were required to undertake in order to decide whether to accept or decline claims (these investigations are considered in *12.7 Assessment process*). Those steps generally included appointment of a loss assessor to inspect and report on damaged properties and, where it was thought that flood had caused the damage, obtaining and considering hydrology information (for details see *12.7.1 Area hydrology reports*, *12.7.2 Site-specific hydrology reports* and *12.7.3 Loss assessors' reports*). Many claims were not determined until insurers had received and reviewed general hydrology reports. Hydrology reports commissioned by the Insurance Council of Australia, by way of example, did not become available until various dates in mid-February, March and late April 2011.<sup>86</sup> In some cases, on reviewing the available information, insurers considered that more information was required and instructed hydrologists to provide site-specific reports.<sup>87</sup> One insurer indicated that such advice was generally provided in six to eight weeks.<sup>88</sup> Another indicated it was in the order of eight to 12 weeks.<sup>89</sup> The investigations insurers undertook did result in delays, but were (generally speaking) necessary in order to properly determine coverage. Most of the claims the Commission examined were decided soon after hydrology reports were received.

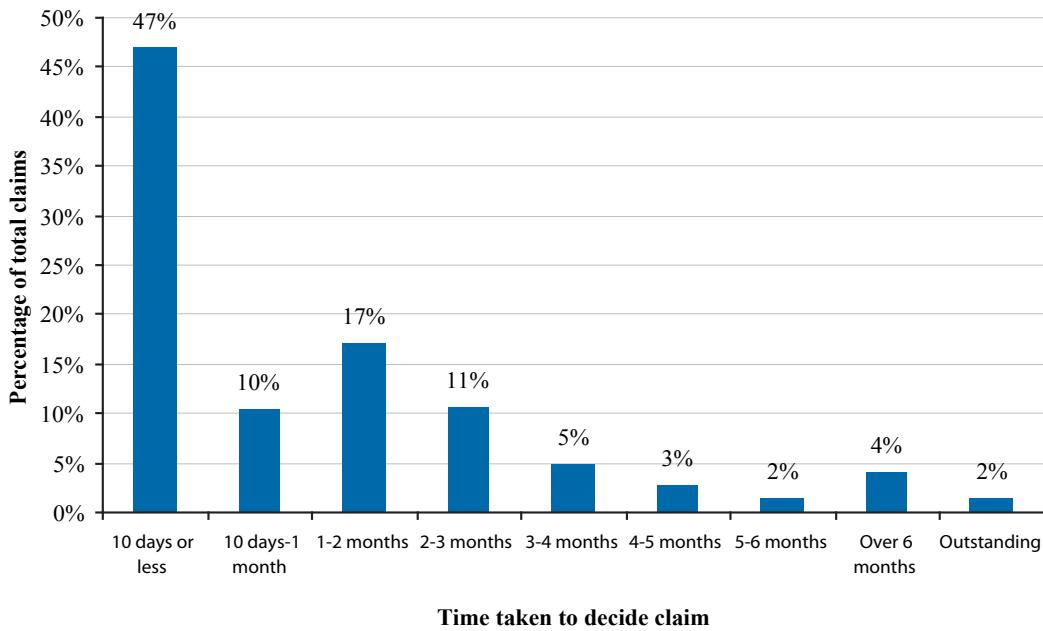
Insurers said that a number of difficulties added to delays in the determination process, including:<sup>90</sup>

- the high volume of claims arising from the floods, as well as other natural disasters which occurred within the relevant period of time (discussed in *12.4.1 The number of claims*)
- the complexity of some cases
- the difficulty of getting access to affected areas
- the limited availability of loss assessors and expert hydrologists
- the time taken to receive flood data and information from government agencies and councils. This point is discussed in the context of an examination of one insurer's re-assessment of a large number of claims (see *12.7.5 RACQ Insurance Limited*).

In light of these circumstances, it is not surprising that delays occurred.

The Commission sought data from the eight insurers as to the time taken to decide to accept and decline claims. The combined data of seven of the eight insurers is depicted in Figure 12(g).

AAMI's data could not be included because it provided data which reflected when claims were finalised, not when they were decided. Its data is represented separately in Figure 12(j) below. The omission of AAMI's data did not, however, substantially alter the results presented in Figure 12(g).



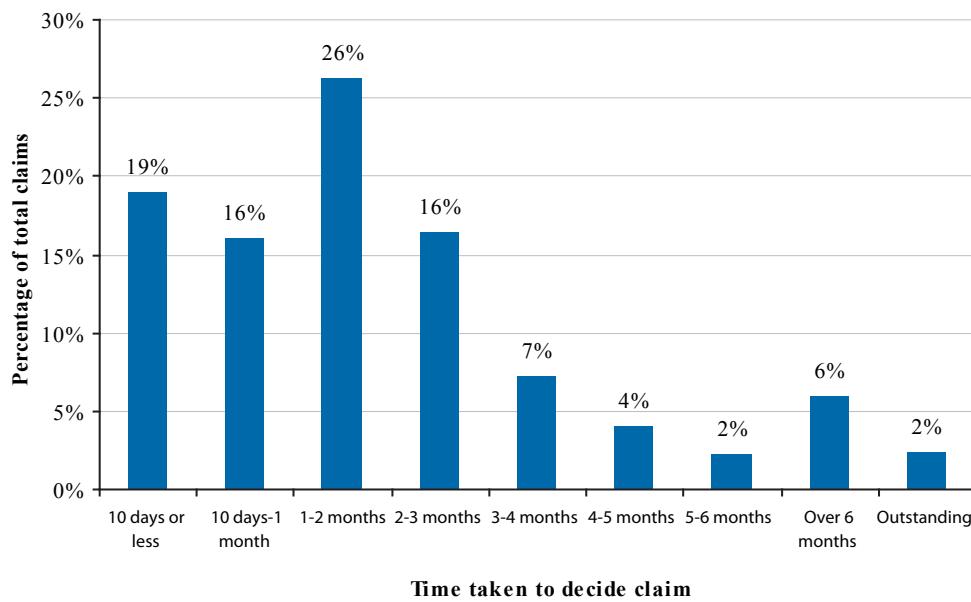
**Figure 12(g):** Time taken to decide household claims arising from the 2010/2011 Queensland floods, as at 1 November 2011, across seven insurers (that is, excluding AAMI), displayed as a percentage proportion of N (N=18 910)<sup>91</sup>

The results do not accord with the general impression created by media coverage and some public statements that insurers were slow to decide claims, at least not for the majority of cases. Figure 12(g) shows that across the seven insurers, more than half of claims were decided within one month. The largest proportion of claims – 47 per cent – was decided in 10 days or less.

The timeframes in Figure 12(g) are not definitive, however, because different insurers took different approaches to what constituted a 'decision' date. Five of the seven insurers – CGU, NRMA, CommInsure, Allianz and QBE – provided data indicating the time taken to determine liability and also communicate the decision to policy-holders. Generally policy-holders were informed of the decision on the same day it was made, or only a short time afterwards. One insurer (Allianz), however, said that the time between making a decision to decline a claim and notifying the policy-holder of the decision, could be as many as eight days. RACQ Insurance's data did not encompass when decisions were communicated to policy-holders. It indicated when the general manager for Personal Insurance Claims made decisions about liability and conveyed those decisions to the claims officers. (The insurer said, however, decisions were generally communicated to policy-holders soon after they were made.)

Because Suncorp provided automatic flood cover, claims were accepted when they were lodged (unless the insurer suspected that an exclusion might apply).<sup>92</sup> As a result, 98 per cent of Suncorp's claims,<sup>93</sup> and all claims it accepted, were decided in 10 days or less. Suncorp's claims explain the high proportion of claims decided within 10 days shown in Figure 12(g): they comprise a large majority (74 per cent) of that group of claims. Additionally, across the seven insurers, a very high proportion – 98 per cent – of the total claims decided within 10 days were accepted; and 91 per cent of the claims decided within one month were accepted.

The following figure, Figure 12(h), excludes Suncorp's claims to show the data which relates to the six other insurers represented in Figure 12(g) which had to determine in each case whether 'flood' or 'stormwater run-off' or (in the case of two insurers) 'flash flood' had occurred. As discussed above, the information must be read in the light of the determination process insurers were required to undertake.

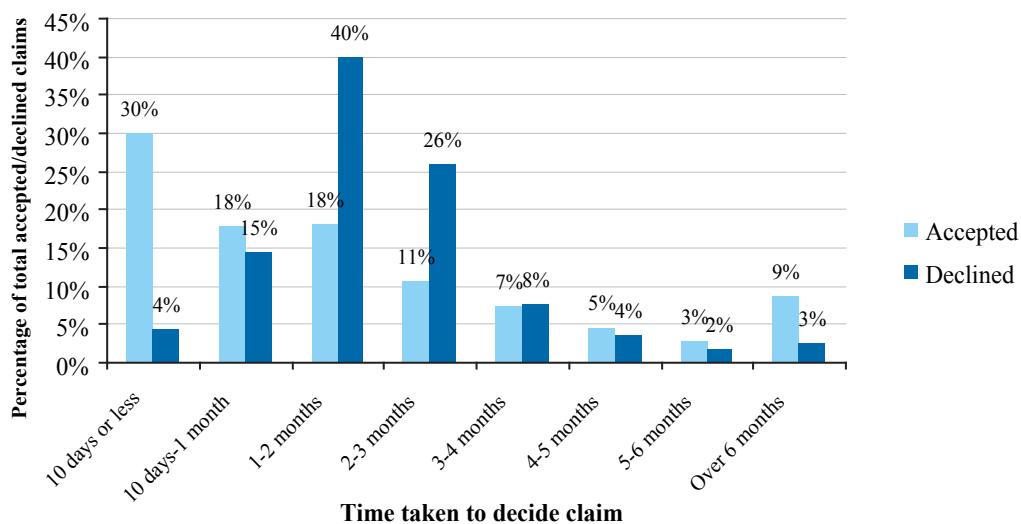


**Figure 12(h):** Time taken to decide household claims arising from the 2010/2011 Queensland floods, as at 1 November 2011, across six insurers (that is, excluding AAMI and Suncorp), displayed as a percentage proportion of N (N=12 265)<sup>94</sup>

The proportion of claims determined within 10 days – and within one month – decreases when Suncorp's data is removed. Still, over a third of claims were decided within one month and more than half (61 per cent) were decided in two months or less. Even without Suncorp's claims, a large proportion of the claims decided within 10 days and within one month was accepted: 91 per cent and 79 per cent respectively.

NRMA Insurance contributes considerably to the number and proportion of claims accepted within 10 days (71 per cent) and one month (44 per cent) across the six insurers. Sixty-four per cent of NRMA claims were decided in 10 days or less.<sup>95</sup> Almost all of those claims (99 per cent) were accepted. This particular body of claims represents 96 per cent of NRMA's total accepted claims (94 per cent of NRMA claims which were not decided within 10 days were declined).

Other insurers also accepted a large proportion of claims they decided within 10 days and within one month.<sup>96</sup> Across the six insurers, 48 per cent of the total accepted claims were decided within one month, as shown in Figure 12(i).



**Figure 12(i):** Time taken to decide accepted and declined household claims arising from the 2010/2011 Queensland floods, as at 1 November 2011, across six insurers (that is, excluding AAMI and Suncorp), displayed as a percentage proportion of total accepted (7075) or total declined (4893) claims for the six insurers (N=11 968)<sup>97</sup>

The majority of accepted claims (66 per cent) were determined in two months or less, while the majority of declined claims (81 per cent) were determined in one to three months. This may suggest, broadly speaking, that it was easier to identify claims that would be accepted (hydrology information may not have been required or general hydrology information was sufficient). Where it was suspected flood had caused damage, claims were harder to determine, or were not decided until hydrology information had been received.

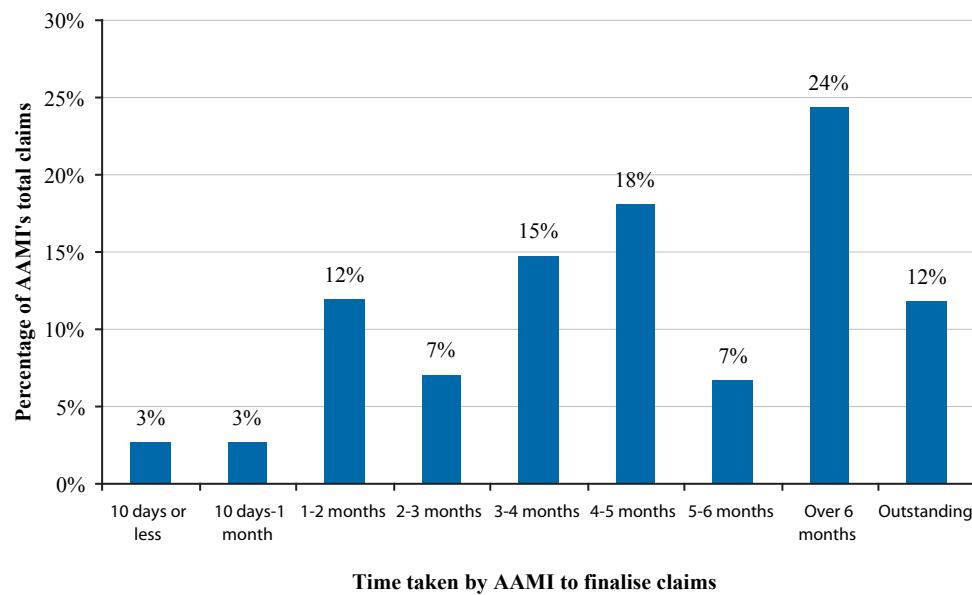
The Natural Disaster Insurance Review recommended the repeal of sections 4.3 and 4.4 of the General Insurance Code of Practice, which relieve insurers of the obligation to comply with standards in the code in times of natural disaster. It recommended the introduction of a four-month time limit, subject to exceptional circumstances, for insurers' determination of liability.<sup>98</sup> On 10 October 2011, the Insurance Council Board agreed in principle to amend the code in line with the review's recommendation. The amendments will also include timeframes for experts to provide reports to insurers.

In May 2011, about four months after the floods in January 2011, the Insurance Council said that its members had determined 97 per cent of claims resulting from the 2010/2011 floods and Cyclone Yasi.<sup>99</sup> Figure 12(h) shows that, across the six insurers represented in the figure, 84 per cent of claims were decided in four months or less. Taking each insurer separately, five of the six insurers decided a high proportion of claims within four months:

- NRMA Insurance decided 99.7 per cent of claims within four months (only five of 2371 claims were not decided within four months, and one claim was outstanding as at 1 November 2011).
- QBE decided 96 per cent of claims within four months.
- CommInsure decided 94 per cent of claims within four months.
- Allianz decided 90 per cent of claims within four months.
- RACQ Insurance decided 81 per cent of claims within four months.

The other insurer, CGU Insurance, decided 65 per cent of claims within four months.

The data AAMI provided to the Commission in December 2011 is represented in figures 12(j) and 12(k). The figures reflect when claims were closed, so the time taken from lodgement to finalisation of the claim. They cannot be compared with the data represented in Figure 12(g) or Figure 12(h).



**Figure 12(j):** Time taken by AAMI to finalise household claims arising from the 2010/2011 Queensland floods, as at 1 November 2011, displayed as a percentage proportion of AAMI's total claims (N=1384)<sup>100</sup>

Presumably the time taken to decline claims might still be reasonably (but approximately) reflected in AAMI's data: the time taken to finalise a declined claim, after the decision was made to deny it, would not be great. Accepted claims, on the other hand, could take some months to be finalised where losses need to be quantified and buildings

repaired. This may explain the proportion of claims finalised in over 6 months shown in Figure 12(j). A high proportion of those claims – 96 per cent – was accepted. This group of claims represented 34 per cent of AAMI's total accepted claims, as shown in Figure 12(k).

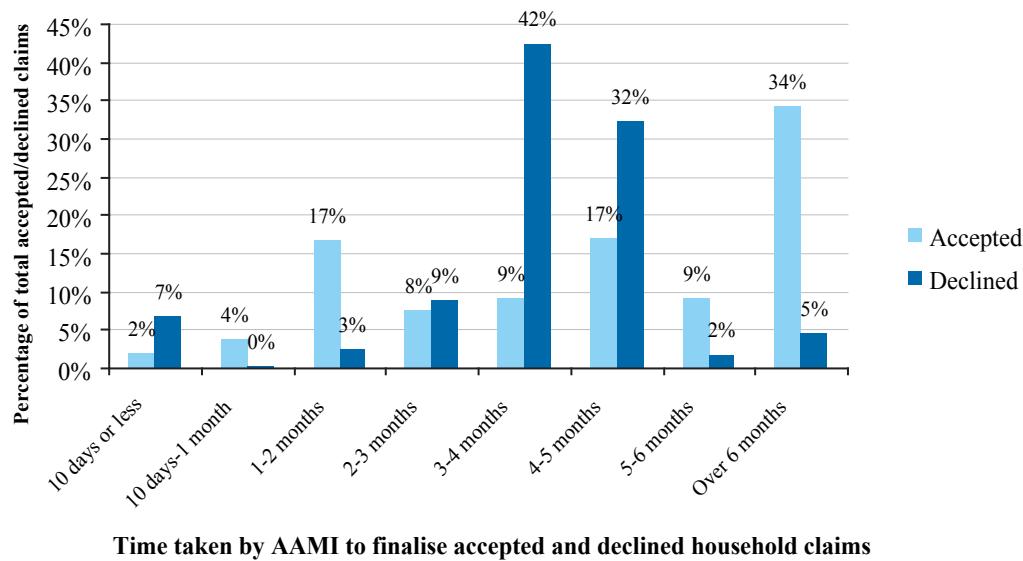


Figure 12(k): Time taken by AAMI to finalise accepted and declined household claims arising from the 2010/2011 Queensland floods, as at 1 November 2011, displayed as a percentage proportion of AAMI's total accepted (942) or total declined (278) claims (N=1220)<sup>101</sup>

The Commission did ask insurers to provide data as to the time taken to finalise claims.<sup>102</sup> That data is presented in the next section (*12.5.2 Finalisation of accepted claims: settlement, replacement and repairs*). Again, AAMI's data could not be compared with that of other insurers because it included data which did not actually relate to finalised claims.

Delays in the determination process undoubtedly caused distress to policy-holders whose lives were significantly disrupted by the floods. The Commission supports the introduction of a time limit in the Code of Practice for the determination of claims arising from a natural disaster. In light of the evidence it received, the Commission considers a maximum of four months to decide flood claims, though lengthy, is reasonable in extraordinary circumstances such as those that prevailed in the wake of the 2010/2011 floods. Four months is, however, a long time for policy-holders to await decisions on their claims. It goes without saying that insurers should decide flood claims in a shorter period of time wherever possible.

## 12.5.2 Finalisation of accepted claims: settlement, replacement and repairs

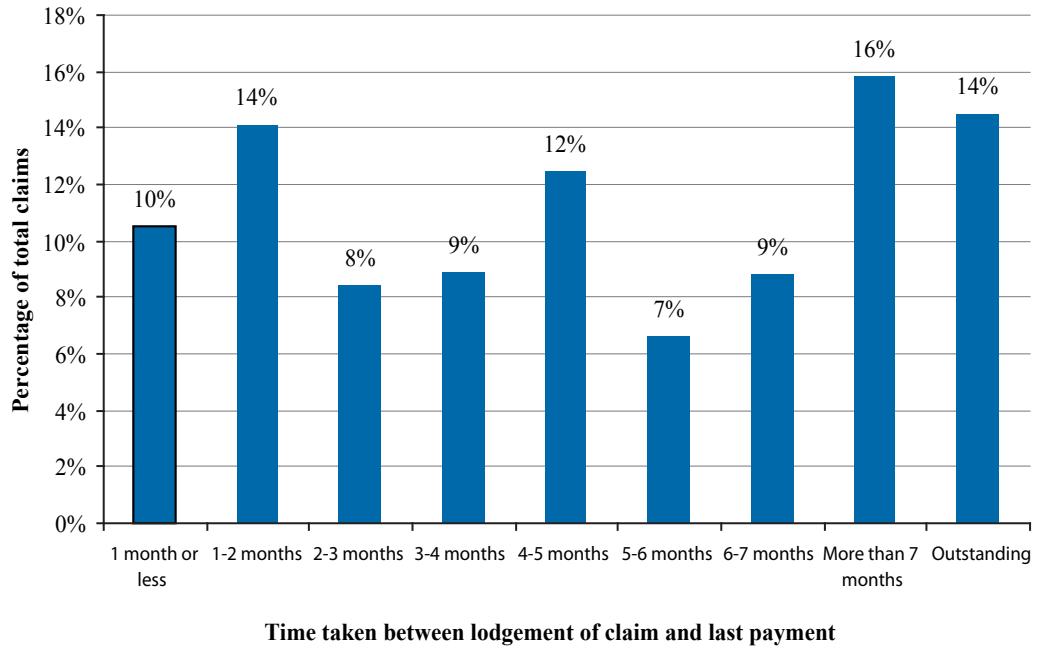
In November 2011, the Insurance Council reported that 85 per cent of residential claims from the 2010/2011 floods had been 'closed', meaning that goods had been replaced, repairs completed or cash settlements made and the insurer considered the claim 'finalised'.<sup>103</sup> The repair process was underway in the remaining 15 per cent of cases.<sup>104</sup>

In gathering the data, the Insurance Council asked insurers to separate their claims into 'open' and 'closed' categories.<sup>105</sup> The Commission sought similar data from eight insurers. The Commission asked for data relating to:

- the number of accepted claims which had been settled or finalised – excluding all partially paid claims
- the time taken for settlement or finalisation to occur, starting from the time the claim was lodged.

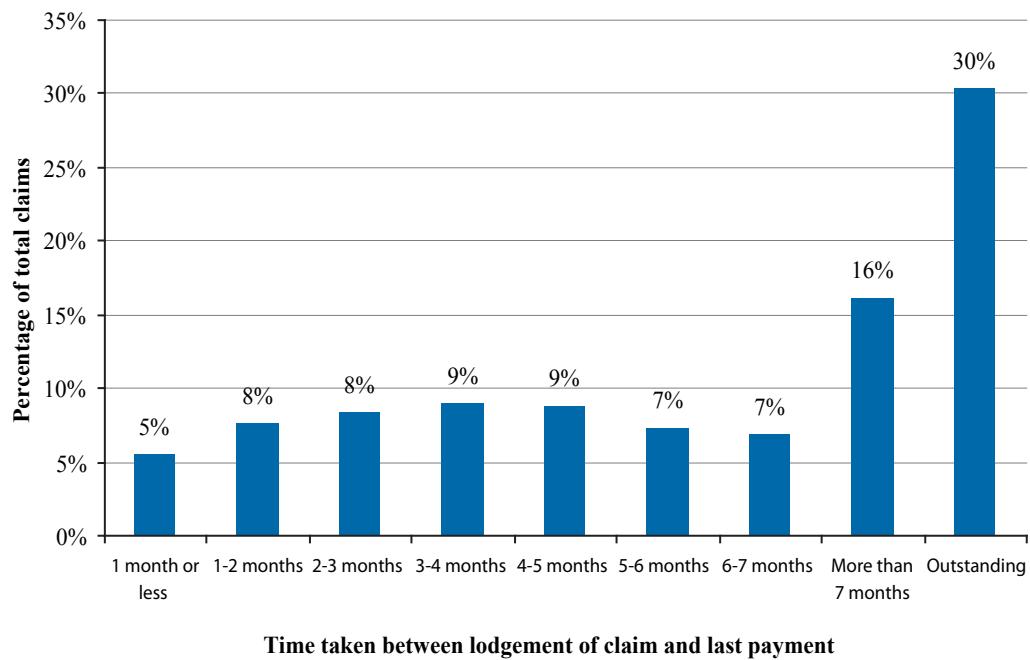
Suncorp and AAMI (both part of the Suncorp Group) provided data which indicated when the most recent payment had been made on a claim. This encompassed not only final payments but also progress payments or some other payment to a policy-holder or supplier. That is, those insurers included data which related to claims which

had not, in fact, been finalised. As a result, AAMI and Suncorp's data could not be compared with the data given by the six other insurers. It is represented separately in figures 12(l) and 12(m) respectively.



**Time taken between lodgement of claim and last payment**

Figure 12(l): Time taken between lodgement of claim and last payment, as at 1 November 2011, displayed as a percentage proportion of AAMI's total accepted claims, excluding withdrawn claims (N=1106)<sup>106</sup>



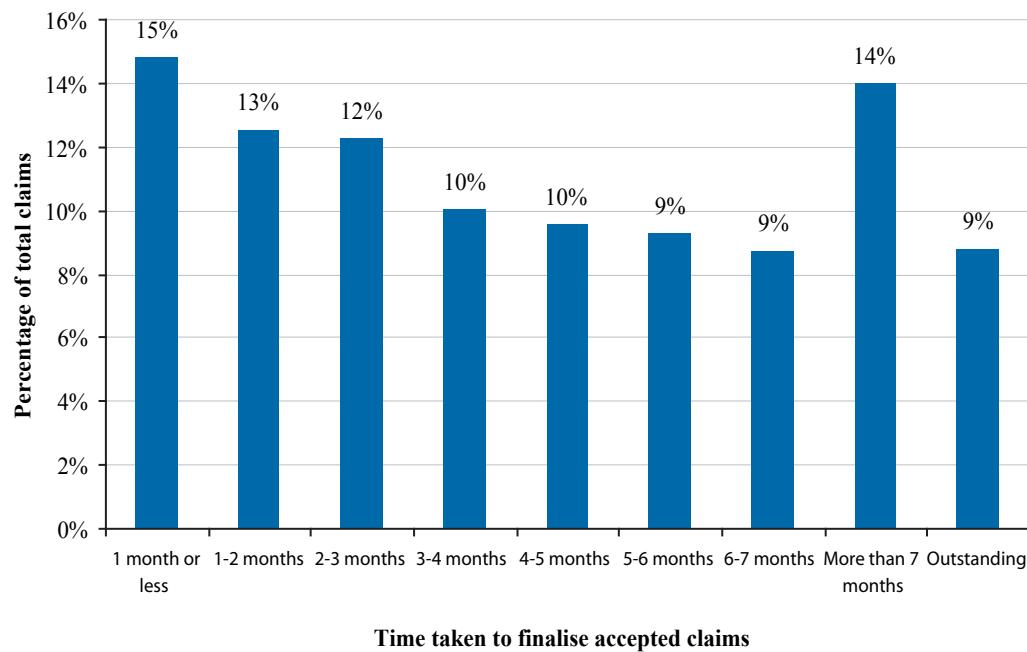
**Time taken between lodgement of claim and last payment**

Figure 12(m): Time taken between lodgement of claim and last payment, as at 1 November 2011, displayed as a percentage proportion of Suncorp's total accepted claims, excluding withdrawn claims (N=6532)<sup>107</sup>

The six other insurers took more logical and broadly similar approaches to what constituted ‘settlement’ or ‘finalisation’ of claims:

- Allianz used the date upon which all payments to the policy-holder, tradespeople and suppliers were complete.
- CGU and CommInsure used the date that all payments made on the claim were complete, including any administrative delays in processing payments.<sup>108</sup>
- QBE, RACQ Insurance and NRMA Insurance provided data which represented when all payments had been made and the internal file was closed. RACQ indicated that administrative delays, such as processing invoices, were most likely around 16 days per claim. NRMA indicated that such delays could sometimes take up to 81 days.

The data of the six insurers was combined to produce Figure 12(n), but the differences in the data must be kept in mind. Figure 12(n) gives only a general impression of the time taken to finalise accepted claims across six insurers. It also encompasses both home building claims and home contents claims. Generally more was involved in finalising building claims, including appointment of an assessor to determine the scope of works, obtaining quotes, engaging builders (and perhaps engineers) and the building work.<sup>109</sup>



**Figure 12(n):** Time taken to finalise accepted household claims arising from the 2010/2011 Queensland floods, as at 1 November 2011, across six insurers (that is, excluding AAMI and Suncorp), displayed as a percentage proportion of N (N=7050)<sup>110</sup>

Figure 12(n) shows that, as at 1 November 2011, 91 per cent of household claims across the six insurers had been settled or finalised.

The Code of Practice does not prescribe any timeframe for the finalisation of claims.<sup>111</sup> The Natural Disaster Insurance Review did not consider it practical to impose a time limit on the finalisation of claims once accepted.<sup>112</sup> The Commission has not reached a different view. It did receive and examine a limited number of complaints about delays in the rebuilding process. The reasons for delay in those cases related, for the most part, to their particular circumstances; some matters were not within the insurer’s control.<sup>113</sup> It is difficult to make general comment about those cases.

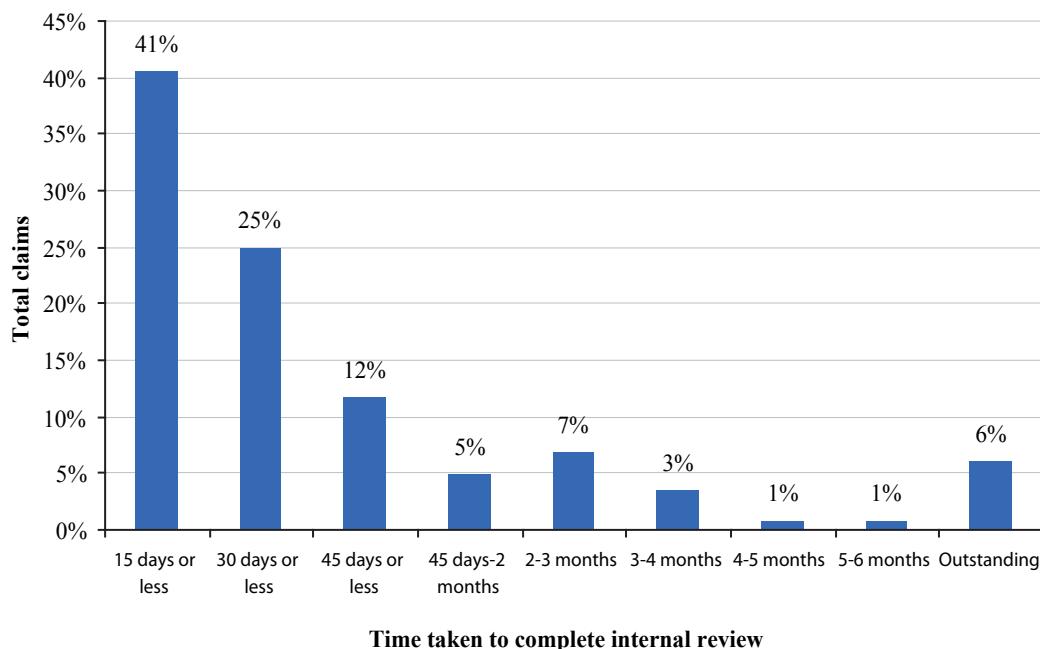
### 12.5.3 Timeliness of internal dispute resolution

Under the Code of Practice, insurers are required to respond to complaints (meaning an expression of dissatisfaction) and disputes (an unresolved complaint) within 15 business days.<sup>114</sup> An insurer and policy-holder can agree on alternative timeframes, however, if further information or investigation is required;<sup>115</sup> and in any case,

insurers do not have to meet these timeframes when dealing with a large number of claims arising from a natural disaster.<sup>116</sup>

If an insurer cannot resolve a complaint or dispute within 45 days, it must advise the policy-holder of the reasons for the delay and tell the policy-holder that he or she may take the grievance to the Financial Ombudsman Service.<sup>117</sup> The Natural Disaster Insurance Review recommended changes to this part of the Code of Practice.<sup>118</sup>

The eight insurers provided data as to the time taken to complete reviews of disputed claims in the internal dispute resolution process. Figure 12(o) shows that, across the eight insurers, the highest proportion of disputes were finalised within the timeframe set in the Code of Practice. Seventy-eight per cent were completed in 45 days or less.



**Figure 12(o):** Time taken to complete internal reviews in the internal dispute resolution process, across eight insurers, as at 1 November 2011 and displayed as a proportion percentage of N (N=1402)<sup>119</sup>

In most of the cases which were the subject of a complaint to the Commission, internal reviews were completed in 15 business days or less.<sup>120</sup> Two matters took considerably longer (over three months). In one of those cases the policy-holder's claim was denied on 6 June 2011. On 15 June 2011, the policy-holder requested a review. That review was not completed until 20 September 2011, two days before the policy-holder gave evidence to the Commission.<sup>121</sup>

In the other case, the policy-holder indicated to the insurer an intention to dispute the insurer's decision to deny the claim. This notification did not, however, commence the internal review process. The policy-holder formally requested a review on 24 April 2011. The review was completed on 26 July 2011 but the policy-holder did not learn that the review was unsuccessful until three weeks later, because notification had been sent to the wrong address (this issue is discussed in *12.6 Communication with policy-holders*).<sup>122</sup>

In each of these cases, the outcome – and time taken – depended on a site-specific hydrology report (for more information about the internal dispute resolution process, see *12.9 Internal dispute resolution*). The decisions were made soon after the reports were received.

There was also, in both cases, a lack of communication from the insurers during the course of the review process. This added to the policy-holders' frustration.

## 12.6 Communication with policy-holders

Submissions to the Commission raised a number of issues about communication. Complaints included the following:

- Insurers had dissuaded policy-holders from making claims.
- When they telephoned their insurers, policy-holders spent long periods of time on hold or could not get through.
- Insurers had not provided regular information about the progress of claims and had not returned policy-holders' phone calls.
- Insurers had told policy-holders, incorrectly, that their claims would be covered when they called to lodge claims.
- Insurers had not provided a single point of contact: policy-holders had to deal with different staff at different times.
- Insurers had, in some instances, treated policy-holders less than professionally or compassionately. Insensitive or inappropriate remarks had been made to some policy-holders.

The Commission did not, in its examination of a limited sample of cases, see evidence of an insurer's discouraging a policy-holder from making a claim. It was an issue reported to the Natural Disaster Insurance Review,<sup>123</sup> and the Insurance Council Board has resolved to amend the General Insurance Code of Practice so that, when a policy-holder calls about making a claim and asks if the policy provides cover, the insurer will specifically ask the policy-holder whether he or she would like to lodge a claim and explain that the claim will be fully assessed.<sup>124</sup>

There was evidence of one instance of inappropriate communication which involved an insurer's chief executive officer. That issue is examined in detail in the section *Events concerning Sallyanne Doyle's claim*.

As to the other issues raised in submissions, lack of communication was a common complaint.<sup>125</sup> Some policy-holders said they did not receive regular updates on the progress of their claim and had to initiate most instances of contact with their insurers. In many cases the Commission examined, the evidence showed this to be true: the policy-holder contacted the insurer on more occasions than the converse. The Suncorp Group pointed out, however, that that did not necessarily indicate inadequate communication by the insurer. It said that comparing the number of times a policy-holder contacted an insurer with the number of times the insurer contacted the policy-holder was not a fair measure of the insurer's performance. The Commission agrees: the frequency and nature of the communications must also be taken into account, and often there were communications between policy-holders and loss assessors in the intervals between policy-holders' communications with the insurers.

The code requires that ordinarily insurers inform policy-holders of the progress of their claims at least every 20 business days.<sup>126</sup> It recognises that insurers may not be able to meet this standard when responding to large volumes of claims after a natural disaster.<sup>127</sup> After the 2010/2011 floods, one group of insurers notified the Financial Ombudsman Service it would not be able to do so and would instead update policy-holders every 40 business days (that is, every eight weeks).<sup>128</sup>

The Commission accepts that, given the large numbers of claims and policy-holders with which insurers were dealing, it may have been difficult for insurers to provide regular updates to policy-holders.<sup>129</sup> It is also unsurprising – but still a source of frustration for policy-holders – that in the circumstances calls went unanswered and policy-holders spent long periods waiting on hold.<sup>130</sup>

The evidence demonstrates, however, that policy-holders wanted frequent information about the progress of their claims (more frequent, perhaps, than the 20-business day period set in the code). This is understandable given the losses and disruption they had experienced and were experiencing, particularly in cases where they were not able to return to live in their homes. Regular communication is particularly important when claims take a long time to determine. As one policy-holder said:<sup>131</sup>

I think [communication] significantly affects one's perception of whether or not a process is timely. The reality is that sometimes things are going to take a long time, but you need to make sure people are kept in constant communication and... that they know they haven't been forgotten, especially in circumstances like these.

She suggested that regular updates (by way of email or text message, for example) would give policy-holders some comfort that their claim had not been forgotten.<sup>132</sup> The Commission heard evidence from a policy-holder whose insurer sent him weekly text messages, which he found helpful.<sup>133</sup> Another insurer wrote to all its policy-holders in February 2011, explaining that it required hydrology reports to determine claims, which were not expected to become available until late February or early March 2011.<sup>134</sup> Keeping policy-holders informed on a regular basis goes some way towards reducing anxiety and dissatisfaction about delays in the determination process. The Financial Ombudsman Service has also noted that effective communication can reduce the level of disputes by policy-holders.<sup>135</sup>

The effect of deleting section 4.3 of the Code of Practice – a recommendation of the Natural Disaster Insurance Review which the industry is adopting – is that the 20-business day timeframe for updating policy-holders will also apply to claims arising from a natural disaster.<sup>136</sup> This is a better situation than that which applied previously; that is, there was no ‘ceiling’ for intervals between updates. This is not to suggest that insurers should not consider more frequent updates where that is feasible. It was clear on the evidence received by the Commission that some policy-holders who had suffered serious losses would have drawn considerable reassurance from regular, perhaps weekly, provision of information. At the very least, however, insurers should put in place measures so that, in similar circumstances, they can give policy-holders updates every 20 business days.

The Commission also considers it would be beneficial for insurers to establish with policy-holders an agreed mode of contact. One insurer has recently introduced such a system.<sup>137</sup> The perils of not doing so were demonstrated in one case in which the policy-holder resided in Singapore. His preferred method of contact was email, but the insurer sent letters to his flood-damaged home in Brisbane and also tried to contact him by phone. As a result, the policy-holder did not receive important information until weeks after the event, causing confusion as to the status of the claim.<sup>138</sup>

## *Recommendation*

- 12.1 When a policy-holder makes a claim, the insurer should ascertain the policy-holder’s preferred method of contact and ensure that it is used (with other modes of communication if necessary) to keep the policy-holder informed about the progress of the claim. However, important decisions regarding the claim – for example, determinations about the outcome of the claim and settlement sums – should always be confirmed in writing.

### 12.6.1 Multiple case managers

Some policy-holders became frustrated by having to deal with different staff at different times,<sup>139</sup> rather than one person who had management of their claim. There are practical and sensible reasons why some insurers do not use single case managers.<sup>140</sup> Insurers should be aware, however, that processes using more than one person to manage a claim can cause confusion and some anxiety to some policy-holders. This could be reduced, perhaps, if insurers explained to policy-holders as clearly as possible that they will deal with multiple staff during the course of the claim, but that up-to-date information about the claim will be on their file and available to staff dealing with their claim.

### 12.6.2 File notes and recording calls

Processes that rely on multiple staff to deal with a policy-holder and his or her claim will inevitably fail if inaccurate or inadequate file notes are kept. The Commission saw examples of such file notes.<sup>141</sup>

Also, evidence in some cases revealed, unsurprisingly, discrepancies between the policy-holder’s recollection or impression of conversations and the insurer’s notes or recording of the same conversations. Two witnesses commented that versions of conversations recorded in the insurers’ file notes were not accurate or did not reflect the effect of the whole conversation.<sup>142</sup> That evidence could not be tested, but it did point to the utility of insurers’ recording conversations with policy-holders. Where call recordings were available to the Commission, disputes about conversations were easily resolved.

Some insurers ordinarily record calls with policy-holders.<sup>143</sup> One insurer arranged for calls to be recorded for this particular event, because of the complexity of the claims and anticipation that a large number of disputes might occur. (It provided numerous recordings to the Commission.) The insurer said that taking that course had proved beneficial, to both the insurer and policy-holders.<sup>144</sup> Another insurer which did not record calls (because of technology limitations) said it believed – because of the number of disputed conversations – it would be prudent to do so in future.<sup>145</sup> A call recording would have assisted in one case where a policy-holder had alleged that when she made her claim, she was told that it was very likely that her claim would be covered. There was no recording or detailed note of the conversation. The investigation into the matter resulted in delay in the determination of the claim.<sup>146</sup>

There are obvious benefits to recording calls with policy-holders, for both insurers and policy-holders, particularly where it is anticipated a high number of disputes may arise. The Commission understands, however, that there are significant costs associated with doing so; and it may not prove worthwhile or necessary in ordinary circumstances. The evidence the Commission received suggests that the recording of calls would be ideal, but such decisions are better left to insurers.

In the absence of call recordings, adequate and accurate file notes are especially necessary.

## *Recommendation*

- 12.2 Insurers should review their existing systems and processes and implement any improvements necessary to ensure that accurate and complete records of conversations with policy-holders are made.

## 12.7 Assessment process

Insurers used a range of information to determine claims: information from policy-holders, aerial photography, flood maps showing the 2010/11 flood levels, loss assessors' reports, and hydrology reports. Some insurers also relied on legal advice as to whether claims were payable.<sup>147</sup> In cases where policies excluded flood but covered stormwater damage or flash flood, expert hydrology advice was usually required to determine which of these caused damage. Thus, in many cases, insurers regarded hydrology reports as essential in determining claims.<sup>148</sup>

Insurers used two kinds of hydrology reports: reports covering broad areas or regions ('area hydrology reports') and reports relating to specific properties ('site-specific hydrology reports').<sup>149</sup> RACQ Insurance used what it described as 'hybrid reports': reports prepared on a regional basis but with regard to individual properties the subject of claims.<sup>150</sup> The process RACQ Insurance adopted to determine claims was distinct from the methods adopted by other insurers and is discussed separately in *12.7.5 RACQ Insurance Limited*.

### 12.7.1 Area hydrology reports

The Insurance Council of Australia commissioned three hydrology firms to jointly prepare area hydrology reports for Toowoomba, Lockyer Valley, Brisbane, Ipswich and the Somerset region.<sup>151</sup> AAMI, Allianz and QBE used these reports to determine claims.<sup>152</sup> Other insurers – CGU and NRMA (both part of the Insurance Australia Group)<sup>153</sup> and CommInsure<sup>154</sup> – commissioned their own area hydrology reports.

These area-wide hydrology reports provided broad conclusions about the likely nature and causes of flooding on an area, rather than property-by-property, basis. They were based on desktop studies which generally did not involve any site-specific investigations.

Insurers relied on these hydrology reports (together with other information) in the majority of cases;<sup>155</sup> site-specific hydrology reports were obtained in particular cases when considered necessary.<sup>156</sup> For example:

- NRMA Insurance obtained site-specific hydrology reports for 160 claims,<sup>157</sup> out of 2371 claims it was required to decide (of which 1556 were accepted and 814 were declined).<sup>158</sup> It obtained another 38 site-specific reports at the internal review stage.
- CGU Insurance Limited commissioned site-specific hydrology reports in 126 cases,<sup>159</sup> out of 2821 cases (of which 1856 were accepted and 681 were declined).<sup>160</sup>

- Site-specific investigations and assessments were carried out for 102 of CommInsure's claims,<sup>161</sup> out of 1473 claims (of which 687 were accepted and 775 were declined).<sup>162</sup>
- AAMI obtained 146 site-specific hydrology reports at the claims determination stage,<sup>163</sup> out of 1384 claims (of which 942 were accepted and 278 were declined).<sup>164</sup> Thirty-four site-specific reports were obtained at the internal review stage and 33 at the Financial Ombudsman Service stage.<sup>165</sup>

Insurers said reliance on area hydrology reports was practical and necessary in the circumstances, given the shortage of hydrologists; delays would have been much greater had site-specific reports been sought in every case.<sup>166</sup> It was not logically possible to obtain site-specific hydrology advice in every case before a determination was made.<sup>167</sup> The Insurance Council contended the use of area hydrology reports, in conjunction with other information, was appropriate in the circumstances.

The Commission accepts that, given the number of claims and the high demand for hydrological expertise in the period after the floods, reliance on area hydrology reports was a practical means by which insurers could inform themselves in a general way, and in a comparatively timely manner, as to cause of inundation in flooded areas. However, an important question is the extent to which the particular circumstances of individual claims were properly considered, and whether flooding could be properly identified as the cause of inundation at properties in respect of which no site-specific hydrology advice was obtained.

The Commission obtained advice on this issue from expert hydrologists it engaged, which can be distilled as follows.<sup>168</sup> It is not possible to say in the abstract whether insurers' reliance on an area hydrology report was appropriate. That judgment can only be made on a case-by-case basis, by reference to the nature and strength of evidence (contained in a hydrology report or otherwise) available in each matter on the following issues:

- a. whether the property was located well within an area of inundation, and
- b. whether local rainfall would have produced sufficient stormwater run-off to exceed the capacity of the local drainage system and cause the level of inundation experienced at the property.

Where, for instance, the evidence shows that a property was located well within an area of floodwater inundation and the local rainfall was unlikely to have been sufficient to exceed the capacity of the local drainage system,<sup>169</sup> flooding can reasonably be assigned as the cause of inundation. In cases where an insurer provides cover for 'flash flood',<sup>170</sup> the timing of the rainfall and inundation is also critical.

Area hydrology reports presented rainfall data which could have been used to determine the level of rainfall in the vicinity of a particular property (depending on its location). The reports generally did not, however, contain suitable aerial photography of flooded areas which would have indicated whether a property was located within an area of inundation. That question could also be determined by reference to flood mapping derived from aerial photography and/or from peak water levels and accurate terrain data or, alternatively, by comparison of a property's ground and floor levels with peak water levels in an adjacent waterway. The latter would typically require an inspection of the property.

The Insurance Council hydrology reports for Brisbane and Ipswich did contain flood extent mapping, but according to the advice the Commission received, that mapping, because of its scale and lack of resolution was often not adequate to ascertain whether a particular property was within an area of floodwater inundation.<sup>171</sup> The report for Ipswich stated that the maps were indicative only and 'should not be used for assessing flooding behaviour at individual properties'.<sup>172</sup> Some insurers used Near Map aerial photography or the Queensland Reconstruction Authority's interactive map, which was based on aerial flood photography and indicated the extent of the flooding, in assessing claims. Those sources were generally adequate to ascertain whether a property was located within an area of floodwater inundation.

Insurers said that hydrology reports were considered with other information, such as the policy-holder's account, reports by loss assessors who had inspected the damaged property and maps which indicated the extent of inundation.<sup>173</sup> (For information about loss assessors' reports, see section 12.7.3 below.) The approach of insurers was generally consistent: area hydrology reports were relied upon where the reports, when read with other information, provided sufficient information to reach a decision as to cause of inundation.<sup>174</sup> One insurer considered information – which usually comprised a policy-holder's account, loss assessor's report, the Reconstruction Authority's interactive map and an Insurance Council hydrology report – sufficient if it consistently pointed to a particular cause.<sup>175</sup> Another insurer relied on an area hydrology report in determining a claim if aerial photography, flood map and

the loss assessor's report indicated that flooding had occurred at the policy-holder's property.<sup>176</sup> It said that area hydrology reports were sufficient to determine reasonably quickly that claims in Toowoomba and the Lockyer Valley for damage resulting from stormwater run-off were covered; on the other hand, its area hydrology report for Emerald 'strongly indicated' that flooding (which its policies excluded from coverage) had occurred in that region.<sup>177</sup>

In four of the cases the Commission examined (which related to properties in Brisbane and Ipswich), the insurer relied on an area hydrology report (its own or the Insurance Council's). In each case, the hydrology report was used in conjunction with other information, such as a loss assessor's report and the Reconstruction Authority's interactive map. (One insurer did not use flood extent mapping or aerial photography.) The Commission engaged independent hydrologists to review the evidence used in the four cases. In three of the cases, the evidence used was considered 'clearly adequate' to support the insurer's decision that flood had caused the damage.<sup>178</sup> The evidence in the fourth case was considered 'adequate'.<sup>179</sup>

It is the Commission's view that generally it would not have been prudent to rely on an area hydrology report alone to reach a conclusion as to the likely cause of inundation at a particular property. As stated above, something more is usually required: whether that will be supporting information such as aerial photography, the policy-holder's account, flood extent mapping or site-specific hydrology (discussed below), will depend on the individual case. The Commission cannot point to any evidence that area hydrology reports were used other than appropriately. But nor does the Commission have sufficient evidence to say whether insurers sought adequate additional information, in particular site-specific hydrology advice, in all cases when they ought to have done so.

## 12.7.2 Site-specific hydrology reports

Whether a site-specific hydrology report should have been sought in a particular case depends on the strength of the information available in that case. The Commission received advice from the hydrologists it engaged that site-specific investigations should be carried out by a hydrologist in cases where it is not clear whether the property was located in an area of inundation and whether the amount of rainfall would have been likely to exceed the capacity of the local drainage system (and, where applicable, whether the timing of the rainfall corresponded with the relevant definition of 'flash flood'). It is advisable that the site-specific investigations include a site inspection.<sup>180</sup>

It follows that in any given case the strength of the evidence needs to be assessed. Evidence received by the Commission indicates that decisions as to whether to obtain site-specific hydrology advice were taken by claims officers, with the exception of one insurer, whose decisions were made by the general manager on legal advice.<sup>181</sup> Generally, prudence would dictate that someone with expertise in hydrology would make those decisions. In some cases, however, the assessment of whether site-specific investigation was needed could be undertaken by an individual with the ability to properly interpret aerial photography, flood extent mapping and rainfall data. The type of case envisaged here is where the information makes so obvious and certain the cause of inundation that it is clear that a conclusion can be reached without site-specific hydrology advice. Where, though, there is any doubt as to the cause of inundation, site-specific hydrology opinion should be sought.

Insurers explained that site-specific reports were obtained in particular cases where it was not possible – because of insufficient or inconsistent information – to make a decision on the area hydrology reports and other information available.<sup>182</sup> One insurer said, by way of example, that if aerial photography did not show a continuation of water between the Brisbane River and a policy-holder's home, the area hydrology report would not be relied on and a site-specific hydrology report would be obtained. (That insurer obtained hydrology reports for specific properties or specific streets, as the case required.)<sup>183</sup> Another said site-specific hydrology reports were sought if an area hydrology report and loss assessor's report did not provide sufficient information to evaluate a policy-holder's assertion that stormwater runoff or drain backflow had contributed to the damage.<sup>184</sup> In a similar vein, another insurer said that it obtained site-specific reports if the information given by a policy-holder conflicted with the area hydrology report.<sup>185</sup>

Site-specific hydrology reports were obtained to decide claims in a number of cases examined by the Commission.<sup>186</sup> In one case, the insurer commissioned a site-specific hydrology report because the Insurance Council hydrology reports did not cover the area in which the property was located (Narangba).<sup>187</sup> The same insurer obtained a site-specific hydrology report in another case because it considered the relevant Insurance Council report, on which it had intended to rely, did not enable the claim (relating to a property in Fernvale) to be decided.<sup>188</sup>

Some insurers also obtained site-specific hydrology reports in cases where policy-holders disputed the insurer's determination.<sup>189</sup> This is discussed in more detail in *12.9 Internal dispute resolution*.

The independent hydrologists the Commission engaged reviewed the methodologies, approaches and assumptions used in eight site-specific reports<sup>190</sup> (and five hybrid reports used by RACQ Insurance, which assigned a cause of inundation to particular properties) and found no common problems.<sup>191</sup> The methodology, approaches and assumptions used in those reports were generally considered sound.<sup>192</sup> The reports were said to be based on a range of appropriate evidence,<sup>193</sup> and the conclusions reached in each of the site-specific reports – that flood was the cause of inundation – were said to be supported by strong evidence.<sup>194</sup>

The Commission notes, however, that the Financial Ombudsman Service has identified as an issue that hydrology reports tended to focus upon peak inundation, rather than initial inundation; in other words, what the source of the water was when the flood was at its height at the affected building, rather than where the water came from when the building was first flooded.<sup>195</sup> The distinction was not the subject of any complaint to the Commission; but the point to be made is the same as for other questions about cause of inundation already discussed: it is important that expert opinion be directed to the causation questions the insurer is required to determine.

### **12.7.3 Loss assessors' reports**

On the information available to the Commission, the determination of the majority of claims at least involved a site inspection and report by a loss assessor. Loss assessors gathered information about the circumstances of water damage at a property by interviewing the insured, and conducting site inspections, which usually included taking measurements and photographs. Some insurers used internal loss assessors; others used external loss assessing companies. The reports of loss assessors contained relevant factual information for determining cause of inundation.

Five of the seven insurers from which the Commission received information appointed loss assessors in virtually all cases.<sup>196</sup> Site inspections generally occurred early in the determination process.<sup>197</sup> Of these insurers, one conducted second site assessments in some cases (approximately 150) where more information was thought necessary (such as where policy-holders suggested stormwater damage had occurred).<sup>198</sup>

Of the two insurers that did not appoint loss assessors in all cases, one insurer arranged site inspections in the majority of home building cases (79 per cent), but not in the remaining cases because it considered the information from the policy-holder and/or area hydrology report sufficient to reach a decision to accept or decline the claims.<sup>199</sup> The other insurer adopted a process which (initially at least) did not involve site inspections by loss assessors except in limited circumstances;<sup>200</sup> distinguishing its claims determination process from those of the other insurers from which the Commission received information. That insurer's process was examined by the Commission in some detail and is discussed separately in section *12.7.4 CGU's desktop assessment process*.

Although it is the Commission's view that site inspections should generally form part of the process of determining cause of inundation (as discussed in *Comments on the desktop assessment process* in section 12.7.4), the proper role of loss assessors must be kept in mind: loss assessors, ordinarily, are not qualified in hydrology. Where determining the cause of inundation requires hydrological expertise, the opinions of loss assessors on the subject add nothing. Notwithstanding this, many of the loss assessors' reports viewed by the Commission expressed opinions as to the cause of water damage at a property (and also as to the insurer's liability for the claim).<sup>201</sup> Some insurers expressly instructed loss assessors to give those opinions.

Allianz, for example, instructed loss assessors to determine the likely cause of inundation at a property. Assessors' reports indicated whether, in the assessor's opinion, the damage was due to flood or stormwater. The insurer said, however, it considered the information in loss assessors' reports against area hydrology reports commissioned by the Insurance Council of Australia; it did not make final determinations on claims until it had reviewed the hydrology reports.<sup>202</sup> This was demonstrated in a case the Commission examined, in which the loss assessor reported his view that flooding of the Brisbane River and Oxley Creek was the principal cause of inundation of the property,<sup>203</sup> but the insurer's decision to decline the claim was made some weeks later, after the Insurance Council's hydrology report for Brisbane was considered.<sup>204</sup> This was one of the cases independent hydrologists reviewed for the Commission. The information used to determine the claim was considered 'clearly adequate'.<sup>205</sup>

AAMI indicated that site inspections by loss assessors 'were particularly focussed on determining the source of water damage'.<sup>206</sup> Although loss assessors had no expertise in, and were not engaged to report on, hydrology matters,<sup>207</sup> AAMI instructed loss assessors to 'provide a preliminary report as to the cause of inundation'.<sup>208</sup> The

instructions were to ‘provide a preliminary opinion as to whether or not you believe the inundation may have been caused by flood as defined in the policy’ and to set out the factual evidence on which the preliminary opinion was based. But, like Allianz, AAMI said it considered loss assessors’ reports in the light of area hydrology reports.<sup>209</sup> The Commission viewed three reports provided to AAMI which expressed the opinion that flood was the cause of inundation.<sup>210</sup> One report expressed a view that stormwater had caused the damage to the property and recommended that the insurer consider accepting the claim.<sup>211</sup> Another report recommended that a hydrologist be appointed as the assessor was ‘unable to determine if floodwaters or overflowing road rains’ had caused the damage to the policy-holder’s property.<sup>212</sup> In each case in which a loss assessor expressed a view as to the cause of inundation, the insurer did not decide the claim until it had received and considered hydrology reports. Two of the cases (in which the claims were declined) were among those independently reviewed for the Commission. In each case, the information was said to be ‘clearly adequate’ to support the insurer’s decision that the inundation had been caused by flooding.<sup>213</sup>

CGU’s instructions to loss assessors stated that because of the difficulty in obtaining site-specific hydrology reports ‘within reasonable timeframes’, the insurer would ‘rely on’ the reports of loss assessors and ‘nearby hydrology reports’.<sup>214</sup> The expression ‘rely on’ is ambiguous: it might have meant that the insurer would act on information recorded in an assessor’s report or that it would adopt an assessor’s view as to the cause of inundation. The insurer explained that the role of loss assessors appointed by CGU was to gather information, including answers to a standard set of questions, to assist CGU staff to determine cause of damage and policy coverage and whether investigation by a hydrologist was required.<sup>215</sup> It acknowledged that ‘assessors were not suitably qualified and had no expertise in determining any hydrology issues’.<sup>216</sup>

Notwithstanding, CGU gave loss assessors the following instructions:<sup>217</sup>

If in your opinion, given the location of the property to a watercourse, you consider that the inundation was caused by flood then your report to CGU can contain the expression of your view to that effect. If however you are of the view that there may be storm water inundation, your report should NOT express that opinion. Your report should contain only factual statements. Your report should contain [the] insured’s account of what occurred and your factual observations. We do not want to be in a position whereby you have expressed a view in your report that the inundation was caused by storm water and then subsequently receive a hydrologists [sic] report expressing the opinion that the inundation was caused by flood.

The instruction is odd. On its face, it appears assessors were permitted to go beyond their role of reporting facts and give an opinion which pointed to the denial of a claim, but (unlike assessors appointed by Allianz and AAMI) were directed not to give an opinion which might have supported granting one. By way of explanation, the insurer said that an assessor’s opinion that inundation was caused by flood, given the proximity of a property to a watercourse, assisted CGU staff to make a determination about the claim, whereas an assessor’s opinion that stormwater had caused damage would not so assist.<sup>218</sup> That explanation is not compelling: assessors were not qualified to give either opinion, yet were invited to do so in respect of the type of opinion which would result in a denial of claim. The fact that a property was located near a watercourse was relevant to the determination of a claim, but the *opinion* of a loss assessor was not.

CGU said staff determined whether stormwater damage may have occurred by reference to answers to a set of standard questions (this is discussed in *12.7.4 CGU’s desktop assessment process*), as reported in the assessor’s report, and other information such as area hydrology reports and aerial photography.<sup>219</sup> But, if claims were assessed fairly, the same process must have been applied to determine whether flood was the cause of damage: a loss assessor’s opinion should not have added anything to, or influenced, the determination of the claim.

The insurer’s justification lacks logic. If by it CGU was indicating that, in fact, an assessor’s *opinion* as to cause of inundation carried some weight in the determination of a claim, that is concerning. If the purpose of the instruction was not related to the assessment of claims, it must have related to management of customers, to which the instruction alludes.<sup>220</sup> A report which stated damage had been caused by flood could be used to support a decision to deny a claim. But a report which stated stormwater had caused damage could create a difficulty with a customer if his or her claim were later denied: a difficulty which CGU seemingly preferred to avoid. From CGU’s perspective, the logic behind it is understandable, although unattractive. However, the real point is that the use of an assessor’s opinion as a reason to deny a claim would make the resulting decision dubious.

In one case examined by the Commission, it appeared that CGU might have placed undue reliance on an assessor's report. The insurer instructed the loss assessor to 'assess and report on [the] cause of damage'.<sup>221</sup> In the particular case, an issue was the extent to which sewerage problems reported by the policy-holder had contributed to the inundation. The insurer instructed the loss assessor: 'Need to ascertain if flood/storm damage or sewerage issues'. The loss assessor's report expressed a view on that question. It stated:<sup>222</sup>

At issue is whether the sewer backup was a distinct and separate event from the flooding, or whether it was an early manifestation of the flooding itself. This report favours the latter understanding and makes its recommendation accordingly.

It is unlikely that the loss assessor was qualified to make such an assessment. The report said the damage was the result of 'a flood event in which sewer backup preceded the inundation of water from the Brisbane River and Mt Ommaney Creek'. This view may have been based on information given by the policy-holder, which was recorded in the report. The report recommended that the claim not be accepted, as flood damage was excluded under the policy.

The claim was denied after the insurer received the assessor's report.<sup>223</sup> The insurer told the Commission that the decision to deny the claim was based on other information as well: aerial photography, flood extent mapping and an area hydrology report, for example.<sup>224</sup> However, the sequence of events and the explanation given to the policy-holder (by telephone and in writing) gives the impression that the insurer treated the report as determinative of the decision. When CGU advised the policy-holder of the decision, it informed her that CGU had received the report, which stated the cause of damage at her property was flooding, and flood was excluded under the policy.<sup>225</sup> No reference was made to the other information on which the insurer said it relied. (It is possible, however, that this merely reflects a deficiency in the explanation given to the policy-holder, an issue discussed in *12.8 Information to policy-holders whose claims were denied*.)

The hydrologists the Commission engaged reviewed the assessor's report. In their view, the information contained in the report was 'barely sufficient' to support a conclusion that flooding caused the inundation.<sup>226</sup> The most relevant information in the report was the level of inundation recorded and the observation (presumably by the policy-holder) that water which damaged the property had initially come from 'the toilets and drains, then, later from the Brisbane River... and Mt Ommaney Creek which overflowed'. In combination, those pieces of information indicated that flooding had caused the inundation; and the reviewers noted that no hydrological expertise would be required to conclude, given the observation that the water came from the river and creek, that the inundation resulted from the overflowing of watercourses. The expert hydrologists engaged by the Commission said that the conclusion in the report would have been greatly strengthened by one or more of the following:<sup>227</sup>

- comparison of peak flood levels in the Brisbane River adjacent to the property with reported inundation levels in the property
- analysis of local rainfall intensity
- analysis of relative timing of rainfall and inundation
- inspection of aerial flood photography.

Facts gathered and reported by a loss assessor are relevant to an insurer's determination, but loss assessors do not possess expertise in hydrology. In the Commission's view, any decision to deny a claim based solely on a loss assessor's opinion or advice that flood had caused the damage would be questionable. It is not a course which should generally be taken.

#### 12.7.4 CGU's desktop assessment process

CGU established a special process for assessing Queensland flood claims, in order to deal with claims as quickly as possible. Referred to as a desktop assessment process (or 'desktop triage process'),<sup>228</sup> it involved assessing claims in the first instance against aerial photography on the Near Map website and Google Maps, maps depicting inundation lines provided by the Insurance Council of Australia, area hydrology reports and policy-holders' responses to a standard set of 15 questions asked via telephone.

Once a policy-holder was taken through the set questions, the call taker assessed the claim. If he or she considered that the policy-holder's responses to the questions and the 'desk top data' (the maps and hydrology report) provided sufficient information to determine whether the claim was covered, the decision was made while the policy-holder

was still on the phone. If, in the claim officer's view, the information established 'conclusively' that flood had caused the damage to the policy-holder's property, the claim was denied and the policy-holder told that was the decision. If the information was not considered 'conclusive', further information, by way of a site assessment by a loss assessor (who also asked the policy-holder the set questions), was sought before a decision was made.<sup>229</sup> Site-specific hydrology reports were also obtained in 126 cases.<sup>230</sup> Approximately 340 claims (of nearly 3000)<sup>231</sup> were declined without any site assessment: that is, on the telephone, on the basis of the desk top data and responses to the set questions.<sup>232</sup>

CGU's assessment process evidently caused distress to some of its policy-holders. In February 2011, about 40 or 50 policy-holders protested outside CGU's offices.<sup>233</sup> One of the group's main complaints was that the insurer had determined claims without carrying out any site inspections (this is discussed below in *Events concerning Sallyanne Doyle's claim*). The Commission examined CGU's assessment process in some detail. It heard evidence from three policy-holders. None of those policy-holders' claims, however, was declined on the telephone. The assessment of each case involved a site inspection. However, an examination of those cases – and one of the cases in particular, that of Ms Sallyanne Doyle, discussed below in *Site assessments* – gave some insight into how the desktop assessment process worked.

The Commission is also aware that the process has been the subject of inquiries by the Australian Securities and Investments Commission.

## Standard set of questions

The desk top triage process was developed by a group of CGU's senior managers on or about 6 January 2011.<sup>234</sup> The standard set of questions was developed on 5 January 2011.<sup>235</sup> The questions were:<sup>236</sup>

1. What type of house is on the property – low set, highset, double storey, split level, etc?
2. Is the house on stumps or slab-on-ground?
3. Approximately how high is the habitable floor level above surrounding ground level?
4. Is the ground level at the house higher than the street level?
5. What date and time was the rain heaviest?
6. What time did the heavy rain stop?
7. When did the property get inundated (date)?
8. What time did the inundation of the property (yard) commence?
9. What time did water come into the house, garage, shed, etc?
10. What date and time did the water level in the property peak?
11. At its peak, how deep was the water inside the house, garage, shed, etc?
12. At its peak, how deep was the water in the yard?
13. [From w]hich direction did the water come into the property?
14. Was the water inundating the property 'clean' or 'dirty'?
15. Was there any and if so what damage caused by rainwater through the roof or by overflowing gutters?

Their purpose was to identify whether damage to a policy-holder's property had been caused by flood (excluded under household policies) or involved stormwater (covered by household policies) or whether further information was required. The questions were not designed to take policy-holders 'through everything that [had] occurred' at their properties.<sup>237</sup>

The Commission was told that the questions were developed in consultation with a hydrologist.<sup>238</sup> CGU asked the hydrologist by telephone on 5 January 2011 to 'prepare a set of questions to assist CGU [claims officers] to identify the source of inundation to a customer's residential property'. The hydrologist proposed 14 questions by email later that day. CGU's technical manager added an extra question to those proposed by the hydrologist to form the set which was used by staff.<sup>239</sup>

The Commission sought the opinion of independent hydrologists as to the extent to which responses to the set of questions could be relied upon to ascertain whether damage at a property had been caused by flood or stormwater.

It received advice that responses to the set questions could be useful in providing a preliminary indication, but could not alone have been relied on to ascertain the cause of inundation.<sup>240</sup>

There is no evidence that CGU used a policy-holder's responses to the questions alone to determine a claim. It did not occur in the cases the Commission examined and CGU indicated to the Commission it did not occur in any case. The insurer said that in cases determined on the telephone (without a site inspection), decisions were based on responses to the set questions, aerial photography, flood mapping provided by the Insurance Council and area hydrology reports: this is reflected in instructions given to staff, as discussed in the next section, *Guidance to staff*.

It is not, however, evident on the material provided to the Commission that the policy-holders in those cases were asked all 15 questions. Responses to 12 questions are recorded in a set of file notes in one case;<sup>241</sup> fewer responses are recorded in the two other cases.<sup>242</sup> It may be that the policy-holders were asked 15 questions and the responses are not reflected, or were not recorded, in the notes (a topic discussed in *12.6.2 Files notes and recording calls*).

It is noted, however, that the Australian Securities and Investments Commission wrote to CGU in April 2011 notifying the insurer of concerns raised about its 'Desk Top Triage Process' which it understood 'involved asking up to five short questions of the policy holder and referring to a "Google map" or "[N]ear [M]ap" image... in order to decide a claim'.<sup>243</sup> An internal record of a review CGU performed in February 2011 also refers to a 'belief from some customers' that they had only been asked five questions.<sup>244</sup> This does not necessarily indicate that policy-holders were not asked all of the set questions: a letter CGU wrote to the Australian Securities and Investments Commission in June 2011 stated:<sup>245</sup>

Whilst the questions themselves did not change throughout the process, it became apparent relatively early during the events that, some of the responses to questions were often put as narrative rather than as specific responses to specific questions. Some customers also only recalled being asked a few questions when in fact CGU staff had covered all 15 questions during the initial discussion. CGU's procedures were accordingly changed so that our claims officers ensured that each question was made more explicit and distinct.

## Guidance to staff

The triage process was carried out by a team of ten staff assembled specifically to deal with the flood claims.<sup>246</sup> The team began operating on or about 20 January 2011<sup>247</sup> and first used the triage process on or about 24 January 2011. Determinations of flood claims began to be made at this time.<sup>248</sup> CGU described the process as 'robust',<sup>249</sup> 'very thorough'<sup>250</sup> and 'very accurate'.<sup>251</sup> Its national claims manager said assessments were based on 'reliable information' and the company was 'very confident' of the ability of its staff to make decisions without site assessments.<sup>252</sup> The expertise of, and guidance given to, staff was thus of some interest to the Commission.

The Commission was told it was a team of experienced staff (but was not informed of the experience the team had in dealing with flood claims) and that the team was trained in the triage process.<sup>253</sup> The national claims manager indicated in oral evidence that the team was instructed to make use of the desktop data to determine whether 'an accurate decision' could be made, and to seek further information, typically by way of site assessment, if one could not be made. Guidance was given to staff by the team's manager and technical manager's 'walking [them] through' the desktop data. The set of questions also provided guidance.<sup>254</sup>

After the national claims manager gave evidence, the Commission sought details of the training staff received by requiring CGU to produce 'records of training' relevant to the process of assessing claims. CGU was also required to produce 'copies of any instructions, directions, or guidance' given to staff. Assuming all such documents were provided in response to the Requirement, there is nothing to add on the topic of training: nothing resembling training records was provided to the Commission.

It appears the team was not given much more in the way of instruction (written or otherwise) than that indicated by the national claims manager. Of the documents produced, a 'Queensland floods claims reference document' dated 17 January 2011 provided instructions on the allocation and processing of claims. It did not include any instructions as to how household claims were to be assessed. The only relevant instruction was: 'Do not allocate an assessor or builder. All potential flood [claims] needs [sic] to be allocated into the correct worklist... before we determine the appropriate assessment method'.<sup>255</sup> Another document headed 'Validation process Brisbane and surrounding area's [sic]' emailed to members of the team on 24 January 2011, set out the following procedure:<sup>256</sup>

1. CMC to validate claim...
2. Review flood maps, Near maps and hydrology report

3. Call customer as per scripting
4. Confirm coverage and make decision on phone
5. Fill out spreadsheet
6. If claim denied, send denial...
7. Finalise file, If [customer] disputes, file can be re-opened
8. If [customer] calls back to dispute decision, reopen claim and refer to [the team manager].

The reference to ‘scripting’ presumably means the standard set of questions. This document, steps 2 to 4 in particular, confirms the process the team followed in assessing claims. The only other relevant instruction given to the team was advice (given on 25 January 2011) on when water rising from drains, and rainwater unable to enter full drains, constituted ‘flood’.

Further instructions were given to staff following a review of the assessment process in mid-February 2011. The circumstances which led to the review and the instructions given to staff are discussed below (see *Events concerning Sallyanne Doyle’s claim*). The three documents referred to above apparently represent the totality of the instructions, directions and guidance relevant to the assessment of claims given to staff before mid-February 2011. Given that the members of the team were required to ‘confirm coverage and make [a] decision on [the] phone’, the dearth of detailed written instructions is surprising. In particular, there is nothing in the instructions which gives any guidance as to the conclusions staff could draw from a policy-holder’s responses to the set questions, how staff could apply the technical information contained in an area hydrology report to the information given by a policy-holder, or when staff could consider information ‘conclusive’ or make an ‘accurate decision’. Nor do they contain any reference to the appointment of assessors for site assessments (discussed in the next section).<sup>257</sup> It would appear that claims officers were to apply their own judgment with little written direction or guidance. The Commission is not in a position to say, however, whether the lack of written instructions and records of training had any bearing on the determination of claims.

## Site assessments

The circumstances in which site inspections by loss assessors were offered to policy-holders or sought by CGU are also unclear. The company’s chief executive officer, Mr Peter Harmer, indicated in a statutory declaration that an assessor would be appointed if a policy-holder disagreed with the outcome of the assessment made as a result of the triage process.<sup>258</sup> He confirmed this in oral evidence, but also said site inspections were ‘clearly offered’ to policy-holders when a determination was made, whether policy-holders disagreed or not. This was a part of the ‘scripts’ staff used.<sup>259</sup> He added that improvements were made, in February 2011, as to how that option was communicated to policy-holders. Mr Harmer qualified this aspect of his evidence by saying that it was something about which CGU’s national claims manager was better placed to inform the Commission.<sup>260</sup>

The national claims manager said that site assessments were sought where the ‘desktop data’ was ‘inconclusive’ or where it was uncertain whether a claim would be covered (and also at the internal review stage if a site assessment had not been conducted).<sup>261</sup> If a policy-holder indicated damage might have been caused by stormwater, this ‘introduced an element of doubt’ and further information would be sought ‘as a matter of course’,<sup>262</sup> ‘invariably’ by way of a site assessment. However, he also emphasised that because of the limited availability of assessors, staff had to be selective in assigning assessors to claims.<sup>263</sup>

Neither the national claims manager’s nor Mr Harmer’s evidence is reflected in the instructions given to staff on 24 January 2011 or any other set of instructions: as discussed above, the instructions give no clue as to when staff were to assign an assessor to a claim. However, a document dated 16 February 2011, which recorded changes made as a result of feedback from policy-holders (detailed below),<sup>264</sup> provides some indication of the circumstances in which assessors were appointed. It states that, as at 16 February 2011, site assessments for personal insurance claims were conducted only where there was ‘insufficient evidence to support a decision’ or where a policy-holder provided ‘objective information’ that suggested damage was not the result of flood. This supports the national claims manager’s evidence as to when site assessments were offered.

A site assessment did occur in the case of each of the three policy-holders who gave evidence. There is no dispute that one policy-holder was, on 27 January 2011, advised that an assessor would be appointed in the phone call in which the set questions were asked. The evidence as to the appointment of assessors was, however, contentious in the cases of two policy-holders.

One of the policy-holders gave an account of a telephone conversation on 2 February 2011, during which she was asked the set questions. This was consistent with descriptions of the triage process.<sup>265</sup> During that call, she said, she was told her claim was being denied.<sup>266</sup> She ‘made a fuss’,<sup>267</sup> and protested that a decision had been made without an assessor inspecting her property.<sup>268</sup> The next day, she was advised an assessor would attend.<sup>269</sup> (She produced handwritten notes which she said she made at the time to support her account.<sup>270</sup>) CGU disputed that account: its records indicated that the policy-holder was told during the conversation on 2 February 2011 that assessors would be appointed and told later that day that the assessors would be Crawford and Company.<sup>271</sup> However, the file note of the conversation also states, ‘advised [policy-holder] flood water, [policy-holder] was adamant not flood damage’. This suggests the policy-holder was told floodwater had caused damage to her property, and that she then argued the damage had not been caused by floodwater.

The state of the evidence does not allow this particular factual dispute to be resolved; nor is it considered necessary to do so. It should be added, however, that the policy-holder had asserted that water had flowed up through the sewerage system, which had occurred a number of times before,<sup>272</sup> and the insurer’s request for a site assessment stated: ‘Please assess and report on cause of damage as insured has stated that there have been issues over recent years with the council in regards to sewerage. Need to ascertain if flood/storm damage or sewerage issues’.<sup>273</sup> (This aspect of the case is discussed in *12.7.3 Loss assessors’ reports*.) This is consistent with the national claims manager’s evidence as to the circumstances in which site inspections were sought.

Ms Sallyanne Doyle was asked the set questions in a telephone call on 1 February 2011. After answering the questions, Ms Doyle was told that her claim would be declined because flooding from the Brisbane River had caused the damage to her West End property. Ms Doyle strongly disagreed with this assessment and argued with the claims officer, for about 30 minutes, that stormwater had caused damage to her property.<sup>274</sup> On any view of CGU’s evidence as to its approach, these circumstances would have resulted in a site inspection being offered: either because she had disagreed with the insurer’s assessment or because she had raised the possibility that stormwater damage had occurred. However, an assessor was not appointed. The claims officer did, at the end of the conversation, invite Ms Doyle to get her tenant, who was present at the property at the relevant time (Ms Doyle was not), to provide information to CGU.<sup>275</sup>

The national claims manager explained that, as he understood it, the claims officer did not assign an assessor to the claim, because, in this particular case, she needed an ‘additional degree of confidence’ that it was appropriate to do so.<sup>276</sup> The difference in this case, he said, was that Ms Doyle was not providing a firsthand account.<sup>277</sup>

However, the note of the conversation contained in the CGU’s records conveys something different. It states:<sup>278</sup>

[Policy-holder] is adamant that water run off went through the property prior to the flood waters.  
[Policy-holder] confirmed the drains rose, I confirmed this is flood from river.  
[Policy-holder] then advised no the water ran down street and into her home.  
[Policy-holder] talked for about 30 minutes about how the water entered.  
Explained that this is consistent with flood as advised by the hydrologist etc. [Policy-holder] did not agree and would not accept it.  
[E]ventually as conversation was not adding value to the claim: asked if I could speak with tenant also to gather further information. [Policy-holder] agreed she will have real estate contact me with tenant details.

This note appears to be consistent with Ms Doyle’s evidence, that the claims officer said the tenant could provide information merely as a means of bringing to an end a ‘long’ and ‘tortuous’ conversation, as a result of which both Ms Doyle and the claims officer were exhausted.<sup>279</sup> The Commission does not, however, have evidence from the claims officer. After the conversation, the claims officer sent an email to Ms Doyle’s broker (which was not passed on to Ms Doyle), which said:<sup>280</sup>

We have discussed the claim with the insured Sally. While the information considered indicates the property has suffered damage as a result of flood the insured is of the opinion that storm water caused damage to the property prior to the flood. CGU will be considering this claim further and await contact details for the tenant to gather more information surrounding the circumstances of the event.

Ms Doyle explained that she did not take any steps to put her tenant in contact with claims officer, because she felt so discouraged after the call on 1 February 2011. She believed the claim had been denied and did not think that information from the tenant would make any difference.<sup>281</sup>

Ms Doyle did, however, call back the following day and, in another lengthy conversation with the claims officer, repeated her view that stormwater had caused damage to her property.<sup>282</sup> There was no discussion about the appointment of an assessor. Ms Doyle did not recall any further discussion about getting information from the tenant.<sup>283</sup> The claims officer made a note of the conversation. It concludes: 'She [Ms Doyle] will get property manager to email me regarding the gathering of further info. [P]ossibly need to appoint an assessor, await further info.'<sup>284</sup> The second sentence is a note to the team manager, not a record of something said to Ms Doyle during the conversation. This is the first time appointment of an assessor was raised as a possibility. It is unclear if the first sentence is also an internal note or reflects part of the conversation.<sup>285</sup>

The records show that on 5 February 2011, the claims officer 'recommended' the appointment of an assessor, after the insurer received a written complaint from Ms Doyle, via her broker (which was also sent to state and federal politicians and journalists).<sup>286</sup> The claim was referred to the team manager, who, according to a note dated 8 February 2011, considered whether an assessor should be appointed. The note also states that CGU was waiting for Ms Doyle to 'forward further information'. The information was not provided, but the team manager approved the appointment of an assessor on the morning of 10 February 2011. An external assessor was initially appointed and an email to that effect was sent to Ms Doyle's broker that morning,<sup>287</sup> but later that day, the decision was made to assign an internal assessor instead because of concerns about delays the external assessor was experiencing.

Prior to the email on 10 February 2011, no indication had been given to Ms Doyle or her broker that an assessor might be appointed. Ms Doyle's broker (who apparently had not seen the email) contacted CGU on the afternoon of 10 February 2011 and was informed the claim had not been denied and an assessor had been appointed. The broker advised Ms Doyle that CGU was continuing to 'review the claim' but did not mention the appointment of an assessor.<sup>288</sup> Ms Doyle did not read an email sent by CGU on 10 February 2011 advising her of the decision to appoint the assessor.<sup>289</sup> It was on 11 February 2011, when another CGU staff member contacted her to schedule the inspection, that she first learned that an assessor had been appointed.<sup>290</sup>

These circumstances suggest that the decisions (on 1 February 2011) to receive further information from Ms Doyle's tenant and then (on 10 February 2011) to appoint an assessor, were related to Ms Doyle's persistence (perhaps intransigence) rather than her suggestion that damage had been caused by stormwater. The national claims manager's evidence as to when site inspections occurred is not reflected in the circumstances of this case, although it was more generally borne out.

Mr Harmer's account as to when site inspections were offered was similarly inconsistent with what happened in Ms Doyle's case. His evidence on this topic does correspond with a letter from CGU's General Counsel to the Australian Securities and Investments Commission, dated 13 May 2011;<sup>291</sup> but is not reflected in any other evidence. The letter indicates that site assessments were sought if 'coverage was unclear or where the customer disagreed with the outcome of the desk top assessment'. A subsequent letter to ASIC, however, dated 30 June 2011 (which responded to a request for further information), states that until 'CGU reviewed its position on or around [22 February 2011]<sup>292</sup> ... a site assessment option was not conveyed to customers where a clear decision had been made to decline cover on the basis of a flood exclusion... Site assessments were still always conducted where there was doubt about the cause of the loss (e.g. uncertainty about whether the loss was caused by stormwater or flood').<sup>293</sup> The author of the letters confirmed in a statutory declaration that site assessments were not 'explicitly offered' to policy-holders where CGU considered flood 'to be the cause of the loss, up until [a] change in communicating the claims process was made on 22 February 2011'.<sup>294</sup> This contradicts Mr Harmer's evidence. It is consistent with the document which recorded the changes made after a review of CGU's processes on or about 16 February 2011.

That review, which led to changes to CGU's processes, occurred as a result of a meeting between Ms Doyle and CGU's chief executive officer (Mr Harmer), corporate affairs manager and general manager of claims on 14 February 2011. For that reason, Ms Doyle's claim warrants further attention. There is an additional reason for focussing on Ms Doyle's case: the professional conduct of the insurer's chief executive officer was called into question as a result of an incident between Ms Doyle and Mr Harmer on 22 February 2011; an issue relevant to the insurer's performance which required examination.

## Events concerning Sallyanne Doyle's claim

### *14 February 2011 meeting*

On 11 February 2011, Ms Doyle received a call from CGU's corporate affairs manager about an article published in *The Courier-Mail* on 10 February 2011.<sup>295</sup> The article reported that Ms Doyle was organising a demonstration outside CGU's Brisbane office on 18 February 2011.<sup>296</sup> The corporate affairs manager requested that Ms Doyle meet her and the general manager of claims; Ms Doyle agreed. The meeting took place at Ms Doyle's property at West End on 14 February 2011. Mr Harmer was in Brisbane that day and also attended the meeting. He was aware of *The Courier-Mail* article and wanted to understand Ms Doyle's concerns.<sup>297</sup>

Most of the communication at the meeting was between Mr Harmer and Ms Doyle. Their respective accounts of the meeting did not differ greatly. Both agreed the meeting was amiable.<sup>298</sup> Ms Doyle expressed her concerns about CGU's assessment process and felt optimistic after the meeting that improvements might be made.<sup>299</sup>

### *Process changes*

The meeting led to a review of CGU's processes.<sup>300</sup> Mr Harmer said the point he gathered from the meeting was that Ms Doyle had not heard or had not understood that a site assessment was available to her, or the option had not been communicated to her effectively.<sup>301</sup> He suggested that Ms Doyle had not appreciated that she had the option of a site assessment; she had not fully 'absorbed' the information which had been given to her.<sup>302</sup> This evidence was curious: as set out above, the option of a site inspection was not communicated to Ms Doyle at all before 10 February 2011; and she was aware from 11 February 2011 that an assessor had been appointed (so there can be no question that she understood on 14 February 2011). At no stage before 11 February 2011 had Ms Doyle not heard or failed to understand that a site inspection was available to her: it simply was not offered to her. It is difficult to believe that Mr Harmer did not appreciate this. In light of the facts, his evidence does not make sense.

In any case, the issue, as far as Mr Harmer was concerned – at least as he explained it to the Commission – related to communication: the availability of site assessments had not been clearly communicated. As a result, 'the way in which [the insurer] communicated [the] claims assessment process' to policy-holders was reviewed.<sup>303</sup> Mr Harmer asked that 'the scripts' be rewritten and training be conducted to ensure that staff offered a site assessment if a customer 'was in any way dissatisfied with the determination'.<sup>304</sup> However, the national claims manger said that, in fact, the changes made as a result of the meeting with Ms Doyle did not involve amendment of any script. Rather, changes were made to the process. One of the changes was to ensure that customers understood that a site assessment was available if they had any 'grievance with the process' or saw 'merit in a site assessment'.<sup>305</sup>

The document which records the 'process changes' made as a result of a 'process review' on 16 February 2011 indicates that changes were made extending the circumstances in which site assessments were to be conducted.<sup>306</sup> Site assessments would occur for all claims which were yet to be determined. An internal email dated 17 February 2011 confirms that 'after the recent media attention', site assessments would be conducted for remaining flood claims (of which there were about 150 personal claims in Brisbane and Ipswich).<sup>307</sup> Site assessments would also occur for all 'disputed/escalated claims', that is, those the subject of a complaint or dispute, and where a customer asserted damage was the result of stormwater run-off or water rising from stormwater drains.<sup>308</sup>

This indicates that more was involved than changes to communication: the process changes related principally to the availability of site assessments themselves, with necessary changes to what was communicated to policy-holders. They were not merely changes to how an existing option was communicated, as Mr Harmer indicated in evidence and in a media statement made on 22 February 2011, in which he stated that the company had 'reviewed and made changes to how we communicate our claims assessment processes to customers'. He also said he wished to make it clear that site assessments were available 'to all customers should they want one'.

Changes to what staff told customers about site assessments would have followed necessarily from an extension of the circumstances in which site assessments were to occur. Precisely what staff were to tell customers after 16 February 2011 is not known. The document dated 16 February 2011 indicates that staff were to be given 'updated scripting'; but if a script was updated, it has not been provided to the Commission.<sup>309</sup> There are no written instructions which reveal what staff were to say to customers about site assessments (or at least none have been provided in response to a Requirement to produce copies of instructions, directions or guidance relevant to the changes made in February 2011). Nor are there any records of training given to staff (which were also specifically sought by the Commission). The national claims manager indicated in oral evidence that the process changes and

Mr Harmer's media statement were explained to the flood team.<sup>310</sup> Other than that, there is no evidence of the details of the training to which Mr Harmer referred.

#### *22 February 2011 telephone conversation*

Mr Harmer's media statement was made in response to the demonstration led by Ms Doyle outside CGU's offices on 18 February 2011. After the demonstration, a meeting, which had been arranged on 14 February 2011, was held between Ms Doyle and other policy-holders (and a lawyer from Legal Aid Queensland) and the corporate affairs manager, general manager of claims and other CGU executives. Mr Harmer was unable to attend. The group of policy-holders made a number of requests at the meeting. Ms Doyle indicated there were three: that site assessments occur as a matter of course in all cases of major loss; that 'there be some recognition' that CGU's assessment process was 'inadequate' and compensation for mismanagement of claims; and that CGU give financial assistance to customers whose claims had been denied under the flood exclusion.<sup>311</sup> Mr Harmer referred to additional demands, that CGU acknowledge that its assessment process was 'illegal' and issue a public apology for it.<sup>312</sup> The CGU representatives agreed to provide a response by 23 February 2011. Mr Harmer communicated the response to Ms Doyle by telephone on 22 February 2011, at about 3.00 pm. What transpired during this call was the subject of contention.

Ms Doyle was at work when she received the call from Mr Harmer. He informed her that a media statement would be published that afternoon and he wanted to 'walk her through it'. Ms Doyle took notes (which she no longer has) as he did so. She said Mr Harmer discussed each request in turn.<sup>313</sup> He explained that CGU would continue to use the triage process and a customer could ask for a site assessment if he or she wanted one. He said the company would not make ex-gratia payments or pay compensation for inadequate assessment processes because he did not accept the processes were inadequate.<sup>314</sup> Ms Doyle said words to the effect of: 'So that's no to everything we asked for'.<sup>315</sup> At this point, Ms Doyle said, the tone and content of the conversation changed. Mr Harmer said, in a 'deliberate voice': 'I have copies of tapes of conversations between you and CGU. I have listened to those tapes and I know you misled the media.' This took Ms Doyle by surprise; she asked: 'What?' Mr Harmer repeated: 'I have tapes of conversations between you and CGU. I've listened to those tapes and I know you misled the media about the reasons for you being provided an assessor visit.' Ms Doyle said: 'Well, I suppose it is open season on CGU now', to which Mr Harmer replied: 'Well, you do what you need to do,' and the conversation ended.<sup>316</sup>

Ms Doyle said she felt that Mr Harmer had threatened her.<sup>317</sup> The next day, she requested, by email to her broker and the claims officer who was handling her claim, copies of recordings of her conversations with CGU.<sup>318</sup> The claims officer replied that 'in some cases, not all, the calls are recorded for training and quality assurance purposes only' and asked Ms Doyle to provide details of the calls, such as the dates and times and lengths of the calls and the names of the people to whom she had spoken. Ms Doyle responded.<sup>319</sup>

It would seem that, at least some of the phone conversations I am requesting are in existence and have been referred to by your CEO Peter Harmer in a conversation I had with him yesterday afternoon, Tuesday Feb 22 at approximately 3pm. Mr Harmer has, he advises me, been in receipt of and listened to taped conversations of me, presumably talking to you regarding the outcome of my claim.

Over a week later, on about 4 March 2011, Ms Doyle received a letter from Mr Harmer, dated 1 March 2011, about her request for copies of call recordings.<sup>320</sup> The letter said:

When we last spoke by phone on 22 February, I indicated that CGU was working towards individual site assessment at your property prior to you contacting the media about your claim. At the time, I made reference to this being reflected in call recordings. Unfortunately, I made a mistake, and it was the file notes of the call made by the claims officer that support this sequence of events.

Call recordings are not made of customer calls to the Brisbane Flood Claims Team... due to technology limitations and, as a result, no recording was made of this particular call. I apologise for any confusion I have caused.

Mr Harmer accepted in evidence he had 'given Ms Doyle some misleading information' in the conversation on 22 February 2011<sup>321</sup> – to which he had referred in the letter – but he denied that he told Ms Doyle he had call recordings, and that he had listened to them.<sup>322</sup> He also denied saying to her that she had 'misled the media'.<sup>323</sup> He accepted, however, that he was, at the time of the conversation, concerned about the report in *The Courier-Mail* on 10 February 2011<sup>324</sup> (and possibly other media reports<sup>325</sup>) and he expressed this to Ms Doyle in the conversation.<sup>326</sup>

His concern, he explained in evidence, was that the ‘article did not covey the true position’ because it did not reflect that Ms Doyle’s claim had not been denied and the insurer had sought further information from Ms Doyle’s tenant and a site assessment had been offered to her.<sup>327</sup> He ‘quite possibly’ felt that Ms Doyle had contributed to the nature of the reporting.<sup>328</sup> He said he discussed with her the fact that the article did not report that she had been offered a site inspection.<sup>329</sup> The article itself did not contain any details of Ms Doyle’s claim. While it reported that Ms Doyle was organising a demonstration against CGU, it did not state that her claim had been denied (although perhaps that inference was open) or that she had not been offered a site inspection, or mention her concerns about CGU’s assessment process. The article otherwise reported her perceptions, as a social worker, of the effects on people whose claims had been denied.

Mr Harmer gave an account of the conversation in a statutory declaration which responded to information Ms Doyle had given the Commission before she appeared as a witness.<sup>330</sup> That information was substantially the same as the evidence given by Ms Doyle.<sup>331</sup> In evidence, Mr Harmer said his statutory declaration did not give a verbatim account of the conversation but ‘reasonably reflected’ his recollection of it.<sup>332</sup> When he said this, Mr Harmer was aware of the evidence Ms Doyle had given when she appeared as a witness the day before; he had, in fact, authorised a media statement which commented on Ms Doyle’s evidence.<sup>333</sup> It became clear in the course of Mr Harmer’s evidence, as additional details were elicited, that his statement did not, in fact, reasonably reflect his recollection of the conversation. His account appears to be as follows.

Mr Harmer informed Ms Doyle about the media release and said he would ‘walk her through it’.<sup>334</sup> He discussed CGU’s responses to the policy-holders’ demands. He told Ms Doyle CGU had ‘adjusted [its] process and implemented additional training’ in response to her feedback.<sup>335</sup> At the end of that discussion, Ms Doyle said words to the effect of, ‘So, you are not giving us any of [the] demands’. Mr Harmer explained that CGU had made changes to its process but could not agree to the other demands. Ms Doyle then responded: ‘Don’t you guys want to do business in Queensland? Don’t you care how your brand is going to be trashed up here in this part of the world?’ Mr Harmer then expressed his concern about the media report. He said: ‘It’s very disappointing when not all of the facts get into the public domain’,<sup>336</sup> and added that *The Courier-Mail* article did not mention that Ms Doyle’s claim had not been denied and that CGU had been waiting on Ms Doyle to provide her tenant’s contact details ‘to be able to conduct a site inspection and gain an eyewitness account’.<sup>337</sup> Ms Doyle disputed what Mr Harmer said. She said something to the effect of: ‘That’s just not the case’,<sup>338</sup> to which Mr Harmer responded by saying that CGU had call recordings which could be checked to establish the true situation.<sup>339</sup> Mr Harmer agreed that the tone of the conversation had changed, but he denied he had used a threatening tone.<sup>340</sup> The conversation came to a conclusion by Ms Doyle’s commenting that CGU was not ‘giving [the protestors] anything’. She said: ‘Well, I guess it’s open season on CGU.’ Mr Harmer replied: ‘Well, you will have to do what you will have to do.’<sup>341</sup>

Mr Harmer’s account that he said there were call recordings which could be checked is not reflected in the letter he sent Ms Doyle dated 1 March 2011. The letter stated that Mr Harmer had indicated to Ms Doyle on 22 February 2011, that the fact that CGU had been working towards a site assessment at her property before she contacted the media, was ‘reflected in call recordings’. He accepted in oral evidence that he did say to Ms Doyle that CGU had been working towards site assessment at her property, as stated in the letter. That sentence was an accurate reflection of what he had said in the conversation on 22 February 2011.<sup>342</sup> However, the next sentence, that he had made ‘reference to this being reflected in call recordings’, was not. That, he said, was a poor use of language. He had not said in the telephone conversation that the facts he asserted were reflected in the call recordings, but rather that the recordings – which he incorrectly assumed existed – could be checked to ascertain whether his or Ms Doyle’s version was correct.<sup>343</sup> He became aware that, in fact, calls had not been recorded after Ms Doyle’s request was brought to his attention. (He said the claims officer made him aware of the request, by email.<sup>344</sup> Mr Harmer was, however, copied into the email Ms Doyle sent to the claims officer on 23 February 2011.)<sup>345</sup> He wrote the letter to correct this ‘misleading information’ he had given Ms Doyle.<sup>346</sup>

Mr Harmer’s account corresponded with Ms Doyle’s except on the critical part of the conversation. His letter to Ms Doyle is consistent with Ms Doyle’s version. Ms Doyle presented as a credible and reliable witness. There is no reason to doubt that she gave her evidence honestly. CGU did not test Ms Doyle’s account in cross-examination, but did point out some differences between Ms Doyle’s evidence, on the one hand, and an earlier statement and questionnaire she provided to the Commission, on the other. The Commission does not consider the differences significant.

Ms Doyle's account is recorded in a typed note she made in late March 2011, based on handwritten notes she made at the time of the events (which no longer exist).<sup>347</sup> But for two incorrect dates (one of which, when drawn to her attention, Ms Doyle accepted was a mistake),<sup>348</sup> Ms Doyle's email to the claims officer on 23 February 2011 contained an otherwise accurate record of her claim. It seems unlikely that Ms Doyle was mistaken when she recorded in that email that Mr Harmer had said to her, the day before, that he had 'been in receipt of and listened to taped conversations'. Taking all of the evidence into account, the Commission is comfortably satisfied that Ms Doyle's account reflects the exchange with Mr Harmer on 22 February 2011. Mr Harmer's conduct was, on this occasion, unprofessional. It seems to have been designed to intimidate Ms Doyle, with an element of bluff (about the existence of recordings). The Commission accepts that it may have been the product of annoyance at what he perceived as an incomplete account of her dealings with the company in the media, rather than any calculated attempt to deter her from persisting with her claim or the more general demands she and others were making.

### Comments on the desktop assessment process

The desktop assessment process was designed to deal with flood claims quickly and practically. It may well have done so in many cases: a substantial number of claims was accepted using the process. The controversial aspect of the process – which informed the Commission's investigation – was the absence of site inspections in cases (which related to significant destruction of people's homes and loss of property) which were declined.

Assessment of inundation-related claims without inspection of the damage or features of the particular site carries a risk that the complexity of some cases, or some individual circumstances, will be overlooked. Ms Doyle's claim demonstrated the potential for that to occur, insofar as it appeared the claims officer made a decision during the telephone call on 1 February 2011 that the claim would be declined without proper consideration of the possibility of stormwater damage. CGU continued to assess the claim because Ms Doyle did not accept that decision. On further investigation, a hydrologist considered there may have been some minor stormwater damage, which would have been covered under the policy; but then, after further investigation again, the hydrologist concluded damage had not been caused by stormwater. The initial assessment, on 1 February 2011, therefore turned out to be correct, but the process the claims officer used did not involve proper consideration of the individual circumstances of the claim. It raises the possibility that other claims, of policy-holders not as assertive or persistent as Ms Doyle, could have been determined without proper investigation of individual circumstances.

As part of the review that occurred in February 2011, however, CGU reviewed 497 claims that had been denied by that time, including those denied without a site inspection, to ensure that the decisions had been based on sufficient information. The decisions were also reviewed against hydrology information CGU had received since the claims were denied. None of the decisions was changed.<sup>349</sup> Of the 126 claims which have been reviewed in the internal dispute resolution process, only three decisions have been overturned and a site inspection occurred in each of them. (The decisions in those cases were overturned for reasons unrelated to the insurer's determination of the cause of damage.)

A number of cases, however, are still before the ombudsman – including the three the Commission examined. It must be added, however, that the expert hydrologists the Commission engaged, reviewed one of the cases and considered the information CGU had used to determine the claim adequate. The site-specific hydrology report used in another case was also reviewed and said to be supported by strong evidence.

ASIC indicated to the Commission that, in its view, the triage process appeared to be 'acceptable' because:

there is no evidence that assessing a claim under the 'Desk top triage' process has adversely affected the outcome of any individual claimant. It also appears to comply with obligations under section 4 of the General Insurance Code of Practice.

This view was based on an explanation given by CGU in correspondence dated 13 May 2011 in response to ASIC's inquiries. ASIC added that if any 'claimants had been disadvantaged by the process ASIC would be more likely to consider it a systemic issue'.<sup>350</sup>

One claim which CGU denied without a site assessment has been overturned by the ombudsman.<sup>351</sup> The ombudsman's determination contains some relevant observations. The ombudsman expressed 'concern' that the insurer had not sent a loss assessor to inspect the property. Had an assessor done so, there would have been 'more detail on the topography and more general information on what occurred'. The 'failure to assess the claim' meant the insurer was unable to refute information from the policy-holders that the damage had occurred to the part of

the property furthest from the waterway which the insurer concluded had caused the damage; the insurer could not establish that the flood exclusion applied. The following comment is made in the determination:

The Panel notes a site specific report is not always required and an insurer may rely on a general hydrology report in certain circumstances. However, in doing so, it must still address the specific circumstances of the loss, such as conducting an assessment of the property and gathering evidence to clarify exactly what occurred and when, as well as providing details of the insured address and the topography of the area.

The Commission agrees with this comment and, as stated in the section on site inspections by loss assessors, considers that a site inspection should generally form part of a proper assessment of cause of damage at a particular property before a claim is declined. Otherwise, the comments made in the section on site-specific hydrology reports are relevant in this context.

The Commission accepts that CGU's process was improved by the changes made as a result of the review in February 2011. It notes also that CGU home, contents and landlord policies will include automatic flood cover from February 2012, removing the need for such a process of determination.<sup>352</sup>

## 12.7.5 RACQ Insurance Limited

A number of RACQ Insurance's policy-holders complained about delay in the handling of claims. The insurer accepted that delay occurred.<sup>353</sup>

The delay is explained, generally, by the large number of claims RACQ Insurance received, the complexity of some cases and the nature of the insurer's assessment process.<sup>354</sup> Hydrological advice was needed for every claim which involved inundation of property,<sup>355</sup> in order to determine whether the inundation was caused by 'flash flood and/or stormwater run-off' ('a sudden flood caused by heavy rain that fell no more than 24 hours prior to the flash flood or stormwater run-off')<sup>356</sup> or 'flood' ('rising water which enters your home as a result of it running off or overflowing from any origin or cause')<sup>357</sup>. That advice was received from a hydrology firm, Water Technology, in the form of 'hybrid' hydrology reports, which covered regional areas but also took into account individual properties of policy-holders within each region.<sup>358</sup> The hybrid reports differed from the area hydrology reports other insurers used in that they assigned a cause of inundation (flood or flash flood or stormwater run-off) to specific properties.

The reports were delivered to RACQ Insurance's solicitors, who considered the reports before providing them to the insurer with legal advice as to whether claims were payable.<sup>359</sup> If Water Technology advised that additional information was needed for some properties, further investigation was then undertaken.<sup>360</sup> In some cases, RACQ Insurance requested that Water Technology carry out further investigation. As those investigations were completed, and as more claims were received, Water Technology provided further reports to RACQ Insurance. The insurer determined a claim when it was satisfied that a report provided sufficient information on which to make a decision.<sup>361</sup>

RACQ Insurance said that a number of difficulties caused delays in this process.<sup>362</sup> One such difficulty was obtaining information and data from local and state authorities.<sup>363</sup> It was in this context that RACQ Insurance explained the re-assessment of 247 claims in Ipswich which had been previously declined.<sup>364</sup> On 2 August 2011, when the insurer announced that it had approved the claims, its media release stated that the decision had been made after 'finally' receiving access to 'new hydrological information' it had been seeking 'since early February'. The new information had been released by Brisbane City Council and upon receiving it, RACQ Insurance had acted 'as soon as possible'.<sup>365</sup>

The 'new information' was in fact Brisbane City Council's Mike-11 hydraulic model of the Brisbane and Bremer Rivers, which the council had made available to RACQ Insurance on 17 May 2011. RACQ Insurance accepted that its media release of 2 August 2011 may have created the impression that other people were responsible for the delay in accepting the claims,<sup>366</sup> but that, the insurer said, was not intentional.<sup>367</sup> Any such impression so far as the Brisbane City Council was concerned would certainly have been unfair; delay in the model's provision, at least over the period from 5 April 2011 to 17 May 2011, was the result of RACQ Insurance's failure to return first a user agreement, and then a purchase order.

The Commission examined the circumstances of RACQ Insurance's decisions to decline claims between February 2011, when the use of the Mike-11 model was first sought, and 17 May 2011, when access to the model was provided, to establish whether RACQ Insurance had acted reasonably. To understand the position, it is necessary

to appreciate the state of the expert reporting to RACQ Insurance. In a report provided in March 2011, Water Technology, which RACQ Insurance had engaged to investigate ‘inundation events’ in the Ipswich region, had explained that without the Mike-11 modelling, the effect of ‘tailwater’ from the Brisbane River upstream of the Ipswich gauge could not be established.<sup>368</sup> However, there were locations upstream where the levels of the Bremer River were unlikely to have been affected by the tailwater; they had been identified in a ‘Schedule C’ to the report. There were properties inundated in the lower reaches of the Bremer River where that river’s levels had been elevated by the Brisbane River tailwater; those properties were identified in a document titled ‘Schedule B Part 1’. Of those properties there was a sub-group where in addition to the tailwater effect, a different mechanism might have produced flooding; that sub-group, identified on ‘Schedule B Part 3’, needed further investigation, with a site-specific approach. Then there was another group of properties which appeared to be outside the identified river inundation zone which might or might not have been affected by the elevated Brisbane River tailwater; they were listed on ‘Schedule B Part 2’.

The significance of the effect of the Brisbane River tailwater was that Water Technology had concluded that flooding in the Brisbane River was attributable to releases from Wivenhoe Dam. Water was discharged from the dam to accommodate inflows into the dam due to rainfall; if that rainfall had commenced more than 24 hours before the releases, claims for damage caused by the resulting dam releases into the Brisbane River and consequent elevation of Bremer River levels would not be payable under RACQ Insurance’s household policy. Without the tailwater, Water Technology said, the Bremer River would have been largely contained within its banks.<sup>369</sup> On that basis, and with the information contained in Water Technology’s report, which was provided to RACQ Insurance’s solicitors on 9 March 2011,<sup>370</sup> the insurer declined claims under the flood exclusion on various dates between 18 March 2011 and 30 June 2011.<sup>371</sup>

Water Technology said in its March report that it had made requests to Brisbane City Council, Ipswich City Council and Seqwater for access to the Mike-11 model, but, as at the date its report was written, had received no response. RACQ Insurance’s solicitors followed up on those requests but were not able to obtain the model from Ipswich City Council or Seqwater. The solicitors asked the Brisbane City Council for the use of Mike-11 on 28 February 2011.<sup>372</sup> The council replied, indicating that the request had been referred to the ‘appropriate area’ ‘as a priority’. The council would ‘endeavour’ to respond within 20 working days, and noted the urgency of the request.<sup>373</sup> On 7 March, the insurer’s solicitors wrote to Brisbane City Council again and reiterated the urgency.<sup>374</sup> The council responded on 10 March 2011 in similar terms to its letter dated 28 February 2011:<sup>375</sup> it would endeavour to provide a response and acknowledged the urgency of the request. At this stage, RACQ Insurance had not received any indication that the model would be made available, but nor had any indication been given that its request would be refused.<sup>376</sup> One hundred and forty-two of the Ipswich claims later re-assessed and accepted were declined in mid- to late March 2011.

On 5 April 2011, Brisbane City Council agreed to provide access to the model. It forwarded to RACQ Insurance’s solicitors, by email, a user agreement, requesting that it be signed and returned, together with a purchase order.<sup>377</sup> (The Commission notes that the council’s provision of the model was a sensible step in the public interest.) The agreement was not signed by the principal of Water Technology until 29 April 2011; it was returned to Brisbane City Council on 3 May 2011, but without a purchase order. The insurer’s reason for the delay in returning the agreement was the pressure of work at the time on RACQ Insurance, its solicitors and Water Technology.<sup>378</sup> In the interval between the council’s agreement to provide the model and the return of the agreement, 100 of the Ipswich claims which were eventually re-assessed were declined.<sup>379</sup> Another claim was declined on 10 May 2011.

On 16 May 2011, Brisbane City Council requested the provision of ‘a purchase order number for this job... required by our finance department to initiate the project’. On 17 May 2011, Brisbane City Council provided RACQ Insurance with the means of accessing the model.<sup>380</sup> Three claims were declined on that date.<sup>381</sup>

When it obtained access to Brisbane City Council’s model, Water Technology carried out further investigations and analysis and provided supplementary reports to RACQ Insurance’s solicitors on 6 June 2011 and 14 June 2011. In the end, the result of having the model, and conducting new hydrological analysis, was that the impact of the Brisbane River tailwater was determined to be substantially less than what it was thought to be in the first analysis undertaken.<sup>382</sup> The report of 6 June 2011 recommended acceptance of claims made by nine policy-holders in the Ipswich suburbs of One Mile and Churchill, which were upstream of the Ipswich gauge. Decisions on those claims had been deferred; it was now concluded that the contribution of any Brisbane River tailwater to flooding at the relevant properties was insignificant. The report of 14 June 2011 explained that Water Technology had used

the Mike-11 model, together with some more detailed terrain information obtained from DERM, and Seqwater's March flood event report, to simulate the flood over the period between 8 January 2011 and 14 January 2011 and to produce a new set of inundation lines. After RACQ Insurance received the report, it re-assessed a large number of Ipswich claims; the end result was that the 247 previously declined claims were accepted. The cost of the re-assessment was in the region of \$20 million.<sup>383</sup> RACQ Insurance did not deduct previously made compassionate payments from the insurance payouts of the 197 policyholders who had received them.<sup>384</sup>

RACQ Insurance justified its decision to proceed to decide claims over the March-May period on the ground that Water Technology's March report made 'reasonable conclusions based on the best information available at the time',<sup>385</sup> and provided a 'reasonable basis for' declining the claims, notwithstanding Water Technology's 'desire to obtain further information'.<sup>386</sup> The decision was appropriate, the insurer's witnesses said, given it was not known whether the model would be made available and, if it did become available, whether it would change Water Technology's initial conclusions.<sup>387</sup>

The Commission accepts that for the large majority of the claims of the schedule, it was reasonable for RACQ Insurance to proceed with decisions. They related to properties inundated by the Bremer River in the stretches downstream of the Ipswich gauge, where the river approaches the junction with the Brisbane River. The relevant areas included Barellan Point, Basin Pocket, Booval, Bundamba, East Ipswich, Karalee, Moores Pocket, North Booval, Riverview, and Tivoli.<sup>388</sup> The Water Technology report in March had presented the position as clear in relation to those areas; it asserted that they 'had been impacted by high Brisbane River tailwater levels', subject to the need for site-specific investigations for the small group where another mechanism might have operated. There was no real reason to suppose that for claims in respect of properties downstream of the Ipswich gauge, the Mike-11 model was likely to make a difference. Timely decision-making was undoubtedly a primary consideration.<sup>389</sup> (As discussed in section 12.2.2, the duty of utmost good faith requires that an insurer not delay in determining claims.) There was, the insurer explained, a 'pressing need' to make decisions on claims in the Ipswich area.<sup>390</sup>

But for at least 28 properties in suburbs upstream of the Ipswich gauge, such as Brassall, West Ipswich, Woodend and Leichardt, the decision to refuse claims in the second half of March and in April is not explained by reliance on Water Technology's March report. It had said quite clearly that the hydrologists were not able to identify the upstream effect of the tailwater without the Mike-11 model. RACQ Insurance pointed out that it could not have been confident of the use to which Brisbane City Council's version of the model could be put for Ipswich. The insurer's chief executive officer said that Water Technology had hoped to obtain data relating to the Bremer River catchment and its configuration as part of the council's model but did not expect the level of detail provided.<sup>391</sup> The general manager, personal insurance claims, for the company similarly said that it was a 'pleasant surprise' to obtain the details of the Bremer catchment.<sup>392</sup> But it seems that there was some level of expectation that the Brisbane City Council model would assist. In the user agreement submitted to the Brisbane City Council on RACQ Insurance's behalf, the 'proposed use of the model' was described as 'To assist [RACQ Insurance's solicitors] and RACQ Insurance in determining inundation mechanisms in Ipswich and Brisbane regions'.<sup>393</sup>

In respect of the properties flooded by the Bremer upstream of the Ipswich gauge, the Commission has weighed the evidence about the need for timely decision-making and the element of uncertainty about what the model could offer. It does not consider, on the available evidence, that it was reasonable for RACQ Insurance, once it had embarked on an application for the Mike-11 model, to deny that group of claims. And it is worth observing that none of those policy-holders was told when their claims were denied that better information might become available or that Water Technology was carrying out further investigations. RACQ Insurance did not consider giving them the option of waiting on the possibility of new information coming to hand.

## 12.8 Information to policy-holders whose claims were denied

### 12.8.1 Provision of reasons

The General Insurance Code of Practice says that insurers will give a policy-holder whose claims are denied written reasons for the decision.<sup>394</sup>

The extent to which insurers provided reasons in their letters to policy-holders varied. Some insurers' letters gave an explanation for the decision and referred to the information on which the insurer had relied in reaching the

decision.<sup>395</sup> Other insurers' letters, however, did little more than state that the claim was denied because damage had been caused by flood, which was not covered by the policy. The explanation given in CGU's standard letter was limited to the following:<sup>396</sup>

We have carefully reviewed your claim and based on your advice and information available to us, we conclude that the loss for which you have claimed was caused by flood.

The standard letter did not specify the advice the policy-holder had given or the information that was available to CGU. CGU said that the standard letters followed detailed telephone conversations with policy-holders,<sup>397</sup> but that was not evident in one case the Commission examined. In that case, CGU told the Commission it had relied on a range of information to determine the policy-holder's claim: the policy-holder's responses to a set of questions, an area hydrology report, an assessor's report, flood extent mapping provided by the Insurance Council of Australia, aerial photography and Google Maps.<sup>398</sup> The note of the conversation in which CGU advised the policy-holder her claim had been denied does not refer to all of this information. It indicates that CGU told the policy-holder that her claim had been denied on the basis of the loss assessor's report, which had recently been received.<sup>399</sup> This may not have been an isolated case of CGU's giving a policy-holder an incomplete explanation. An internal record of a review CGU performed in February 2011 indicates that some customers were not being told of all the information which the insurer had used to decide their claims.<sup>400</sup> CGU conceded that the standard letters it used could be improved.<sup>401</sup>

Another insurer, RACQ Insurance, provided scant reasons to policy-holders whose claims were denied under the flood exclusion. A policy-holder was informed by phone, typically, that the claim had been denied because the insurer had determined that flooding had caused the damage to his or her property, and the policy did not cover flood.<sup>402</sup> The standard letter confirming the decision did not provide any greater explanation. It stated that RACQ Insurance's investigations had been completed and determined that flood was the cause of damage which was not covered by the policy.<sup>403</sup> The letter set out the definition of 'flood' but did not refer to the relevant clauses of the policy which provided and excluded cover. No attempt was made to explain the basis for the conclusion that the damage was caused by flood. Nor did the letters apprise policy-holders of the information on which RACQ Insurance had relied, from which the policy-holder might glean the basis for the conclusion. The letter did advise policy-holders who had any queries or needed more information, to call RACQ Insurance, and provided a telephone number for this purpose.

RACQ Insurance did not regard the letters as being deficient in any respect.<sup>404</sup> The insurer said the letter was consistent with the company's usual practice and provided all the information that was necessary. It asserted that including any more particular information would have been onerous and extended the time taken to assess claims and advise policy-holders of decisions.<sup>405</sup>

While the Commission acknowledges, given the magnitude of the tasks which insurers had to perform, that some standardisation of communications was essential, it considers that standard letters which do not give any sense of why the cause of inundation was flood, and therefore excluded from cover, do not assist policy-holders to understand the reason for rejection of their claims. A statement in a letter that the property damage was caused by flooding from the river, and not by stormwater, and that river flooding was excluded from the policy's coverage, would have been more informative and would give a policy-holder some sense of why his or her claim was rejected.

If standard letters such as those discussed in the preceding paragraphs are to be regarded as meeting the code's obligation to give reasons, they deprive that obligation of any meaningful content. They are not helpful, particularly when the complexity of flood claims and policy terms is considered, and given also that the code intends that a policy-holder will have the opportunity to review the information on which his or her insurer relied in assessing the claim.<sup>406</sup>

At a minimum, letters telling policy-holders that their claims have been denied should advise them of the information on which the insurer relied to reach the decision. The letters should also advise policy-holders that they can request copies of that information, and how to do so.

## 12.8.2 Provision of information

Section 3.4.3 of the Code of Practice is the only section in the code which imposes an obligation on insurers to make material available to a policy-holder in the assessment stage. It states that:

You will have access to information about you which we have relied on in assessing your claim and an opportunity to correct any mistakes or inaccuracies. In special circumstances or where a claim is being or has been investigated, we may decline to release information and reports but we will not do so unreasonably. In these circumstances, we will give you reasons and you will have the right to request a review of our decision through our complaints handling procedures. We will provide our reasons in writing upon request.<sup>407</sup>

There is a corresponding provision in the section in the Code dealing with complaints handling procedures.<sup>408</sup>

Some insurers provided policy-holders with copies of the information on which they had relied with the letter confirming decisions to deny claims.<sup>409</sup> Other insurers only provided material on request.<sup>410</sup> That approach is consistent with the code, which does not require insurers to offer, unsolicited, copies of information on which they rely in assessing claims. The code also states that insurers may refuse to provide copies of material if ‘special circumstances’ apply; for example, if the material is ‘subject to privacy laws’ or ‘protected from disclosure by law’.

In its submission to the Natural Disaster Insurance Review, the ombudsman stated that ‘as a general rule with the Queensland floods, the insurers have provided early access to the information and in particular hydrology information relied upon. Where this information has not been provided this has led to a considerable level of complaints’.<sup>411</sup>

RACQ Insurance withheld its hydrology reports, for a time, from policy-holders, their lawyers and the Financial Ombudsman Service, on the grounds of legal professional privilege and protection of privacy.<sup>412</sup> The insurer maintained its refusal to release the reports until the ombudsman indicated, that if the reports were not disclosed, adverse inferences might be drawn against the insurer in the ombudsman’s resolution of disputes. The reports were provided to the ombudsman in mid-July 2011.

RACQ Insurance had, in lieu of the full hydrology reports, given policy-holders who requested copies of reports, summaries of the conclusions expressed in the reports in ‘plain English’. For any matter before the ombudsman, RACQ Insurance provided to the ombudsman and policy-holder statements by its hydrologist, instead of the full hydrology report.<sup>413</sup>

The ombudsman is considering whether RACQ Insurance’s actions in withholding the hydrology reports give rise to a systemic issue.<sup>414</sup> The insurer’s position is that it was, at all relevant times, entitled to claim legal professional privilege, and that there had been no breach of the code.<sup>415</sup>

The right to claim legal professional privilege is fundamental,<sup>416</sup> and is not abrogated in any way by the *Insurance Contracts Act 1984* or the code. The Commission makes no finding that RACQ Insurance was not entitled to claim privilege.

On the other hand, insurers are not obliged to claim privilege. There are good reasons for an insurer, in both its own interests and that of its policy-holders, to consider the wisdom of standing on privilege so as to refuse disclosure of information relied on in its decision-making. Hydrology reports, in particular, are fundamental to a policy-holder’s understanding of the refusal of a claim based on a distinction between flood and storm-water inundation; and to enabling him or her to make an informed decision as to whether to pursue internal and/or external review.<sup>417</sup> Their prompt disclosure may assuage policy-holders’ doubts about whether their claims have been properly rejected, avoiding dispute.

The Commission notes that, on 10 October 2011, the Insurance Council Board agreed in principle to an amendment of the code to the effect that insurers will make hydrology and other expert reports used to determine claims available to policy-holders within ten business days of receiving the reports. The Commission generally supports the proposed amendment, but it has not seen its precise terms and does not know how it would apply to the circumstances of the case mentioned above.

The Commission also notes that clause 3.4.3 gives policy-holders the right to request a review of an insurer’s decision to refuse to release copies of information, but does not impose any obligation on insurers to inform policy-holders of their right to do so. The code should be amended to correct the omission.

## Recommendations

- 12.3 Letters notifying policy-holders that their claims have been denied should, at a minimum, state the information upon which the insurer has relied in making the decision. These letters should also advise policy-holders that copies of the information will be made available upon request (in accordance with clause 3.4.3 of the General Insurance Code of Practice) and indicate how policy-holders can make a request.
- 12.4 The Insurance Council of Australia should consider an amendment to Part 3 of the code which requires insurers to notify policy-holders of the information on which they relied in assessing claims.
- 12.5 The Insurance Council of Australia should amend clause 3.4.3 of the General Insurance Code of Practice so that it requires insurers to inform policy-holders of their right to request a review of an insurer's decision to refuse to provide access to information on which it relied in assessing claims.

## 12.9 Internal dispute resolution

The obligation on insurers to offer internal dispute resolution as part of their claims handling procedures is discussed in 12.2.2 *The Insurance Contracts Act 1984*.

The Commission received evidence from insurers detailing their internal dispute resolution procedures.<sup>418</sup> As would be expected, there were differences in some of the detail of the procedures, but the key aspects of the process were consistent across insurers; a description follows.

If an insurer denies (or partially denies) a claim, a policy-holder is entitled, on request, to an independent review of the decision through the insurer's internal dispute resolution procedure. On internal review, an internal dispute officer considers all the information contained in the policy-holder's file (including expert reports) and requests any further information required. The decision made upon internal review is binding and cannot be challenged by the insurer. If the claim is denied at internal review, the insurer must outline the reasons for the decision and advise that the policy-holder is entitled to have the decision reviewed by the Financial Ombudsman Service.

In some cases the Commission considered, further evidence was obtained on internal review in the form of site-specific hydrology reports.<sup>419</sup> By way of example, in one case, a site-specific hydrology inspection and report were commissioned when the policy-holder disputed the finding that the cause of the inundation was flood because of the location of his property.<sup>420</sup> In another case, the insurer obtained a supplementary site-specific hydrology report after the policy-holder provided further information to the insurer, including an engineer's report and flood maps, which raised doubts as to the cause of the inundation.<sup>421</sup>

The Commission received evidence from an AAMI policy-holder who complained that during the internal review process, he provided a written submission to AAMI which was not passed onto a hydrologist for further opinion. The initial claim was denied on the strength of a site-specific hydrology report in which the hydrologist concluded that the cause of the property's inundation was overflow from a local creek, and was, in consequence, flood, excluded under the policy.<sup>422</sup> The hydrologist concluded that the level of stormwater would have been insufficient to inundate the property above floor level.<sup>423</sup>

The policy-holder wrote to AAMI challenging that conclusion: he queried the validity of the hydrologist's assumptions, particularly questioning the adequacy of the rainfall data, and the conclusions made in consequence of reliance on that data.<sup>424</sup> He also suggested that a three metre stormwater drain in the vicinity, a photograph of which he attached, was significant and should have featured in the report (which it did not). The hydrology report attached an annotated aerial photograph described as depicting '[d]rainage features in the vicinity of the subject property'. The stormwater drain does not appear to be depicted within it.

The internal review officer was aware that seeking a further report from the hydrologist would delay the review by approximately six to eight weeks. He considered that course not justified because he had formed the view that:<sup>425</sup>

- The information in the AAMI's policy-holder's submission had already been considered by the hydrologist (he assumed that the hydrologist must have had regard to the stormwater drain, although

the hydrologist did not expressly mention it in the hydrology report),<sup>426</sup> was directly contradicted by information in the hydrologist's report, or was not of a kind likely to result in the hydrologist's changing his mind.

- The evidence was of sufficient strength to make a decision on the available material without seeking a further report from the hydrologist.

The internal review officer had some training in reading hydrology reports, but was not an expert in matters of hydrology and was not in a position to determine whether the factual issues raised by the policy-holder were relevant to the hydrologist's opinion as to cause of inundation.<sup>427</sup> That he was not qualified to determine such issues seems implicit in his letter to the policy-holder, which stated that he was guided by the expert qualified opinion of the hydrologist.<sup>428</sup> Nevertheless, he did not seek such guidance when presented with the policy-holder's specific challenge to the hydrologist's report.<sup>429</sup> And while the Commission accepts that there were delays in obtaining site-specific reports of up to eight weeks or more, it seems unlikely that it would have taken six to eight weeks for the hydrologist to advise whether the additional information provided by the AAMI policy-holder might affect his determination. There was no evidence of a pressing need to conclude the internal review in advance of the time it would take to receive and consider further hydrology advice.

The Commission is not in a position to say whether the additional information would have altered the result of the claim. However, as a matter of prudence and fairness, where a policy-holder provides information which appears relevant to the cause of inundation, claims officers and internal review officers should refer that information to any reporting hydrologist for consideration.

## (Endnotes)

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- 1 Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 [p1].
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- 2 Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 [Recommendations 1, 8 and 11; see also p29: para 2.4 and 2.5].
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- 3 Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 [Recommendation 25; see also p74: para 9.7].
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- 4 See Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 [p103: para 13.31-13.32 and Recommendation 34; and p104-105: para 13.37-13.46 and Recommendation 36].
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- 5 'Reforming flood insurance: A proposal to improve availability and transparency'. The Natural Disaster Insurance Review did not recommend the 'opt-out' option. It advocated automatic flood cover over automatic flood cover with an 'opt-out' option for purchasers (Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 [p29: para 2.5; p31: para 2.13-2.15].
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- 6 Statement of Paul Fahey (CommInsure – Response to question 30), 23 September 2011 [Appendix A]; Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 125].
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- 7 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011, Exhibit 3 [p28].
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- 8 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011, Exhibit 3 [p27].
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- 9 *Pye v Metropolitan Coal Co Ltd* (1934) 50 CLR 614, 625.
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- 10 To be a 'proximate cause' the cause must be 'direct, real or commonsense, dominant, effective or operative'. A cause can be the proximate cause, whether or not it is the closest cause in time: D Derrington and R Ashton, *The Law of Liability Insurance*, Lexis Nexis Butterworths, 2005 (2<sup>nd</sup> edition) [p490-491]; see *Elilade Pty Ltd v Nonpareil Pty Ltd* [2002] FCA 909 [para 55].
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- 11 *HIH Casualty & General Insurance Ltd v Waterwell Shipping Inc* (1998) 43 NSWLR 601, [p612: para B]; P Telford, *Of floods and driving rains: Hams v CGU Insurance Ltd* (2003) 18(3) ILB 31.
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- 12 *Elilade Pty Ltd v Nonpareil Pty Ltd* [2002] FCA 909 [para 52-53].
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- 13 Commonwealth Treasury, *Reforming flood insurance: A proposal to improve availability and transparency*, Consultation paper, November 2011 [p3].

- 14 Section 51(xiv) *Constitution of the Commonwealth of Australia*.
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- 15 It commenced on 1 January 1986.
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- 16 Preamble, *Insurance Contracts Act 1984*.
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- 17 *CGU Insurance Ltd v AMP Financial Planning Pty Ltd* (2007) 235 CLR 1 [p12]; [2007] HCA 38 [para 15]; *Murphy v Allstate Insurance Company* (1976) 17 Cal 3d 937; P 2d 984; D Derrington and R Ashton, *The Law of Liability Insurance*, Lexis Nexis Butterworths, 2005 (2nd edition) [p237].
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- 18 P Mann, *Annotated Insurance Contracts Act*, Lawbook Co., 2003 (4th edition) [p38: para 13.10.3]; see also, *CGU Insurance Ltd v AMP Financial Planning Pty Ltd* (2007) 235 CLR 1 [p42].
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- 19 *Moss v Sun Alliance Ltd* (1990) 55 SASR 145 [p154].
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- 20 Sections 11A-11E, *Insurance Contracts Act 1984*.
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- 21 Section 1017G, *Corporations Act 2001*.
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- 22 Australian Securities and Investments Commission, *Regulatory Guide 165 Licensing: Internal and external dispute resolution, April 2011*.
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- 23 Australian Securities and Investments Commission, *Regulatory Guide 165 Licensing: Internal and external dispute resolution, April 2011* [p24: RG 165.98-RG 165.106].
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- 24 Exhibit 587, General Insurance Code of Practice [section 7.7]. See also sections 7.8 to 7.23.
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- 25 Foreword, General Insurance Code of Practice.
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- 26 Section 1.19 of the General Insurance Code of Practice states: ‘The objectives of this code will also be pursued and its provisions applied having regard to the fact that a contract of insurance is a contract involving the utmost good faith which requires each party to the contract to act towards the other party with the utmost good faith in respect of any matter arising under the contract.’
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- 27 Exhibit 587, General Insurance Code of Practice [section 3.2].
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- 28 Exhibit 587, General Insurance Code of Practice [section 6.9].
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- 29 Exhibit 587, General Insurance Code of Practice [section 3.4].
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- 30 Exhibit 587, General Insurance Code of Practice [p15].
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- 31 Exhibit 587, General Insurance Code of Practice [sections 4.1, 4.3].
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- 32 Exhibit 587, General Insurance Code of Practice [section 4.2].
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- 33 Exhibit 587, General Insurance Code of Practice [sections 6.6-6.9].
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- 34 Financial Ombudsman Service, Terms of Reference, 10 January 2010 (as amended by 1 January 2012) [para 8.1-8.9].
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- 35 One witness giving evidence at a public hearing commended his insurer’s performance (Transcript, Graham Spackman, 29 September 2011, Emerald [p3403: line 40]).
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- 36 The eight insurers defined ‘household claims’ as follows.
- AAMI defined ‘household claims’ as ‘claims for damage to home and contents items covered by the following AAMI home and contents policies’ relating to residential properties: Home Building Insurance Policy; Home Contents Insurance Policy; Fire and Theft Contents Insurance Policy; Landlord Insurance Policy; Strata Title Landlord Insurance Policy.
  - Allianz Australia Insurance Limited defined ‘household claims’ as ‘building or contents claims on policies that provide cover for domestic home buildings and contents’ including ‘domestic home buildings and contents written under landlords and rural products’.
  - CGU Insurance Limited defined ‘household claims’ as ‘all home buildings, home contents (including valuables), and landlords claims’.
  - CommInsure defined ‘household claims’ as residential and investment policies providing home buildings and home contents cover.
  - NRMA Insurance defined ‘household claims’ as ‘all home buildings, home contents, landlord buildings and landlord contents claims’.
  - QBE Insurance (Australia) Limited defined ‘household claims’ as ‘all claims related to home building &/or home contents risks’.
  - RACQ Insurance Limited’s defined ‘household claims’ as claims made under its ‘household insurance policy’.
  - Suncorp Metway Insurance Limited defined ‘household claims’ as ‘claims for damage to

- home and contents items covered by the following Suncorp home and contents policies' relating to residential properties: Classic Home & Contents; 55UP Home & Contents; Platinum Home & Contents; Investor Home & Contents.
- 37 Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [para 41].
- 38 See correspondence from the Australian Securities and Investments Commission to CGU Insurance Limited, dated 20 April 2011, and CGU's response, dated 13 May 2011, provided by CGU in response to a Commission Requirement, 14 October 2011.
- 39 Correspondence from CGU Insurance Limited to the Australian Securities and Investments Commission, dated 30 June 2011, provided by CGU in response to the Commission Requirement, 14 October 2011; Statutory Declaration of Dion Gooderham (CGU Insurance Limited), 21 November 2011 [p5: para 30-32].
- 40 Correspondence from the Australian Securities and Investments Commission to CGU Insurance Limited, dated 3 August 2011, provided by CGU in response to a Commission Requirement, 14 October 2011.
- 41 Statement of Gregory Kirk (Australian Securities and Investments Commission), 5 October 2011, Annexure 4G.
- 42 Correspondence between Financial Ombudsman Service and CGU Insurance Limited, various dates, provided by CGU in response to a Commission Requirement, 14 October 2011.
- 43 Correspondence from the Financial Ombudsman Service to CGU Insurance Limited, dated 14 July 2011, provided by the Financial Ombudsman Service. Under its terms of reference, the Financial Ombudsman Service 'must identify systemic issues and refer [them] to the relevant Financial Services Provider [in this case, an insurer] for remedial action'. It must also report systemic issues to ASIC. A systemic issue is 'an issue that will have an effect on other persons...beyond the parties to the Dispute'. The correspondence dated 14 July 2011 states, 'A dispute has been referred to me as raising a possible systemic issue. I will be responsible for investigating the matter'. The letter states elsewhere: 'This possible systemic issue was investigated recently...'.
- 44 Correspondence from the Financial Ombudsman Service to CGU Insurance Limited, dated 26 August 2011, provided by CGU in response to a Commission Requirement, 14 October 2011.
- 45 Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [para 15, 16].
- 46 Transcript, James Merchant, 6 October 2011, Brisbane [p3816: line 25 – p3819: line 45].
- 47 Consistent with its terms of reference, the Commission defined the 2010/2011 floods as the floods that occurred in Queensland in December 2010 and January 2011.
- 48 The total number of residential and commercial claims across 'all classes' encompassed residential building, residential contents, domestic motor, domestic other, commercial property, commercial vehicles, business interruption and commercial other claims. Domestic and commercial 'other' claims include a variety of small insurance classes, including landlords insurance, farm and rural insurance and marine insurance (Statutory Declaration of Robert Whelan, 2 December 2011 [para 12-13]). The data does not include mining and heavy manufacturing claims (Statutory Declaration of Robert Whelan, 2 December 2011 [para 11]).
- 49 The Insurance Council of Australia defined the 'Queensland floods' as including:
- inundation in regional Queensland (including Ipswich) from 21 December 2010 to 14 January 2011
  - inundation in the Lockyer Valley and Toowoomba from 10-11 January 2011
  - inundation in the Brisbane local government area from 21 December 2010 to 14 January 2011 (Statutory Declaration of Robert Whelan, 2 December 2011 [para 3-4]).
- 50 The Insurance Council took 'residential claims' to mean residential building claims only, including claims for non-body corporate policies and visualised as claims arising from standalone or duplex properties in domestic use (Statutory Declaration of Robert Whelan, 2 December 2011 [para 23]).
- 51 The companies which were included were: Insurance Australia Group, Allianz Australia Insurance Limited, Auto & General Insurance, Catholic Churches Insurance, FM Global Insurance, Progressive Direct, Westpac Insurance,

- YouI, Suncorp, Ansva Insurance, Calliden Insurance, Comminsure, Lloyds, QBE Insurance (Australia) Limited, Zurich, Aioi Insurance, Assetinsure, Guild Insurance, CUNA Mutual, Great Lakes Insurance, RACQ Insurance Limited and Westfarmers Insurance (Statutory Declaration of Robert Whelan, 2 December 2011 [para 7, 9]).
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- 52 Statutory Declaration of Robert Whelan, 2 December 2011 [para 10].
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- 53 Figure 12(a) includes withdrawn claims for all insurers but RACQ Insurance Limited, which did not include withdrawn claims in its data. Withdrawn claims totalled 2,916 claims (13 per cent of N). Insurers counted composite home and contents claims differently. Four insurers – AAMI, QBE Insurance (Australia) Limited, RACQ Insurance Limited and Suncorp Metway Insurance Limited – counted composite home and contents claims as a single claim. The other insurers – Allianz Australia Insurance Limited, CGU Insurance Limited, NRMA Insurance and CommInsure – recorded composite claims as two separate claims: one home building claim and one contents claim. So, for every home and contents claim recorded by the first group of insurers, two claims were recorded by the second group – inflating the totals of the second group when compared with the first.
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- 54 ‘Storm’ is defined in RACQ Insurance Limited’s Household Insurance Policy as ‘A violent disturbance of the atmosphere associated with strong winds including a cyclone, lightning, heavy rain, hail or snow, but not continuous bad weather by itself’ (Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [Exhibit 3: p29]).
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- 55 In September 2011, QBE Insurance (Australia) Limited indicated that it received approximately 4000 claims from the 2010/2011 floods, a far greater number than indicated in Figure 1 (Statutory Declaration of Shaun Standfield, 22 September 2011 (QBE Insurance (Australia) Limited), Annexure B [para 18]). AAMI indicated that from the flooding in central and south east Queensland it received 1736 claims, of which approximately 1200 were paid and settled (Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011 [p9: para 39]).
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- 56 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [p37: para 194]. QBE Insurance (Australia) Limited received approximately 7000 claims
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- from Cyclone Yasi and 4500 claims from the Victorian Storms (Statutory Declaration of Shaun Standfield, 22 September 2011 (QBE Insurance (Australia) Limited), Annexure B [para 18]). AAMI received over 3050 claims for Cyclone Yasi (Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [para 81]). NRMA Insurance received over 1000 (Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [para 79]).
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- 57 Residential and commercial claims.
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- 58 Insurance Council of Australia, Current Disaster Statistics as at January 2012, available at: [www.insurancecouncil.com.au/industry-statistics-data/disaster-statistics](http://www.insurancecouncil.com.au/industry-statistics-data/disaster-statistics).
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- 59 Figure 12(b) excludes all outstanding and withdrawn claims. Seven of the eight insurers recorded claims accepted in part as ‘accepted’ claims. Allianz Australia Insurance Limited records partially accepted claims differently: these claims were counted in its data as ‘declined’ claims.
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- 60 As for Figure 12(b), Figure 12(c) excludes all outstanding and withdrawn claims. Seven of the eight insurers recorded claims accepted in part as ‘accepted’ claims. Allianz Australia Insurance Limited records partially accepted claims differently: these claims were counted in its data as ‘declined’ claims.
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- 61 All percentages are rounded upwards to the nearest whole percentage point. As for figures 12(b) and 12(c), Figure 12(d) excludes all outstanding and withdrawn claims. Seven of the eight insurers recorded claims accepted in part as ‘accepted’ claims. Allianz Australia Insurance Limited records partially accepted claims differently: these claims were counted in its data as ‘declined’ claims.
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- 62 The terms of cover were: ‘Storm and rainwater including stormwater runoff from areas surrounding the site, or water escaping from any water main, drain, pipe, street gutter, guttering or surface. Storm means violent wind (including a cyclone or tornado’.
- ‘Flood’ was defined in AAMI’s home building insurance policies and home contents insurance policies as:
- ‘the inundation or covering of normally dry land by water which:

- escapes or overflows from, or
- cannot enter (because it is full or has overflowed), or
- is prevented from entering (because other water has already escaped or been released from it) the normal confines of any watercourse or lake, including any that may have been modified by human intervention, or reservoir, canal, dam or stormwater channel.

Flood does not mean stormwater runoff from areas surrounding the site or water escaping from any water main, pipe, street gutter, guttering or surface.'

- 63 Allianz Australia Insurance Limited policies provided cover for 'storm, rainwater or run-off' where 'storm' was defined as 'violent wind (including cyclones and tornadoes), thunderstorms and hail which may be accompanied by rain or snow'; 'rainwater' was defined as 'rain falling naturally from the sky onto the buildings and/or ground'; and 'run-off' was defined as 'rainwater that has collected on or has flowed across normally dry ground...' Other policies provided cover for 'storm, rainwater, hail or wind', or 'storm (including cyclone or hurricane) and/or rain, which may be accompanied by... hail', or 'storm, tempest, rainwater, wind, hail or tornado, cyclone'.

The declined claims shown in figures 12(c) and 12(d) were declined under the flood exclusion or some other policy exclusion (such as wear and tear, or subsidence, for example). The definition of 'flood' in Allianz Australia Insurance Limited's generic domestic home policy was: 'the inundation of normally dry land by water that has escaped or has been released from the normal confines of any natural watercourse, lake or lagoon whether or not altered or modified or of any reservoir, canal or dam'.

Some policies excluded loss or damage caused by 'flood water combined with run-off and/or rainwater'.

- 64 Claims accepted by CGU Insurance Limited were accepted on the basis of one of the following events (depending on the policy): 'storm, rainwater or wind'; 'storm (including cyclone or hurricane) and/or rain...'; 'storm, tempest, rainwater, wind, hail, tornado, cyclone or hurricane'. The most common definition of 'flood' in CGU Insurance Limited's policies was: 'the covering of normally dry land by water

escaping or released from the normal confines of a watercourse or lake, whether or not it is altered or modified. Flood also includes water escaping from the confines of any reservoir, channel, canal or dam'.

Slightly different definitions were used in two policies. One was: 'the inundation of normally dry land by water escaping from any watercourse, lake, canal, dam or reservoir. Flood does not include inundation from rainwater that cannot flow into a stormwater drain because the drain is blocked or backed up'.

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- 65 NRMA Insurance's policies defined 'storm' as 'a violent wind, cyclone, tornado, thunderstorm or hail... or a sudden, excessive run-off of water as a direct result of a storm in your local area. It does not include persistent rain by itself'. 'Flood' was defined as: 'the covering of normally dry land by water escaping or released from the normal confines of a watercourse or lake, whether or not it is altered or modified. Flood also includes water escaping from the confines of any reservoir, channel, canal or dam'.
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- 66 'Flood', or 'River flood' was generally defined as: 'the inundation of normally dry land by water escaping from any watercourse, lake, canal, dam or reservoir'; or as 'when water that is normally contained in a water catchment system increases because of rainfall or snow melt (whether in the immediate region or elsewhere) or is deliberately released by an authority, and the water overflows onto land that is not normally covered by water into your home'.
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- 67 Defined as: 'A sudden flood caused by heavy rain that fell no more than 24 hours prior to the flash flood or stormwater run-off.'
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- 68 Defined as: 'Rising water which enters your home as a result of it running off or overflowing from any origin or cause.'
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- 69 'Flash flood' was defined as: 'The overflow of any lake, river, creek, stormwater channel, canal or any other watercourse (whether natural, altered or man made), caused by a storm, where the flooding occurs within 24 consecutive hours of the storm having commenced.'
- CommInsure also covered damage caused by 'storm', defined as:
- A violent wind (including cyclones), sometimes combined with thunder, heavy falls of rain, hail or snow; or

- Thunderstorms or hailstorms, sometimes accompanied by heavy falls of rain or snow.
- It is not persistent bad weather or heavy or persistent rain by itself.
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- 70 Defined as: ‘The inundation of normally dry land by water which has overflowed, escaped or been released from a lake, river, creek, storm water channel, canal or any other watercourse whether natural, altered or man made.’
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- 71 Figure 12(e) excludes all claims received by Suncorp. Figure 12(e), like figures 12(b) to 12(d), excludes all outstanding and withdrawn claims. Six of the seven insurers recorded claims accepted in part as ‘accepted’ claims. Allianz Australia Insurance Limited records partially accepted claims differently: these claims were counted in its data as ‘declined’ claims.
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- 72 Submission by the Financial Ombudsman Service Limited to the Natural Disaster Insurance Review, July 2011 [p13].
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- 73 Seven of the eight insurance providers treated disputes resolved by way of mutual agreement as being resolved in favour of the insured. CGU Insurance did not have any claims that were resolved by way of mutual agreement.
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- 74 Total disputed claims across the eight insurers was 1331, as shown in Figure 12(f). Total decided claims across the eight insurers was 19833, as shown in figures 12(b) to 12(d).
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- 75 Section 35 of the *Insurance Contracts Act 1984* requires an insurer to clearly inform a policy-holder, before the insurance contract is entered into, of the terms of the contract that differ from the standard terms of a prescribed contract under the *Insurance Contract Regulations 1985*. A contract for home buildings and home contents insurance is a prescribed contract under the regulations. The regulations prescribe that such contracts include flood insurance. Under s 35 of the Act, if an insurer fails to clearly inform a policy-holder that flood is excluded from cover, the insurer is not entitled to rely on the exclusion.
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- 76 Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 [p110: para 14.13].
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- 77 *Moss v Sun Alliance Aust Ltd* (1990) 55 SASR 145; *B H Gutteridge & Anor v Commonwealth of Australia* (unreported), Supreme Court of Queensland, Ambrose J, 25 June 1993.
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- 78 Exhibit 587, General Insurance Code of Practice [section 3.1].
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- 79 Exhibit 587, General Insurance Code of Practice [section 3.2.5].
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- 80 Exhibit 587, General Insurance Code of Practice [section 3.3].
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- 81 Exhibit 587, General Insurance Code of Practice [section 4.3].
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- 82 Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 [p24: para 1.35]. This statement was based on unpublished data the Insurance Council of Australia provided to the Review Panel.
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- 83 Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 23 September 2011, Annexure B [para 18].
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- 84 For example, two claims were determined in two months: Raymond Byron (2 months): see Exhibit 591, Third Affidavit of Graham Dale (RACQ Insurance Limited), 14 September 2011 [para 8]; Michael Gourley (2 months): see Exhibit 898, Ninth Affidavit of Graham Dale (RACQ Insurance Limited), 19 October 2011, Exhibit 5. Six claims were determined in two to three months: Robert Clements (2 months, 5 days): see Exhibit 649, Letter from Allianz Australia Insurance Limited to Robert Clements, 18 March 2011 and Statement of Garry Townsend (Allianz Australia Insurance Limited), 16 September 2011 [para 3.6]; Attachment 1.2; Gary Lobley (2 months, 2 weeks): see Exhibit 878, Statement of James Higgins (AAMI), 13 October 2011 [para 8 and 10-15]; Kristy Sihvola (2 months, 3 weeks): see Exhibit 891, First Affidavit of Graham Dale (RACQ Insurance Limited), 1 September 2011 [para 6 and 26]; Lynn Doyle (2 months, 3.5 weeks): see Exhibit 626, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011 [para 4 and 6]; Leslie Cameron (2 months, 3.5 weeks): see Exhibit 897, Seventh Affidavit of Graham Dale (RACQ Insurance Limited), 13 October 2011, Exhibit 5; Dennis Ward (3 months): see Exhibit 879, Statement of James Higgins (AAMI), 3 October 2011 [para 8]. Three claims were determined in three to four months: Sharron Campbell (3 months, 1 week): see Exhibit 719, Statutory Declaration of Matthew Jarrett (NRMA Insurance), 22 September 2011 [para 18 and 33]; Sallyanne Doyle (3 months, 2 weeks): see Exhibit 717, Statutory Declaration of James Merchant (CGU

- Insurance Limited), 3 October 2011 [para 9 and 59]; Julian and Rebecca Chambers (4 months); see Exhibit 843, Statement of James Higgins (AAMI), 7 October 2011 [para 8].
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- 85 Three claims were determined in four to five months: Colin Sharp (4 months, 2 weeks): see Exhibit 851, Eighth Affidavit of Graham Dale (RACQ Insurance Limited), 15 October 2011, Exhibit 3; Thomas Fischer (4 months, 3.5 weeks): see Exhibit 593, Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 14 September 2011, Attachment 2; Josephine Sledge (4 months, 3.5 weeks): see Exhibit 896, Sixth Affidavit of Graham Dale (RACQ Insurance Limited), 13 October 2011 [para 13 and 104].
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- 86 QBE Insurance (Australia) Limited received the report for Toowoomba on 18 February 2011; the report for the Brisbane River Catchment on 9 March 2011; the report for the Brisbane Local Government Area 9 March 2011; the report for Ipswich on 22 March 2011; the report for the Lockyer Valley on 29 March 2011; and report for the Somerset Local Government Area on 27 April 2011 (Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 23 September 2011, Annexure B [para 12.3.3]).
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- 87 QBE Insurance (Australia) Limited indicated that it took, on average, 35 business days to determine claims arising from the 2010/2011 floods, but that if a site-specific hydrology report were not required, claims would generally be determined in less than 35 business days. If a site-specific report were obtained, determinations may have taken more than 35 business days (Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 23 September 2011, Annexure B [para 18]).
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- 88 Exhibit 1026, Statement of Mark Richards (AAMI), 8 November 2011 [para 13].
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- 89 Statement of Garry Townsend (Allianz Australia Insurance Limited), 12 September 2011 [para 17].
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- 90 See, for example, Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [para 173-182]; Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 167-187]; Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 23 September 2011 [para 17]; Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [para 76]; Statement of Garry Townsend (Allianz Australia Insurance Limited), 12 September 2011 [para 17]; Statement of Paul Fahey (CommInsure), 23 September 2011, Appendix A [p19]; Exhibit 742, Statutory declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [para 12.3.3 ,17].
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- 91 Figure 12(g), includes outstanding claims, but does not include withdrawn claims. All percentages are rounded upwards to the nearest whole percentage point. All references to 'days' includes business days only. 'Months' means calendar months.
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- 92 Exhibit 873, Statement of James Higgins (Suncorp Group Limited), 30 September 2011 [para 6-9].
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- 93 Excluding withdrawn claims.
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- 94 As for Figure 12(g), Figure 12(h) includes outstanding claims, but does not include withdrawn claims. All percentages are rounded upwards to the nearest whole percentage point. All references to 'days' includes business days only. 'Months' means calendar months. The timeframes in Figure 8 are not definitive because different insurers took different approaches to what constituted a 'decision' date. Five of the seven insurers – CGU Insurance Limited, NRMA Insurance, CommInsure, Allianz Australia Insurance Limited and QBE Insurance (Australia) Limited – provided data indicating the time taken to determine liability and also communicate the decision to policy-holders. Generally policy-holders were informed of the decision on the same day it was made, or only a short time afterwards. One insurer (Allianz Australia Insurance Limited), however, said that the time between making a decision to decline a claim and notifying the policy-holder of the decision, could be as many as eight days. RACQ Insurance Limited's data did not encompass when decision dates were communicated to policy-holders. It indicated when the General Manager for Personal Insurance Claims made decisions about liability and conveyed those decisions to the claims officers. The insurer said, however, decisions were generally communicated to policy-holders soon after they were made.
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- 95 This excludes withdrawn claims but includes outstanding claims.
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- 96 For example, 96 per cent of Allianz Australia Insurance Limited claims decided in 10 days or less were accepted and 85 per cent of Allianz Australia Insurance Limited claims decided

within one month were accepted; 95 per cent of RACQ Insurance Limited claims decided in 10 days or less were accepted and 93 per cent of RACQ Insurance Limited claims decided within one month were accepted; 94 per cent of CommInsure claims decided in 10 days or less were accepted and 61 per cent of claims decided within one month were accepted; 70 per cent of CGU Insurance Limited claims decided in 10 days or less were accepted and 64 per cent of claims decided within one month were accepted.

- 97 Figure 12(i) excludes outstanding and withdrawn claims. Five of the six insurers recorded claims accepted in part as ‘accepted’ claims. Allianz Australia Insurance Limited records partially accepted claims differently: these claims were counted in its data as declined claims. RACQ Insurance Limited was instructed to treat 247 Ipswich claims, which were originally declined but later accepted in bulk in August 2011, as accepted claims. For details, see section on Ipswich re-assessment.

As for figures 12(g) and 12(h):

- All percentages are rounded upwards to the nearest whole percentage point.
- All references to ‘days’ includes business days only. ‘Months’ means calendar months.
- The timeframes in Figure 8 are not definitive because different insurers took different approaches to what constituted a ‘decision’ date. Five of the seven insurers – CGU Insurance Limited, NRMA Insurance, CommInsure, Allianz Australia Insurance Limited and QBE Insurance (Australia) Limited – provided data indicating the time taken to determine liability and also communicate the decision to policy-holders. Generally policy-holders were informed of the decision on the same day it was made, or only a short time afterwards. One insurer (Allianz Australia Insurance Limited), however, said that the time between making a decision to decline a claim and notifying the policy-holder of the decision, could be as many as eight days. RACQ Insurance Limited’s data did not encompass when decision dates were communicated to policy-holders. It indicated when the General Manager for Personal Insurance Claims made decisions about liability and conveyed those decisions to the claims officers. The insurer said, however,

decisions were generally communicated to policy-holders soon after they were made.

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- 98 Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 [p115, para 14.36; p116, para 14.40-14.43; Recommendations 39 and 40].
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- 99 Insurance Council of Australia, Media Release: ‘QLD Insurance Claims Assessments Near Completion’, 10 May 2011.
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- 100 Figure 12(j) includes outstanding claims, but does not include withdrawn claims. All percentages are rounded upwards to the nearest whole percentage point. All references to ‘days’ includes business days only. ‘Months’ means calendar months.
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- 101 Figure 12(k) excludes outstanding and withdrawn claims. All percentages are rounded upwards to the nearest whole percentage point. All references to ‘days’ includes business days only. ‘Months’ means calendar months.
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- 102 The Commission did not compare the data AAMI provided with that of other insurers concerning finalisation of claims because it was not able to be satisfied, at the time of writing, that the data was comparable.
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- 103 The Insurance Council of Australia took ‘residential claims’ to mean residential building claims only, including claims for non-body corporate policies and visualised as claims arising from standalone or duplex properties in domestic use (Statutory Declaration of Robert Whelan, 2 December 2011 [para 23]).
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- 104 As at 24 November 2011. Across residential and commercial claims, 86 per cent of claims had been ‘closed’ and 14 per cent remained ‘open’. See Insurance Council of Australia, General insurance claims response – 2010/2011 Queensland floods and cyclone, 24 November 2011 [p2-3]. The Insurance Council of Australia’s report is available online at [www.insurancecouncil.com.au](http://www.insurancecouncil.com.au). NRMA Insurance indicated to the Commission that 97 per cent of all accepted claims had been finalised as at 1 December 2011. RACQ Insurance Limited informed the Commission that, as at 30 September 2011, it had finalised 91 per cent of household claims arising from the 2010/2011 floods (Exhibit 893, Updated Table – RACQ Insurance Limited Finalisation Table as at 30 September 2011).
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- 105 The Insurance Council of Australia did not seek further clarification as to how individual insurers interpret and record ‘open’ or ‘closed’

- claims. The Commission's experience was that different insurers record the finalisation date of claims at different times: some when the decision is finalised internally and others when the decision is communicated to the customer and the customer's file is closed on the insurer's records system. There is some potential, based on the Commission's experience, that some insurers interpreted 'closed' claims as encompassing more or fewer claims than other insurers.
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- 106 Figure 12(l) includes outstanding claims, but does not include withdrawn claims. All percentage points are rounded upwards to the nearest whole percentage point. 'Months' means calendar months.
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- 107 Figure 12(m) includes outstanding claims, but does not include withdrawn claims. All percentage points are rounded upwards to the nearest whole percentage point. 'Months' means calendar months.
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- 108 CGU Insurance Limited indicated that manual processing of invoices generally took three business days.
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- 109 See, for example: Statement of Garry Townsend (Allianz Australia Insurance Limited), 12 September 2011 [para 36]; Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 22 September 2011 [para 36]; Statement of Paul Fahey (CommInsure), 23 September 2011, Appendix A [p28-36]; Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [para 132-33]; Exhibit 871, Statement of James Higgins (Suncorp Metway Insurance Limited), 14 September 2011 [para 230-238]; Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [para 255-263]; Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [para 34]; Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 266-272].
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- 110 Figure 12(n) includes outstanding claims, but does not include withdrawn claims. All percentage points are rounded upwards to the nearest whole percentage point. 'Months' means calendar months. In this figure, 'finalised' claims only include claims that have been closed. It does not include claims where partial or progress payments have been made.
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- 111 The duty of utmost good faith does require insurers to settle claims promptly (*Moss v Sun Alliance Aust Ltd* (1990) 55 SASR 145).
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- 112 Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 [p115: para 14.37].
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- 113 Exhibit 879, Statement of James Higgins (AAMI), 3 October 2011, Annexure 2; Exhibit 1030, Statement of Jamie Dobbs (Vero Insurance), 7 October 2011, Annexure 1; Exhibit 674, Statement of James Higgins (Suncorp Metway Insurance Limited), 27 September 2011 [para 60]; Exhibit 877, Statement of James Higgins (Suncorp Metway Insurance Limited), 14 September 2011 [para 20-25]; Exhibit 591, Third Affidavit of Graham Dale (RACQ Insurance Limited), 14 September 2011; Exhibit 894, Fourth Affidavit of Graham Dale (RACQ Insurance Limited), 16 September 2011.
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- 114 Exhibit 587, General Insurance Code of Practice [sections 6.2, 6.6].
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- 115 Exhibit 587, General Insurance Code of Practice [sections 6.3, 6.7].
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- 116 Exhibit 587, General Insurance Code of Practice [section 4.3].
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- 117 Exhibit 587, General Insurance Code of Practice [section 6.10].
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- 118 Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 [p117-118: para 14.50-14.59; Recommendation 42].
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- 119 Figure 15 includes outstanding claims, but does not include withdrawn claims. All references to 'days' includes business days only. 'Months' means calendar months. All percentages are rounded upwards to the nearest whole percentage point. Seven of the eight insurers measured the time taken to finalise internal reviews from the date the request for a review was made. RACQ Insurance Limited measured the time taken to finalise internal reviews from the date the policy-holder provided substantive submissions, rather than the date that the policy-holder indicated that he or she would be disputing a decision. However, insurers used slightly different 'completion' dates. AAMI, Allianz Australia Insurance Limited, CommInsure, CGU Insurance Limited, NRMA Insurance and Suncorp Metway Insurance Limited used the date on which the decision was communicated to the policy-holder. QBE

Insurance (Australia) Limited also did so, but where an extension was agreed with the insured, it used the agreed date as the end date. RACQ Insurance Limited used the date that the review was completed internally, though it indicated that the customer was usually advised on the same day. Figure 15 must be read with these slight differences in mind. In addition, in Suncorp Metway Insurance Limited's case, the disputes were not about the insurer's decisions about cause of inundation. The exclusion of Suncorp Metway Insurance Limited's data, however, has little effect on the results shown in Figure 15.

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- 120 See, for example: Leslie Cameron (5 business days): see Exhibit 897, Seventh Affidavit of Graham Dale (RACQ Insurance Limited), 13 October 2011 [para 40, 44-45]; Sally Doyle (6 business days): see Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011 [para 59 and 76]; Gary Lobley (7 business days): Exhibit 878, Statement of James Higgins (AAMI), 13 October 2011 [para 49 and 53]; Colin Sharp (8 business days): see Exhibit 851, Eighth Affidavit of Graham Dale (RACQ Insurance Limited), 15 October 2011 [para 46 and 50]; Kristy Sihvola (10 business days): see Exhibit 891, First Affidavit of Graham Dale (RACQ Insurance Limited), 1 September 2011 [para 42 and 51]. Michael Gourley (15 business days): Exhibit 898, Ninth Affidavit of Graham Dale (RACQ Insurance Limited), 19 October 2011 [Exhibit 5]. One matter (Nick Laszlo) was finalised in 16 business days: see Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011 [para 53, 61].
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- 121 Transcript, Thomas Fischer, 22 September 2011, Brisbane [p3009: lines 25-45]; Exhibit 593, Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 14 September 2011, Annexure B [para 8].
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- 122 Statement of Gary Townsend (Allianz Australia Insurance Limited), 16 September 2011 [para 5.1 and 5.5]; Exhibit 658, Email from Robert Clements to Allianz, 11 August 2011; Transcript, Robert Clements, 27 September 2011, Brisbane [p3269: line 35]; Exhibit 647, Statement of Robert Clements, 13 September 2011 [para 9].
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- 123 Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 [p110; para 14.14]. The Australian Securities and Investments Commission noted, in a different context, that advising a policy-holder calling to make a claim that the claim is likely to be denied can have the effect of dissuading him or her from proceeding with the claim (Report 245: Review of general insurance claims handling and internal dispute resolution procedures, August 2011 [p25: para 133-137]). In dealing with the claims arising from the 2010/2011 floods, some insurers advised policy-holders when they called to claim that their policy did not cover damage caused by flood. The Commission expresses no view as to whether or not it is better for an insurer to advise a policy-holder calling to make a claim that their claim is likely to be denied. Provided that advice is given in good faith, and that a policy-holder is informed that if a claim is lodged, it will be fully assessed, the Commission acknowledges that some policy-holders would prefer to have this early indication of likelihood of denial of claim, rather than being lulled into a sense of false hope.
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- 124 This information is current as at 30 November 2011 (correspondence from Insurance Council of Australia to the Commission, 30 November 2011). The change arose from consultation between the Insurance Council of Australia, the ASIC and consumer advocates at the end of 2010 about ASIC's Regulatory Guide 165 on Dispute Resolution (see ASIC's Report 245: Review of general insurance claims handling and internal dispute resolution procedures, August 2011 [p25: para 137] and correspondence from Insurance Council of Australia to the Commission, 30 November 2011).
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- 125 This was also raised with the Natural Disaster Insurance Review, Inquiry into flood insurance and related matters, September 2011 [p24: para 1.35; p110: para 14.14].
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- 126 Exhibit 587, General Insurance Code of Practice [section 3.2.3].
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- 127 Exhibit 587, General Insurance Code of Practice [section 4.3].
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- 128 Exhibit 871, Statement of James Higgins (Suncorp Metway Insurance Limited), 14 September 2011 [para 175]; Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [para 204]; Transcript, James Higgins (Suncorp Metway Insurance Limited/AAMI), 25 October 2011, Brisbane [p4319: line 46].
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- 129 RACQ Insurance Limited informed the Commission that during 2010 its 'Teleclaims' call centre received around 35 000 calls per month. In January 2011, the call centre received 60 090 calls

- and 71 463 calls in February 2011. It said this volume of calls was 'unprecedented' (Exhibit 896, Sixth Affidavit of Graham Dale (RACQ Insurance Limited), 13 October 2011 [para 47]).
- 130 RACQ Insurance Limited informed the Commission that calls took longer to answer during December 2010 and January and February 2011. The highest average wait time was in February: 264 seconds (Exhibit 896, Sixth Affidavit of Graham Dale (RACQ Insurance Limited); see also Transcript, Graham Dale (RACQ Insurance Limited), Brisbane, 27 October 2011 [p4449: line 16].
- 131 See, for example, Transcript, Sharron Campbell, 5 October 2011, Brisbane [p3682: lines 45-53].
- 132 Transcript, Sharron Campbell, 5 October 2011, Brisbane [p3683: lines 1-8].
- 133 Transcript, Graham Spackman, 29 September 2011, Emerald [p3403: lines 48-55].
- 134 Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited, 22 September 2011, Annexure B [para 19]; Attachment 7.
- 135 Submission by the Financial Ombudsman Service Limited to Natural Disaster Insurance Review, July 2011 [p10-11].
- 136 Exhibit 587, General Insurance Code of Practice [section 3.2.3].
- 137 Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [para 81]; Transcript, Dominic Dower (NRMA Insurance), 6 October 2011, Brisbane [p3836: line 39].
- 138 Exhibit 659, Email from Allianz Australia Insurance Limited to Robert Clements, 16 August 2011; Statement of Garry Townsend (Allianz Australia Insurance Limited), 16 September 2011 [para 5.5].
- 139 See, for example, Exhibit 673, Statement of Cresta Richardson, 15 September 2011 [para 8].
- 140 Exhibit 674, Statement of James Higgins (Suncorp Metway Insurance Limited), 27 September 2011 [para 43]; Transcript, Graham Dale (RACQ Insurance Limited), 28 October 2011, Brisbane [p4559: line 45 – p4560: line 5]; Transcript, Dominic Dower (NRMA Insurance), 6 October 2011, Brisbane [p3825: line 22 – p3826: line 3].
- 141 Exhibit 843, Statement of James Higgins (AAMI), 7 October 2011 [para 22]; Annexure 2; Transcript, Sharron Campbell, 5 October 2011, Brisbane [p3676: lines 19-40].
- 142 Transcript, Judith Dobrowa, 27 September 2011, Brisbane [p3282: lines 1-39]; Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3657: lines 8-21].
- 143 Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [para 91]; Transcript, Dominic Dower (NRMA Insurance), 6 October 2011, Brisbane [p3832: line 23]; Statement of Paul Fahey (CommInsure), 12 September 2011, Appendix A [p36].
- 144 Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4477: lines 50-60; p4478: lines 22-48].
- 145 Transcript, James Merchant (CGU Insurance Limited), 6 October 2011, Brisbane [p3818: line 47 – p3819: line 8].
- 146 Exhibit 843, Statement of James Higgins (AAMI), 7 October 2011 [para 34]; Annexure 2. The insurer determined that the policy-holder had not been given incorrect information.
- 147 Transcript, James Higgins (AAMI), 25 October 2011, Brisbane [p4345: line 43; p4248: lines 40-56]; Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [p10: para 47; p23: para 122]; Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011 [p4454: lines 11-52].
- 148 See, for example, Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4453: 10 – p4454: line 1]; Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [p11: para 52]; Exhibit 824, First Affidavit of Bradley Heath (RACQ Insurance Limited), 23 September 2011 [p3: para 14]; Transcript, Dominic Dower (NRMA Insurance), 6 October 2011, Brisbane [p3834: line 55; p3835: line 20]; Statement of Garry Townsend (Allianz Australia Insurance Limited), 12 September 2011 [p14: para 17]. In some cases, AAMI did not rely on hydrology reports (Transcript, James Higgins (AAMI), 25 October 2011, Brisbane [p4324: lines 28-50]).
- 149 NRMA Insurance obtained reports which related to particular properties and to particular streets (Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [p14: para 64]).

- 150 Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4452: lines 12-15; p4478: line 50 – p4479: line 10]; Exhibit 892, Statutory Declaration of Graham Dale (RACQ Insurance Limited), 19 September 2011 [p12: para 58 – p13: para 61; p20: para 108; p22: para 116 – p24: para 123; p29: para 149-150].
- 151 The reports of the Insurance Council of Australia hydrology panel are available on the Insurance Council's website: [www.insurancecouncil.com.au](http://www.insurancecouncil.com.au).
- 152 Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [p26: para 145; p28: para 158-159]; Statement of Garry Townsend (Allianz Australia Insurance Limited), 12 September 2011 [p11: para 12.3.1, 12.3.3; p12: para 12.3.5]. QBE Insurance (Australia) Limited also obtained reports for regions which were not covered by the Insurance Council's reports (Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 22 September 2011, Annexure B [p6: para 12.3.1; p7: para 12.3.3]).
- 153 Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [p12-13: para 12.3.1]; Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011, Appendix A [p12: para 56 – p13: para 63].
- 154 Statement of Paul Fahey (CommInsure), 23 September 2011, Appendix A [p10, 15-16].
- 155 See, for example, Statement of Garry Townsend (Allianz Australia Insurance Limited), 12 September 2011 [p11: para 12.3.3]; Statement of Paul Fahey (CommInsure), 23 September 2011, Appendix A [p16].
- 156 For example, one insurer took a ‘staged approach’ to determining what information was required, considering whether site-specific hydrology was required once it had reviewed the general hydrology information (Exhibit 1024, Statement of Jane Pires (AAMI), 8 November 2011 [p1-2: para 7]). See *12.7.2 Site-specific hydrology reports* for more information as to when this second stage would be adopted.
- 157 Transcript, Dominic Dower (NRMA Insurance), 6 October 2011, Brisbane [p3829: line 39].
- 158 As at 1 November 2011, NRMA Insurance had received a total of 2955 household claims, including 584 claims which were withdrawn and 1 claim which had not been determined.
- Withdrawn claims are excluded from the figure cited in the text. For more information, see *12.4 The picture as a whole*.
- 159 Transcript, James Merchant (CGU Insurance Limited), 6 October 2011, Brisbane [p3813: line 17].
- 160 As at 1 November 2011, CGU Insurance Limited had received a total of 3897 household claims, including 1076 claims which were withdrawn and 284 claims which had not been determined. Withdrawn claims are excluded from the figure cited in the text. For more information, see *12.4 The picture as a whole*.
- 161 Statement of Paul Fahey (CommInsure), 23 September 2011, Appendix A [p16].
- 162 As at 1 November 2011, CommInsure had received a total of 1644 household claims, including 171 claims which were withdrawn and 11 claims which had not been determined. Withdrawn claims are excluded from the figure cited in the text. For more information, see *12.4 The picture as a whole*.
- 163 Exhibit 1025, Statement of Peter Unwin (AAMI), 8 November 2011 [p1: para 4]. See also, Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011 [p9-10: para 40].
- 164 As at 1 November 2011, AAMI had received a total of 1,560 household claims, including 176 claims which were withdrawn and 164 claims which had not been determined. Withdrawn claims are excluded from the figure cited in the text. For more information, see *12.4 The picture as a whole*.
- 165 Exhibit 1024, Statement of Jane Pires (AAMI), 8 November 2011 [p1: para 4].
- 166 Statement of Garry Townsend (Allianz Australia Insurance Limited), 12 September 2011 [p6: para 5; p12-13: para 12.3.5.1]; Statement of Paul Fahey (CommInsure), 23 September 2011, Appendix A [p16]; Exhibit 892, Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [p12-13: para 58-61; p39: para 202]. Transcript, James Higgins (AAMI), 25 October 2011, Brisbane [p4319: line 19].
- 167 Exhibit 1024, Statement of Jane Pires (AAMI), 9 November 2011 [p1-2: para 7]. See also Exhibit 843, Statement of James Higgins (AAMI), 7 October 2011 [p11: para 54]: ‘it was exceptionally difficult, if not impossible, to obtain site-specific reports.’

- 168 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigations into Causes of Property Inundation: Overview of Insurance Reports*, 5 November 2011 [p8: para 11-13]; Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigations into Causes of Property Inundation: Review of Insurance Reports*, 6 November 2011 [p10-11: para 29-30]; Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigation into Causes of Property Inundation: Review of Four Insurance Matters*, 14 December 2011 [p3: para 6 and 8].
- 169 Sinclair Knight Mertz advised that where storm events had an intensity of less than the 2-Year ARI, it is considered most unlikely that they would have been sufficient to exceed the local drainage system (Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigation into Causes of Property Inundation: Review of Four Insurance Matters*, 14 December 2011 [p3: para 9]).
- 170 RACQ Insurance Limited's household policy provided cover for 'flash flood and/or stormwater run-off' which was defined as: 'A sudden flood caused by heavy rain that fell no more than 24 hours prior to the flash flood or stormwater run-off'. CommInsure also provided cover for 'flash flood', defined as: 'The overflow of any lake, river, creek, stormwater channel, canal or any other watercourse (whether natural, altered or man made), caused by a storm, where the flooding occurs within 24 consecutive hours of the storm having commenced.'
- 171 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigation into Causes of Property Inundation: Review of Four Insurance Matters*, 14 December 2011 [p4-5: para 13; p8: para 22].
- 172 Insurance Council of Australia Hydrology Panel, Flooding in the Brisbane River Catchment January 2011: Volume 3, Flooding in Ipswich City LGA, 20 February 2011 [p98]. The report is available on the Insurance Council of Australia's website: [www.insurancecouncil.com.au](http://www.insurancecouncil.com.au).
- 173 See, for example, Statement of Garry Townsend (Allianz Australia Insurance Limited), 12 September 2011 [p6: para 5]; Statutory Declaration of Shaun Standfield, 22 September 2011 (QBE Insurance (Australia) Limited), Annexure B [para 12.3.5.1-12.3.5.2].
- 174 See, for example, Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [p28: para 160]; Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011 [p9-10: para 40]; Transcript, James Higgins (AAMI), 25 October 2011, Brisbane [p4310: lines 47-55]; Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 22 September 2011, Annexure B [para 12.3.5].
- 175 Transcript, James Higgins (AAMI), 25 October 2011, Brisbane [p4311: lines 8-22].
- 176 Transcript, Dominic Dower (NRMA Insurance), 6 October 2011, Brisbane [p3829: lines 20-25].
- 177 Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [para 70].
- 178 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigation into Causes of Property Inundation: Review of Four Insurance Matters*, 14 December 2011 [p8-10: para 23-38]. For details of the particular matters, see Statement of Garry Townsend (Allianz Australia Insurance Limited), 16 September 2011; Exhibit 843, Statement of James Higgins (AAMI), 7 October 2011; Exhibit 878, Statement of James Higgins (AAMI), 13 October 2011.
- 179 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigation into Causes of Property Inundation: Review of Four Insurance Matters*, 14 December 2011 [p4: para 10 – p5: para 15]. For details of the particular matter, see Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011.
- 180 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigations into Causes of Property Inundation: Overview of Insurance Reports*, 5 November 2011 [p8: para 11-13].
- 181 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [p23: para 122].
- 182 Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [para 147-150 and 160]; Transcript, James Higgins (AAMI), 25 October 2011, Brisbane [p4311: lines 1-6; p4315: line 42; p4316: line 3]; Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [p12: para 12.3.1; p14: 12.3.5]; Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [para 65 and 70] and Transcript, Dominic Dower, 6 October 2011, Brisbane [p3829: lines 20-43]. See also Exhibit 719, Statutory Declaration of Matthew Jarrett (NRMA Insurance), 22 September 2011 [para 25]; Statement of Paul Fahey (CommInsure),

- 23 September 2011, Appendix A [p16-17]; Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 22 September 2011, Annexure B [para 12.3.5]; Statement of Garry Townsend (Allianz Australia Insurance Limited), 12 September 2011, Annexure B [para 12.3.3 and 12.3.5.2].
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- 183 Transcript, Dominic Dower, 6 October 2011, Brisbane [p3829: lines 20-43]. See also Exhibit 719, Statutory Declaration of Matthew Jarrett (NRMA Insurance), 22 September 2011 [para 25].
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- 184 Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [p28: para 160].
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- 185 Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 22 September 2011, Annexure B [para 12.3.5.1].
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- 186 Exhibit 593, Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 14 September 2011; Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011; Exhibit 626, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011; Exhibit 879, Statement of James Higgins (AAMI), 28 September 2011; Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011; Exhibit 719, Statutory Declaration of Matthew Jarrett (NRMA Insurance), 22 September 2011 [para 25-26].
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- 187 Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011 [p3: para 11]; Transcript, James Higgins (AAMI), 25 October 2011, Brisbane [p4311: line 31].
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- 188 Exhibit 879, Statement of James Higgins (AAMI), 28 September 2011 [p6: para 21-22].
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- 189 Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [para 66 and 115]; Statement of Garry Townsend (Allianz Australia (Insurance) Limited), 12 September 2011 [para 12.3.5.2]; Statement of Paul Fahey (CommInsure), 23 September 2011, Appendix A [p16].
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- 190 Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 22 September 2011, Annexure B, Attachment 4; Water Technology, Supplementary report, 14 September 2011; Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 11; Annexure 18; Exhibit 719, Statutory Declaration of Matthew Jarrett (NRMA Insurance), 22 September 2011, Annexure A [p141-150]; Statement of Garry Townsend (Allianz Australia Insurance Limited), Attachment 5.2; Exhibit 843, Statement of James Higgins (AAMI), 7 October 2011, Annexure 3; Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011, Annexure 8.
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- 191 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigations into Causes of Property Inundation: Review of Insurance Reports*, 6 November 2011 [p11: para 31].
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- 192 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigations into Causes of Property Inundation: Review of Insurance Reports*, 6 November 2011 [p9: para 27; p13: para 32].
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- 193 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigations into Causes of Property Inundation: Review of Insurance Reports*, 6 November 2011 [p9: para 28; p11: para 31; p13: para 33].
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- 194 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigations into Causes of Property Inundation: Review of Insurance Reports*, 6 November 2011 [p7: para 26].
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- 195 The Financial Ombudsman Service, Circular: Flood Edition, Issue 7, Update 1, November 2011, available at [http://fos.org.au/centric/home\\_page/publications/the\\_circular.jsp](http://fos.org.au/centric/home_page/publications/the_circular.jsp). In a number of cases, the ombudsman has ruled that insurers were liable to pay part of a policy-holder's claim because he was persuaded that stormwater run-off had initially caused damage before flood water inundated the property. See the following determinations, for example, which are available on the Financial Ombudsman Service's website: case numbers 241994, 243793, 242183, 241145, 235302, 239580, 239578, 239186 and 235758.
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- 196 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [p21-22: para 115; p27: para 138, 140]; Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [p25: para 135, 139; p26: para 144; p31: para 178]; Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 22 September 2011, Annexure B [para 12.1.1]; Statement of Garry Townsend (Allianz Australia Insurance Limited), 12 September 2011 [para 12 and 12.1]. NRMA Insurance used its internal loss assessors (Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [para 51]).
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- 197 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [p21-22: para 115]; Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [p25: para 140]; Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [para 23, 54]; Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 22 September 2011, Annexure B [para 12.1.2].
- 198 Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [p25-26: para 143; p31-32: para 179]; Transcript, James Higgins (AAMI), 25 October 2011, Brisbane [p4312: line 31; p4317: line 35].
- 199 Statement of Paul Fahey (CommInsure), 23 September 2011, Annexure A [p4].
- 200 Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [p11: para 12.2.3, 12.2.4]; Transcript, James Merchant, 6 October 2011, Brisbane [p3807: lines 10-45]. Loss assessors were not appointed if the insurer considered that a policy-holder's responses to a standard set of questions, aerial photography, flood mapping and an area hydrologist 'conclusively' established the cause of damage.
- 201 See, for example, Exhibit 593, Statutory Declaration of Shaun Standfield (QBE Insurance (Limited) Australia), 14 September 2011, Annexure B; Attachment 1; Exhibit 879, Statement of James Higgins (AAMI), 28 September 2011, Annexure 5; Exhibit 878, Statement of James Higgins (AAMI), 13 October 2011, Annexure 4; Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011, Annexure 4; Statement of Garry Townsend (Allianz Australia Insurance Limited), 16 September 2011, Attachment 2.3.
- 202 Statement of Garry Townsend (Allianz Australia Insurance Limited), 12 September 2011 [p9: para 12, 12.1.3; p14: para 17].
- 203 Statement of Garry Townsend (Allianz Australia Insurance Limited), 16 September 2011, Attachment 2.3 [p3].
- 204 Statement of Garry Townsend (Allianz Australia Insurance Limited), 16 September 2011 [p8: para 3.8-3.9].
- 205 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigation into Causes of Property Inundation: Review of Four Insurance Matters*, 14 December 2011 [p8: para 23 – p9: para 28].
- 206 Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [p25: para 141].
- 207 Transcript, James Higgins, 25 October 2011, Brisbane [p4312: line 5].
- 208 Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011, Annexure 6.
- 209 Transcript, James Higgins, 25 October 2011, Brisbane [p4310: line 50].
- 210 Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011, Annexure 4 [p2]; Exhibit 878, Statement of James Higgins (AAMI), 13 October 2011, Annexure 4; Exhibit 843, Statement of James Higgins (AAMI), 7 October 2011, Annexure 6 [p2].
- 211 Exhibit 879, Statement of James Higgins (AAMI), 28 September 2011, Annexure 5 [p3].
- 212 Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011, Annexure 7; Transcript, James Higgins, 25 October 2011, Brisbane [p4307: line 41].
- 213 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigation into Causes of Property Inundation: Review of Four Insurance Matters*, 14 December 2011 [p9: para – p23: para 38].
- 214 CGU Insurance Limited, Notice to Loss Adjusters – January 2011, provided in response to the Commission Requirement, 14 October 2011.
- 215 Statutory Declaration of James Merchant (CGU Insurance Limited), 25 November 2011 [p2: para 10.1; p3: para 13-14]; Transcript, James Merchant, 6 October 2011, Brisbane [p3820: line 2; p3821: lines 8-11].
- 216 Statutory Declaration of James Merchant (CGU Insurance Limited), 25 November 2011 [p2: para 10.3].
- 217 CGU Insurance Limited, Notice to Loss Adjusters – January 2011, provided in response to the Commission Requirement, 14 October 2011.
- 218 Statutory Declaration of James Merchant (CGU Insurance Limited), 25 November 2011 [p2: para 11-12; p3: para 21].
- 219 Statutory Declaration of James Merchant (CGU Insurance Limited), 25 November 2011 [p3: para 14-15, 17-18].

- 220 Statutory Declaration of James Merchant (CGU Insurance Limited), 25 November 2011 [p2: para 10.4; p3: para 21].
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- 221 Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 4.
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- 222 Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 9.
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- 223 Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011 [p2: para 6.7]; Annexure 2.
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- 224 Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011 [p2-3: para 7].
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- 225 Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 2 [p5].
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- 226 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigation into Causes of Property Inundation: Review of Four Insurance Matters*, 14 December 2011 [p6: para 17-18].
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- 227 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigation into Causes of Property Inundation: Review of Four Insurance Matters*, 14 December 2011 [p6: para 17].
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- 228 Statutory Declaration of Dion Gooderham (CGU Insurance Limited), 21 November 2011 [p4: para 23]. The term 'triage process' was used in correspondence between the Australian Securities and Investments Commission and CGU Insurance Limited (see CGU Insurance Limited's response to the Commission Requirement, 14 October 2011), and in the Commission's public hearings (see, for example, Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p6: para 27]; Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3638: lines 47-53]; Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011 [p4: para 19-20]; Transcript, Peter Harmer, 6 October 2011, Brisbane [p3779: lines 27-30]).
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- 229 Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [p1: para 12.2.3, 12.2.4]; Transcript, James Merchant, 6 October 2011, Brisbane [p3807: lines 10-45].
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- 230 Transcript, James Merchant, 6 October 2011, Brisbane [p3813: line 16].
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- 231 Transcript, James Merchant, 6 October 2011, Brisbane [p3807: line 1].
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- 232 The national claims manager said in his statutory declaration, dated 22 September 2011, that approximately 190 claims were declined without a site inspection having been carried out (Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [p11: para 12.2.1]). He confirmed this in oral evidence (Transcript, James Merchant, 6 October 2011, Brisbane [p3802: lines 1-7]). CGU Insurance Limited informed the Commission on 18 January 2012 that this information was not correct. It lawyers advised that, 'following further investigation... it appears that the 190 estimate is the number of site assessments that were conducted prior to the process change on or about 17 February 2011. The number of household claims declined without a site assessment is approximately 340'.
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- 233 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p7: para 34]; Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3639: line 6].
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- 234 Statutory Declaration of Dion Gooderham (CGU Insurance Limited), 21 November 2011 [p4: para 25.1; p5: para 29.1].
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- 235 Statutory Declaration of James Merchant (CGU Insurance Limited), 25 November 2011 [p1: para 3].
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- 236 Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 7.
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- 237 Transcript, James Merchant, 6 October 2011, Brisbane [p3805: lines 48-53; p3815: lines 13-22]; Statutory Declaration of James Merchant (CGU Insurance Limited), 25 November 2011 [p1: para 4.1].
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- 238 Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [p10: para 11].
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- 239 Statutory Declaration of James Merchant (CGU Insurance Limited), 25 November 2011 [p1: para 4].
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- 240 Sinclair Knight Merz, *Brisbane River 2011 Flood Event – Investigation into Causes of Property Inundation: Review of Four Insurance Matters*, 14 December 2011 [p6: para 19 – p8: para 21].
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- 241 Exhibit 715, Statement of Sallyanne Doyle, 3 October 2011, Attachment 4.
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- 242 Exhibit 626, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 1 [p3]; Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 2 [p2-3].
- 243 Correspondence from the Australian Securities and Investments Commission to CGU Insurance Limited, dated 20 April 2011, provided by CGU Insurance Limited in response to the Commission Requirement, 14 October 2011.
- 244 CGU Insurance Limited, QLD Flood Claims Process Review – 16<sup>th</sup> Feb 2011, provided in response to the Commission Requirement, 14 October 2011.
- 245 Correspondence from CGU Insurance Limited to the Australian Securities and Investments Commission, dated 30 June 2011, provided by CGU Insurance Limited in response to the Commission Requirement, 14 October 2011.
- 246 Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011 [p8: para 6].
- 247 See Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011, Annexure 3. A file note dated 22 January 2011 states that the policy-holder's broker 'was already told on 18/1 that the flood team would be up and running on 20/1...'
- 248 Statutory Declaration of Dion Gooderham (CGU Insurance Limited), 21 November 2011 [p5: para 29].
- 249 Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [p11: para 12.2].
- 250 Transcript, James Merchant, 6 October 2011 [p3804: line 22].
- 251 Transcript, James Merchant, 6 October 2011 [p3806: line 41].
- 252 Transcript, James Merchant, 6 October 2011 [p3806: line 57].
- 253 Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [p8: para 6]; Transcript, James Merchant, 6 October 2011, Brisbane [p3804: lines 30-42].
- 254 Transcript, James Merchant, 6 October 2011, Brisbane [p3807: lines 10-32].
- 255 CGU Insurance Limited, Queensland Floods Claims Reference Document, provided in response to the Commission Requirement, 14 October 2011. It appears from a note of a telephone conversation between a CGU Insurance Limited staff member and a policy-holder's broker that, as at 18 January 2011, CGU Insurance Limited was not appointing assessors to inspect properties the subject of claims (Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011, Annexure 3 [p1]).
- 256 CGU Insurance Limited, 'Validation process Brisbane and surrounding area's [sic]', provided in response to the Commission Requirement, 14 October 2011.
- 257 A file note in CGU Insurance Limited's records for one policy-holder, dated 1 February 2011, states:
- ‘~await call from [policy-holder]
  - ~ask flood scripting – check with [policy-holder] which house is hers on near map
  - ~if clearly flood – advise [policy-holder] no cover & arrange decline letter
  - ~determine if assessing is required.’
- (Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 2.)
- 258 Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011 [p3: para 14.3].
- 259 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3780: line 25].
- 260 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3780: lines 5-55].
- 261 Exhibit 742, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 3 [p11: para 12.1.2, 12.2.4]. This information was given in response to a question in a Requirement, issued on 2 September 2011, which asked: 'At what stage of the claims handling process were site assessments/inspections carried out?' Mr Merchant's answer to this question did not include the information Mr Harmer gave in evidence.
- 262 Transcript, James Merchant, 6 October 2011, Brisbane [p3807: line 37; p3815: line 20].

- 263 Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011 [p9: para 81]; Transcript, James Merchant, 6 October 2011, Brisbane [p3806: line 50; p3809: line 40 – p3810: line 5].
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- 264 CGU Insurance Limited, QLD Flood Claims Process Review – 16<sup>th</sup> Feb 2011, provided in response to the Commission Requirement, 14 October 2011.
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- 265 Transcript, Judith Dobrowa, 27 September 2011, Brisbane [p3284: lines 27-32].
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- 266 Transcript, Judith Dobrowa, 27 September 2011, Brisbane [p3282: line 12; p3284: line 27; p3293: line 32; p3294: line 29].
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- 267 Transcript, Judith Dobrowa, 27 September 2011, Brisbane [p3293: line 50; p3294: line 30].
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- 268 Transcript, Judith Dobrowa, 27 September 2011, Brisbane [p3284: lines 27, 55].
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- 269 Transcript, Judith Dobrowa, 27 September 2011, Brisbane [p3294: line 30].
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- 270 Exhibit 664, Notes made by Judith Dobrowa.
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- 271 Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 2.
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- 272 Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 2; Exhibit 663, Transcript of conversation between CGU Insurance Limited consultant and Judith Dobrowa.
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- 273 Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 4.
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- 274 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p3: para 14-16]; Attachment 4.
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- 275 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p3-4: para 16].
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- 276 Transcript, James Merchant, 6 October 2011, Brisbane [p3809: line 55]. See also Transcript, James Merchant, 6 October 2011, Brisbane [p3810: line 50; p3811: lines 5-10].
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- 277 Transcript, James Merchant, 6 October 2011, Brisbane [p3808: lines 7-32].
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- 278 Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011, Annexure 3 [p3-4].
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- 279 Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3636: line 1; p3637: lines 3-20, 45-50; p3658: line 20].
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- 280 Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011 [p3: para 25]; Annexure 12.
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- 281 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p4: para 16-17]; Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3637: lines 10-22; p3657: lines 45-51].
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- 282 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p4: para 18]; Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011 [p3: para 26]; Annexure 3.
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- 283 Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3666: line 55 – p3667: line 17].
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- 284 Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011, Annexure 3. See also Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011 [p3: para 26].
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- 285 The second note of the conversation, the one provided to Ms Doyle in March 2011, does not refer to any discussion about getting further information from the property manager or tenant: Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011, Attachment 4. Mr Merchant gave evidence that Ms Doyle said that ‘she would provide [CGU Insurance Limited] with details of her tenant so that further information could be gathered about the claim’: Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011 [p3: para 26].
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- 286 Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011, [p4: para 27-28]; Annexure 3; Annexure 13; Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011, Annexure 1.
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- 287 Exhibit 717, Statutory Declaration of James Merchant (CGU Insurance Limited), 3 October 2011, Annexure 3; Annexure 15. See also para 30-32.
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- 288 Exhibit 715, Statement of Sallyanne Doyle [p5: para 24]; Attachment 12.
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- 289 Exhibit 715, Statement of Sallyanne Doyle [p5: para 23]; Attachment 11.
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- 290 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p5: para 25]; Transcript,

- Sallyanne Doyle, 5 October 2011, Brisbane [p3638: lines 1-22].
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- 291 Correspondence from CGU Insurance Limited to the Australian Securities and Investments Commission, dated 13 May 2011, provided by CGU Insurance Limited in response to the Commission Requirement, 14 October 2011.
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- 292 Statutory Declaration of Dion Gooderham (CGU Insurance Limited), 21 November 2011 [para 33.2 and 42].
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- 293 Correspondence from CGU Insurance Limited to the Australian Securities and Investments Commission, dated 30 June 2011, provided by CGU Insurance Limited in response to the Commission Requirement, 14 October 2011.
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- 294 Statutory Declaration of Dion Gooderham (CGU Insurance Limited), 21 November 2011 [p7: para 44].
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- 295 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p5: para 26].
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- 296 Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011, Annexure 2.
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- 297 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3783: lines 18-30].
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- 298 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [para 30]; Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3638: line 55]; Transcript, Peter Harmer, 6 October 2011, Brisbane [p3783: lines 56-58].
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- 299 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p7: para 30].
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- 300 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3780: line 30].
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- 301 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3780: line 25]. In his statutory declaration, dated 3 October 2011 (Exhibit 716), Mr Harmer said, at page 6, paragraph 27: 'Ms Doyle told us that we had not made it clear to her that an assessor would be appointed by CGU Insurance Limited if the customer did not agree with our assessment of their claim and sought for the claim to be assessed'.
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- 302 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3781: line 2].
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- 303 Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011 [p5: para 26].
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- 304 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3780: line 30]; Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011 [p6: para 27].
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- 305 Transcript, James Merchant, 6 October 2011, Brisbane [p3805: lines 34, 55; p3806: lines 15-20].
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- 306 CGU Insurance Limited, QLD Flood Claims Process Review – 16<sup>th</sup> Feb 2011, provided in response to the Commission Requirement, 14 October 2011.
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- 307 CGU Insurance Limited, email dated 17 February 2011, provided in response to the Commission Requirement, 14 October 2011.
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- 308 CGU Insurance Limited, QLD Flood Claims Process Review – 16<sup>th</sup> Feb 2011, provided in response to the Commission Requirement, 14 October 2011.
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- 309 The Commission was concerned to see all scripts used by CGU Insurance Limited staff dealing with flood claims. Two scripts were exhibited to Mr Merchant's main statutory declaration (Exhibit 742): one used by claims lodgement staff (Annexure 5 to his statutory declaration) and the standard set of questions (Annexure 7 to his statutory declaration). Mr Merchant confirmed in evidence that these were the only scripts used: Transcript, 6 October 2011, Brisbane [p3806: lines 21-28]. The document dated 16 February 2011 refers to 'customer scripting when communicating the decision to deny the claim'. If this is a reference to another script, it has not been provided to the Commission and Mr Merchant did not mention it when asked if all scripts had been provided to the Commission.
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- 310 Transcript, James Merchant, 6 October 2011, Brisbane [p3805: line 30].
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- 311 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p7-8: para 34]; Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3640: lines 24-42].
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- 312 Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011 [p5: para 25]; Transcript, Peter Harmer, 6 October 2011, Brisbane [p3785: line 15].
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- 313 Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3640: line 47].
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- 314 Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3640: lines 24-48]; Exhibit 715,

- Statement of Sallyanne Doyle, 5 October 2011 [p8: para 36].
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- 315 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p8: para 36].
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- 316 Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3641: lines 14-35]; Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p8: para 37].
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- 317 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p9: para 38].
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- 318 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p9: para 39]; Attachment 3.
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- 319 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p9: para 39-40]; Attachment 3.
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- 320 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p10: para 42]; Attachment 4.
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- 321 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3790: lines 15, 37].
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- 322 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3791: line 6; p3794: lines 28, 43]; Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011 [p4: para 21.3].
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- 323 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3787: line 1].
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- 324 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3785: lines 48-58].
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- 325 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3786: line 5].
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- 326 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3786: line 30]; Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011 [p5: para 21.4].
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- 327 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3785: line 53; p3786: lines 15-20; p3795: lines 35-45].
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- 328 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3786: line 25].
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- 329 Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011 [p5: para 21.4].
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- 330 Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011 [p4: para 25].
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- 331 Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011, Annexure 1.
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- 332 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3785: lines 20-30].
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- 333 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3785: line 31].
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- 334 Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011 [p4: para 21.1]; Transcript, Peter Harmer, 5 October 2011, Brisbane [p3787: line 13].
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- 335 Transcript, Peter Harmer, 5 October 2011, Brisbane [p3787: line 25].
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- 336 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3792: lines 5-17; p3796: lines 5-15].
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- 337 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3796: lines 9-13].
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- 338 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3795: line 50; p3796: line 18].
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- 339 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3787: lines 48-55; p3788: line 55; p3791: lines 8-15; p3796: line 33]; Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011 [p4: para 21.3].
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- 340 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3797: lines 42-51].
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- 341 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3796: line 35; p3792: line 55].
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- 342 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3788: lines 20-30].
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- 343 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3789: lines 8, 30-35].
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- 344 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3790: lines 28-50]; Exhibit 716, Statutory Declaration of Peter Harmer (CGU Insurance Limited), 3 October 2011 [p6: para 35].
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- 345 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011, Attachment 3.
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- 346 Transcript, Peter Harmer, 6 October 2011, Brisbane [p3790: line 37].
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- 347 Exhibit 715, Statement of Sallyanne Doyle, 5 October 2011 [p6: para 29]; Attachment 5; Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3641: line 37 – p3642: line 16].
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- 348 Transcript, Sallyanne Doyle, 5 October 2011, Brisbane [p3643: lines 1-24].
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- 349 Statutory Declaration of Dion Gooderham (CGU Insurance Limited), 21 November 2011 [p9: para 58].
- 350 Statement of Gregory Kirk, 5 October 2011, Annexure 4; Statement of Michael Saadat, 21 October 2011 [p3: para 9 – p4: para 12].
- 351 Determination 239347. The ombudsman has found in favour of CGU Insurance Limited policy-holders in four other cases, two on the basis that the insurer could not prove it clearly informed the policy-holder of the exclusion; and two on the basis that stormwater run-off had initially inundated the property.
- 352 CGU Insurance Limited, Media Release: 'CGU to provide automatic flood cover in home, contents and landlords policies and improved customer experience', 9 December 2011.
- 353 Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4451: lines 18-38; p4456: lines 6-15]; Exhibit 895, Fifth Affidavit of Graham Dale (RACQ Insurance Limited), 21 September 2011, Exhibit 8.
- 354 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 167-170, 199]; Transcript, Graham Dale, 28 October 2011, Brisbane [p4549: line 4; p4558: lines 15-31].
- 355 Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4453: 10 – p4454: line 2]; Exhibit 824, First Affidavit of Bradley Heath (RACQ Insurance Limited), 23 September 2011 [para 14].
- 356 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011, Exhibit 3 [p28].
- 357 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011, Exhibit 3 [p27].
- 358 Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4452: lines 10-15; p4478: lines 50 – p4479: line 10]; Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 58-60, 108, 116-123, 149-150].
- 359 Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011 [p4453: line 20 – p4454: line 52; p4474: lines 10-30]; Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 47, 143-144].
- 360 Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4454: lines 44-46; p4479: lines 7-48]; Transcript, Graham Dale (RACQ Insurance Limited), 28 October 2011, Brisbane [p4556: lines 40-55].
- 361 Transcript, Graham Dale (RACQ Insurance Limited), 28 October 2011, Brisbane [p4542: line 50 – p4544: line 55].
- 362 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 167-187]; Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4451: lines 28-38].
- 363 Exhibit 892, Second affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 172-173].
- 364 Exhibit 892, Second affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 172-183]; Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4462: lines 48-52].
- 365 Exhibit 901, RACQ Media Release dated 2 August 2011.
- 366 Transcript, Graham Dale (RACQ Insurance Limited), 28 October 2011, Brisbane [p4512: line 54 – p4513: line 3].
- 367 Transcript, Graham Dale (RACQ Insurance Limited), 28 October 2011, Brisbane [p4513: lines 29-35].
- 368 Exhibit 824, First Affidavit of Bradley Heath (RACQ Insurance Limited), 23 September 2011 [Exhibit 3: p36].
- 369 Exhibit 824, First Affidavit of Bradley Heath (RACQ Insurance Limited), 23 September 2011 [Exhibit 3: p33].
- 370 Exhibit 824, First Affidavit of Bradley Heath (RACQ Insurance Limited), 23 September 2011 [para 21 and 38-39].
- 371 Exhibit 824, First Affidavit of Bradley Heath (RACQ Insurance Limited), 23 September 2011 [Exhibit 2: p6-11].
- 372 Exhibit 824, First Affidavit of Bradley Heath, 23 September 2011 [Exhibit 4: p120-122].
- 373 Exhibit 824, First Affidavit of Bradley Heath, 23 September 2011 [Exhibit 4, p127]. See also: Exhibit 902, Bundle of correspondence.

- 374 Exhibit 824, First Affidavit of Bradley Heath, 23 September 2011 [Exhibit 4, p150]. See also: Exhibit 902, Bundle of correspondence.
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- 375 Exhibit 824, First Affidavit of Bradley Heath, 23 September 2011 [Exhibit 4, p157]. See also: Exhibit 902, Bundle of correspondence.
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- 376 Transcript, Graham Dale, 28 October 2011, Brisbane [p4514: line 58 – p4515: line 45].
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- 377 Exhibit 824, First Affidavit of Bradley Heath, 23 September 2011 [Exhibit 4, p170]. See also exhibit 902, Bundle of correspondence.
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- 378 Exhibit 824, First Affidavit of Bradley Heath, 23 September 2011 [para 43(o)-(p)]. See also Transcript, Graham Dale, 28 October 2011, Brisbane [p4563: lines 5-40].
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- 379 Thirty-five claims were declined on 7 April 2011, 60 on 15 April 2011 and 5 on 21 April 2011 (Exhibit 824, First Affidavit of Bradley Heath, 23 September 2011, Exhibit 2).
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- 380 Exhibit 902, Bundle of correspondence.
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- 381 Exhibit 824, First Affidavit of Bradley Heath, 23 September 2011, Exhibit 2.
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- 382 Transcript, Graham Dale (RACQ Insurance Limited), 28 October 2011, Brisbane [p4540, lines 1-10].
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- 383 Transcript, Graham Dale (RACQ Insurance Limited), 28 October 2011, Brisbane [p4541: lines 50-57].
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- 384 Transcript, Graham Dale (RACQ Insurance Limited), 28 October 2011, Brisbane [p4540: line 41 – p4541: line 8].
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- 385 Transcript, Graham Dale, 27 October 2011, Brisbane [p4464: line 53 – p4466: line 20; p4467: line 50; p4468: lines 5-56].
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- 386 Transcript, Graham Dale, 27 October 2011, Brisbane [p4465: lines 24-51]. In his second affidavit, the insurer's general manager, personal insurance claims, acknowledged that Water Technology 'required more complete data' in order to 'accurately estimate' the effect of the Brisbane River on the flooding in Ipswich, and that the modelling Water Technology had done was based on the '(limited) information then at its disposal'. He said the report adopted a 'cautious approach with respect to the data then available to it' (Exhibit 892, Second Affidavit of Graham Dale, 19 September 2011 [para 175, 178]). See also Exhibit 824, First Affidavit of Bradley Heath, 23 September 2011 [para 17(a)].
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- 387 Transcript, Graham Dale, 27 October 2011, Brisbane [p4464: line 53 – p4465: line 51; p4467: lines 28-50; p4468: lines 7, 48-55]; Exhibit 892, Second Affidavit of Graham Dale, 19 September 2011 [para 178]; Exhibit 824, First Affidavit of Bradley Heath, 23 September 2011 [para 19-20, 23].
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- 388 Exhibit 824, First Affidavit of Bradley Heath (RACQ Insurance Limited), 23 September 2011 Exhibit 2 [p6-11].
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- 389 Transcript, Graham Dale (RACQ Insurance Limited), 28 October 2011, Brisbane [p4547: line 50].
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- 390 Exhibit 824, First Affidavit of Bradley Heath, 23 October 2011 [para 20].
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- 391 Exhibit 824, First Affidavit of Bradley Heath, 23 September 2011 [para 26].
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- 392 Transcript, Graham Dale, 28 October 2011, Brisbane [p4563: line 47].
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- 393 Exhibit 824, First Affidavit of Bradley Heath, 23 September 2011, Exhibit 4 [p193].
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- 394 Exhibit 587, General Insurance Code of Practice [section 3.4.5(a)]. The same expectation applies when insurers notify policy-holders of the outcome of disputes (Exhibit 587, General Insurance Code of Practice [section 6.9]). These standards are presently subject to section 4.3 of the Code which has the effect of relieving insurers of their obligations under the Code when dealing with a high volume of claims as a result of a natural disaster (Exhibit 587, General Insurance Code of Practice [section 4.3]).
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- 395 See, for example, Exhibit 593, Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 14 September 2011, Attachment 7. See also Exhibit 873, Statement of James Higgins (AAMI), 14 September 2011 [para 167, 171].
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- 396 See, for example, Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 5.
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- 397 Transcript, James Merchant (CGU Insurance Limited), 6 October 2011, Brisbane [p3817: line 31].
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- 398 Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011 [para 7].
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- 399 Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011, Annexure 2.
- 400 CGU Insurance Limited, QLD Flood Claims Process Review – 16<sup>th</sup> Feb 2011, provided in response to the Commission Requirement, 14 October 2011.
- 401 Transcript, James Merchant (CGU Insurance Limited), 6 October 2011, Brisbane [p3818: lines 35-40].
- 402 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [p31: para 158]; Exhibit 17 [p367, 369]; Exhibit 897, Seventh Affidavit of Graham Dale (RACQ Insurance Limited), 13 October 2011, Exhibit 33 [p864-865]; Exhibit 851, Eighth Affidavit of Graham Dale (RACQ Insurance Limited), Exhibit 26 [p317]; Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4482: lines 19-36]. The script another insurer used when informing a policy-holder that his or her claim had been denied, by contrast, stated that the assessment of the claim had involved ‘a physical assessment of [the] property’ and a review of ‘aerial photos taken during the flood, utilising a QLD Government website mapping areas that were impacted by flooding, along with an external hydrology report specific to your property’ (Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [p356]).
- 403 See, for example, Exhibit 898, Ninth Affidavit of Graham Dale (RACQ Insurance Limited), 19 October 2011, Exhibit 17 [p190-191]; Exhibit 897, Seventh Affidavit of Graham Dale (RACQ Insurance Limited), 13 October 2011, Exhibit 22 [p184-185]; Exhibit 851, Eighth Affidavit of Graham Dale (RACQ Insurance Limited), Exhibit 19 [p203-204].
- 404 Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4486: lines 1-40]. The insurer similarly defended the standard letter which advised policy-holders of the outcome of internal reviews. That letter did not give reasons for a decision to maintain the initial denial of the claim (Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4500: line 55]). It stated no more than the review had been completed and the result of it. The insurer’s general manager of claims could not think of any other information which might be included in the letter for a policy-holder’s benefit. More detailed reasons were given, however, if a lawyer had made a submission to the insurer on a policy-holder’s behalf.
- 405 Transcript, Graham Dale, 28 October 2011, Brisbane [p4547: line 55 – p4548: line 20; p4548: line 55 – p4549: line 10].
- 406 Exhibit 587, General Insurance Code of Practice [section 3.4.3].
- 407 The footnote in the code then sets out some examples of special circumstances. They are ‘where information is subject to privacy laws, where information is protected from disclosure by law, or where the release of the information may be prejudicial to us in relation to a dispute about your claim’.
- 408 Exhibit 587, General Insurance Code of Practice [section 6.1.4].
- 409 QBE Insurance (Australia) Limited provided copies of all relevant material on which it had relied (Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 23 September 2011, Annexure B [para 15-16] and Exhibit 593, Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited, 14 September 2011, Annexure B [para 7.4]). AAMI provided a copy of the loss assessor’s report and any site-specific hydrology report with letters to policy-holders confirming denial of their claims. Where an Insurance Council hydrology report was relied on, AAMI informed the policy-holder and told the policy-holder that it was available on the Insurance Council’s website (Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [para 170]). NRMA Insurance provided a copy of the hydrology report (general area or site-specific) which it commissioned and relied on to make the claim decision. Policy-holders were advised on how to access documents relied on which were in the public domain (Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [para 100] and see Transcript, Dominic Dower (NRMA Insurance), 6 October 2011, Brisbane [p3834: line 50 – p3835: line 56]).
- 410 Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4485: line 3 – p4486: line 13]; Transcript, Graham Dale (RACQ Insurance Limited), 28 October 2011, Brisbane [p4546: line 42]; Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 158 and

- 276]; see also Exhibit 662, Statutory Declaration of James Merchant (CGU Insurance Limited), 22 September 2011 [para 8] and Transcript, Judith Dobrowa, Brisbane, 27 September 2011 [p3286: lines 35-43].
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- 411 Submission by the Financial Ombudsman Service to the Natural Disaster Insurance Review, July 2011 [p15]. The submission does not state the insurer or insurers in respect of whom such complaints were made. The Commission is not otherwise aware of the identity of the insurer/s to which this submission relates.
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- 412 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 160-164]; Transcript, Graham Dale (RACQ Insurance Limited), 27 October 2011, Brisbane [p4489: line 1 – p4491: line 51]; Transcript, Graham Dale, 28 October 2011, Brisbane [p4550: lines 8-57].
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- 413 Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 163].
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- 414 Under its terms of reference, the Financial Ombudsman Service ‘must identify systemic issues and refer [them] to the relevant [insurer] for remedial action’. It must also report systemic issues to ASIC. A systemic issue is ‘an issue that will have an effect on other persons... beyond the parties to the Dispute’.
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- 415 Affidavit of Bradley Heath (RACQ Insurance Limited), 28 November 2011, Exhibit 4.
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- 416 *The Daniels Corporation International Pty Ltd v Australian Competition and Consumer Commission* (2002) 213 CLR 543 at 563 per McHugh J.
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- 417 A similar sentiment is expressed by the ombudsman in its submission to the Natural Disaster Insurance Review, at page 12:
- Delays by some insurers in exchanging information in particular hydrologists reports, or requiring multiple reports prior to making a claim decision has caused significant disputes between consumer, advisors and insurers. The provision of information relied upon need to be strengthened to ensure all information relied upon is exchanged with a consumer so that consumer/advisor can make an informed decision as to whether to dispute a claim decision or not.
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- 418 For example, Exhibit 745, Statutory Declaration of Dominic Dower (NRMA Insurance), 23 September 2011 [para 102-118]; Exhibit 872, Statement of James Higgins (AAMI), 14 September 2011 [para 229-235]; Exhibit 892, Second Affidavit of Graham Dale (RACQ Insurance Limited), 19 September 2011 [para 237-240]; Statement of Paul Fahey (CommInsure), 23 September 2011, Appendix A [p22-24].
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- 419 Exhibit 878, Statement of James Higgins (AAMI), 13 October 2011 [para 60-61]; Statement of Garry Townsend (Allianz Australia Insurance Ltd), 16 September 2011[para 5.2]; Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 14 September 2011, Annexure B [para 6.4 and 10.2].
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- 420 Statement of Garry Townsend (Allianz Australia Insurance Ltd), 16 September 2011 [para 5.1-5.2]; Attachment 3.3.
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- 421 Statutory Declaration of Shaun Standfield (QBE Insurance (Australia) Limited), 14 September 2011, Annexure B [para 12].
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- 422 Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011, Annexure 9.
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- 423 Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011, Annexure 8.
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- 424 Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011, Annexure 10.
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- 425 Exhibit 1027, Statement of Robert Hazell (AAMI), 8 November 2011 [para 12].
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- 426 Letter from Corrs Chambers Westgarth Lawyers, 11 January 2012.
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- 427 Exhibit 1027, Statement of Robert Hazell (AAMI), 8 November 2011 [para 6, 10].
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- 428 Exhibit 874, Statement of James Higgins (AAMI), 13 October 2011, Annexure 11.
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- 429 Exhibit 1027, Statement of Robert Hazell (AAMI), 8 November 2011 [para 11].
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# 13

## 13 Mining

Prolonged rainfall over Queensland's mining regions during the 2010/2011 wet season severely affected the industry. Huge volumes of water poured into pits and leaked into underground areas. Following years of drought, some mines had been designed to catch as much runoff as possible.<sup>1</sup> Storage facilities and dams became so full that operators were forced to pump excess water into pits.<sup>2</sup> Access to equipment, storage facilities and monitoring sites was cut.<sup>3</sup> Gigantic mining equipment was swamped by floodwaters.

Eighty-five per cent of Queensland coal mines had to either restrict production or close entirely.<sup>4</sup> In May 2011, Queensland's coal mining sector had recovered to only 75 per cent of its pre-flood output.<sup>5</sup> The economic repercussions of these events were a loss of \$5.7 billion<sup>6</sup> (2.2 per cent)<sup>7</sup> in Queensland's gross state product for the financial year ending June 2011, and a reduction in royalties received by the Queensland Government.

In early 2011, the Premier indicated to the peak mining industry body, the Queensland Resources Council, that her government was committed to the successful recovery of the coal industry. The Premier said that all agencies had been instructed to facilitate a return to full production capacity at the earliest opportunity.<sup>8</sup> Inherent in this commitment was a tension between environmental and economic objectives, the resolution of which fell to the Department of Environment and Resource Management (DERM) in its administration of the *Environmental Protection Act 1994*. The Act has, as its object, the protection of the environment while allowing development.<sup>9</sup> By the time of the Premier's letter, DERM had, in fact, already been authorising (by dispensing with normal restrictions) the discharge of water from mines into flooded rivers and creeks.



Baralaba Coal Mine (photo courtesy Cockatoo Coal)



Baralaba Mine during 2010/2011 floods (Newspix, Lyndon Mechielson)

The processes by which DERM put the Premier's commitment into effect, both before and after it was publicised, were the subject of many submissions to the Commission. Mining companies and the Resources Council complained of delays, impossible conditions and an agency hesitant to take an expansive view of its powers to assist their recovery.<sup>10</sup> Environmental groups expressed concern that DERM's actions resulted in harm to ecosystems.<sup>11</sup> DERM, for its part, contended that it had struck an appropriate balance between the competing interests by allowing the release of water from mines under strict conditions.<sup>12</sup>

Those submissions were the impetus for a confined examination of DERM's response to flooding at mine sites and the use of its legislative powers under the *Environmental Protection Act*. The Commission has not conducted a comprehensive investigation into the mining industry in Queensland. The fact that only a limited number of recommendations are directed at mining companies should not, therefore, be interpreted as an endorsement of existing flood preparedness and response activities within that industry.

In order to examine DERM's response, the Commission selected seven case examples:

- Hail Creek mine, operated by Rio Tinto Australia, an open cut coal mine situated near Mackay<sup>13</sup>
- Rolleston mine, operated by Xstrata Coal Queensland, an open cut thermal coal mine located 275 kilometres due west of Gladstone, approximately 16 kilometres from the town of Rolleston<sup>14</sup>
- the Ensham mine, an open cut coal mine approximately 40 kilometres east of Emerald in Central Queensland<sup>15</sup>
- the Moranbah North mine, operated by Anglo American Metallurgical Coal Pty Ltd, an underground coal mine 15 kilometres north of Moranbah<sup>16</sup>

- the Dawson mining project, also operated by Anglo American Metallurgical Coal Pty Ltd, a collection of three open cut coal mines (Dawson South, Dawson Central and Dawson North) located near Moura<sup>17</sup>
- the Moranbah Gas Project, operated by Arrow Energy, a site used for the extraction and processing of coal seam gas, situated on the Isaac River 2.5 kilometres from Moranbah<sup>18</sup>
- the Century mine, operated by MMG Century, 250 kilometres north-west of Mt Isa, which produces lead and zinc concentrates.<sup>19</sup>

Water is required to undertake most mining activities. Coal miners use it to process and wash coal and suppress dust.<sup>20</sup> At coal seam gas projects, saline water is extracted from coal seams in the process of obtaining the gas.<sup>21</sup> If the gas is not exiting the coal seam quickly enough, water is used in ‘fracking’, a process in which water is inserted into coal seams at high pressure to fracture the rock, allowing the gas to escape.<sup>22</sup> Other types of operations, such as the Century lead and zinc mine, use water to separate minerals from a slurry of mined ore.<sup>23</sup> Whatever role it plays, water used in, or resulting from, mining operations is likely to come into contact with contaminants, such as salts and metals.<sup>24</sup> As a result, it will often be of lower quality than fresh water in rivers and creeks. In light of water’s status as a tool used in mining operations and a product of such activities, most mines have facilities to store both fresh water and contaminated, or mine-affected,<sup>25</sup> water. During times of flood, storage facilities of this type may be overwhelmed by the influx of water.

The *Environmental Protection Act* sets up the regulatory framework for mining companies in Queensland. A miner must have an environmental authority, the terms of which are set by DERM. Environmental authorities deal with, among other things, water management, including the circumstances in which an operator may discharge mine-affected water into natural watercourses. Mining companies are voluntary participants in the industry. It is their responsibility to ensure that they are able to comply with the environmental authority conditions and any other requirements set by DERM. Generally speaking, they have the technical and financial ability to do so. DERM, as the regulator, has responsibility for setting and enforcing the conditions under which mining may take place. In accordance with the Act’s object of allowing ecologically sustainable development,<sup>26</sup> DERM must set reasonable and effective conditions that allow mining to occur in an environmentally sustainable manner. As part of this, DERM has a responsibility to address requests for the relaxation of environmental authority conditions in a predictable and consistent manner. This responsibility, and the way it was discharged by DERM during flooding, was the focus of the Commission’s investigation.

In addition to its investigation into DERM’s response to flooding at active mine sites, the Commission considered the effect of flooding on one abandoned mine, Mt Oxide mine: see section 13.8.3.

## 13.1 Preparation for the 2010/2011 wet season

Preparation for flooding at a mine site begins well before the wet season. Mine operators are required to produce water management plans for DERM’s approval. Mines are able to deal with excess water in a range of ways, including building infrastructure such as water storage and tailings dams, desalination and treatment plants and diversion channels. Emergency action plans and flood procedures may be developed. A mine operator’s preparation for flood may include audits of the operator’s capacity to respond quickly to flood and checks to ensure equipment is functional. There has been no attempt to consider whether all such measures were appropriately adopted at each mine site – that would be a formidable task. The Commission has focussed on the two aspects of preparation that were squarely raised on the material before it: the response to the Bureau of Meteorology’s forecast in October 2010 that above median rainfall was expected for much of Queensland, and DERM’s pre-wet season inspections.

### 13.1.1 Response to Bureau of Meteorology seasonal forecast

Surprisingly, not all of the operators of case study mines were aware that the Bureau of Meteorology had forecast that the 2010/2011 wet season was likely to involve above median rainfall. None was provided with the seasonal forecast by DERM, or the Bureau itself.<sup>27</sup> The forecast was available on the Bureau’s website. It is not DERM policy to provide forecast information to operators.<sup>28</sup> It was not until December 2010 that Rio Tinto, for example, realised that a significant wet season might be approaching.<sup>29</sup> The operators of Century mine were aware of the general thrust of the Bureau’s forecast in the second half of 2010, but had no specific advice about the Gulf region in which that mine is located.<sup>30</sup> Others did obtain and use forecast information: from March 2010, Xstrata had a staff member reviewing and distributing to employees publicly available weather forecast information for the Rolleston coal mine, including seasonal, weekly and daily forecasts.<sup>31</sup>

Very few specific actions were taken by the operators of the case study mines in response to the Bureau forecast. One operator which did react was Anglo American; it undertook a pre-wet season review at its Capcoal mine which identified risks and recommended infrastructure upgrades,<sup>32</sup> in consequence of which Anglo purchased additional pumping equipment.<sup>33</sup>

Most companies took at least some action to implement their water management plans and deal with issues arising from previous wet seasons. Ensham, which had experienced significant inundation in 2008, constructed levees to protect it from a flood with an average recurrence interval of 1000 years in the Nogoa River.<sup>34</sup> It had also installed additional pipe infrastructure.<sup>35</sup> Arrow Energy was building additional dams and planned to build a water treatment plant.<sup>36</sup> Xstrata implemented a system of levees and diversion channels to move water away from mine pits,<sup>37</sup> and responded to short-term forecasts of rainfall of over 50 millimetres by checking diversion channels and pumps and blocking off ramps that might allow water to enter operational pits.<sup>38</sup>

Representatives from MMG Century and Anglo American indicated that seasonal forecasts did not provide enough lead time to build infrastructure to cope with flooding.<sup>39</sup> That is true for long term solutions to the threat of flood. Other measures, such as checking pumps and drainage channels or auditing response capability, do not require such lead times. Knowledge of forecasts can help operators to prepare for the wet season ahead, for example by preparing applications for transitional environmental programs and opening lines of communication with DERM.

Mine operators should take primary responsibility for obtaining and reviewing the best forecast information available. It would be sensible for operators of sites at high risk of flood to obtain region specific forecast information (both seasonal and short-term) directly from the Bureau of Meteorology. The Bureau does provide such a service for some mines currently.<sup>40</sup>

That said, it should not be difficult for the Queensland Government, through DERM or another agency, to provide all operators with any seasonal forecast information it obtains from the Bureau of Meteorology. This would be particularly appropriate if, as was the case prior to the 2010/2011 wet season, the information held by the Queensland Government extended beyond that made available to the public on the Bureau's website.

## *Recommendations*

- 13.1 Mine operators should obtain all public seasonal forecasts issued by the Bureau of Meteorology relevant to the regions in which their operations are located.
- 13.2 Any mine operator of a site at high risk of flood should obtain the best forecast information available (seasonal and short term) for the region in which the mine is located.

### 13.1.2 Pre-wet season inspections

Prior to each wet season, DERM pursues a system of inspections for those mines it considers at risk of experiencing difficulty coping with excess water.

Site inspections are planned to occur as close as possible to, but in advance of, the start of the wet season, which DERM puts at 1 November.<sup>41</sup> Of the seven case examples considered by the Commission, DERM inspected five sites. The Moranbah North coal mine was inspected on 6 October;<sup>42</sup> Hail Creek mine on 16 November;<sup>43</sup> Ensham mine on 17 November;<sup>44</sup> and Dawson Central, North and South mines on 9 November.<sup>45</sup> The Century mine was not physically inspected until 23 and 24 November, and disputes about the water management at the site were not settled between the operator and DERM until 19 January 2011.<sup>46</sup> The Commission's seven case studies do not permit generalisations to be made about whether DERM's inspection system is comprehensive or effective, but plainly enough indicate that in some cases the 1 November date was not met.

The Commission acknowledges that physical inspections are only one part of DERM's preparation for wet seasons. The process, however, could be improved in a number of ways.

The first concerns the process by which DERM determines which sites to inspect. DERM assesses risk by reference to its regional officers' knowledge of the site, history of compliance and known water management issues.<sup>47</sup> Given the reliance on officers' knowledge, it is impossible to list exhaustively factors that are taken into account. However,

DERM did, properly, take account of meteorological observations and forecasts in its allocation of resources to site inspections.<sup>48</sup> Some matters relevant to risk assessment, such as blocked drainage channels or low access roads, may only be discernible from a physical inspection.

The risk assessment process would benefit from the development of a list of relevant considerations, thereby ensuring consistency between DERM regional officers. Forecasts, particularly seasonal forecasts for specific regions of Queensland, should be one of those considerations.

The second opportunity for improvement lies in timing. DERM should ensure its risk assessment process, undertaken in preparation for a wet season, is conducted in time for it to be able to inspect the sites it identifies as requiring inspection, and for operators to implement solutions to any problems identified, by 1 November. Inspections in late November are too late to have any useful effect for the wet season. And while DERM considers the wet season to begin on 1 November, heavy rain and flooding can occur before that date. DERM's inspection program should not be confined to the period immediately preceding each wet season. Risk assessment and site inspection should be a continuous undertaking by DERM. The assessment of the risks posed by a particular site should be reviewed if circumstances change (for example a seasonal forecast is released, a non-compliance event occurs or environmental harm is caused). The factual basis upon which risk assessments are made should be reviewed on a regular basis.

## *Recommendations*

- 13.3 The Department of Environment and Resource Management should prepare a list of relevant considerations to be taken into account in performing a risk assessment to decide which sites to inspect. Bureau of Meteorology forecasts should be one consideration.
- 13.4 The Department of Environment and Resource Management should conduct risk assessments in time for site inspections, and the implementation of solutions to problems identified at inspections, to take place before 1 November of each year.

## 13.2 Flooding at mine sites

Substantial rainfall was experienced during the 2010/2011 wet season at all the case study mines.

At the end of December 2010 at Hail Creek mine, water storages were calculated to be approximately 98 per cent full; by the end of January 2011, the storage facilities were at 105 per cent capacity.<sup>49</sup> The mine was storing approximately seven gigalitres of water on-site in dams and pits.<sup>50</sup> Water was continually pumped from high priority areas into low priority areas around the site in an effort to maintain some operations.<sup>51</sup> Rio Tinto sought, and was granted, authorisation by DERM to release water into surrounding watercourses in January 2011.<sup>52</sup> All sale contracts were suspended by reason of the wet weather from 24 December 2010.<sup>53</sup> Pits used for the purpose of storing water were unable to be mined until dewatering activities had begun; supplies of explosives were delayed; and resources were being deployed to address the water located in the pits.<sup>54</sup> The sales suspension was lifted on 12 May 2011.<sup>55</sup> As at September 2011, the mine was still not operating at full production on a sustained basis.<sup>56</sup>

The Rolleston mine experienced record rainfall: 250 millimetres fell in September 2010, with a further 366 millimetres falling in December 2010.<sup>57</sup> Production was also affected by flooding of the Dawson highway and rail lines.<sup>58</sup> The site was able to discharge excess water regularly during the wet season under its environmental authority,<sup>59</sup> but did require two relaxations of it to prevent uncontrolled discharges from water storages.<sup>60</sup> Xstrata Coal estimated a reduction in production forecast for 2011 by approximately 1.1 million tonnes as a result of the 2010/2011 wet season.<sup>61</sup>



*Rolleston Coal Mine, 2010/2011 floods (photo supplied)*

Thanks to its levee banks, the Ensham mine did not suffer any flooding of its mine pits from the nearby Nogoa River or its tributaries during the 2010/2011 wet season.<sup>62</sup> Heavy rainfall over the site itself increased the amount of surface water at the site.<sup>63</sup> From 2 to 5 December 2010, the site received approximately 200 millimetres of rainfall. This flooded active mine pits and resulted in the cessation of mining activities.<sup>64</sup> An authorisation to release water into the Nogoa River was sought and granted by DERM. The mine was, at November 2011, still holding water from the 2007/2008 and 2010/2011 wet seasons.<sup>65</sup>

At Moranbah North, heavy rainfall occurred at Anglo American's site in December 2010, with 80 millimetres falling the night before 20 December.<sup>66</sup> The excess water being retained led to concerns about the safety of a dam on site; as a result, emergency authorisations were sought on 19 and 20 December to release water to prevent the dam from collapsing. DERM granted those authorisations.<sup>67</sup> A longer term authorisation was granted on 24 December 2010, allowing continued releases from the water storage facilities.<sup>68</sup>

By 28 December 2010, Anglo American advised DERM that heavy rainfall meant that it was no longer able to comply with the conditions of its environmental authority at Dawson mine relating to the management of mine-affected water.<sup>69</sup> Authorisations to release water were given in December, January and February. Following the 2010/2011 wet season, 4.5 gigalitres of water remained in a pit at Dawson North.<sup>70</sup> The pit was to be mined in May 2011, but because of the large volume of water still inside it, mining had not commenced by November 2011.<sup>71</sup>

By 13 December 2010, the water storage facilities at Arrow Energy's Moranbah coal seam gas project were reaching capacity. Arrow Energy was concerned about the structural integrity of one of its dams.<sup>72</sup> Between 13 and 14 December 2010, 2.6 megalitres of coal seam gas water was released in breach of Arrow's environmental authority to prevent any failure of the dam.<sup>73</sup> Further rainfall over the site necessitated the release of more water between 20 December 2010 and 6 January 2011: in total, another 34 megalitres of coal seam gas water was released in breach of the applicable environmental authority.<sup>74</sup>

At Century mine, the rainfall received during the 2010/2011 wet season was estimated to represent an event with an average recurrence interval of 150 years.<sup>75</sup> Between 1 November 2010 and 1 April 2011, 1114.8 millimetres of rain fell in the area around the mine site.<sup>76</sup> This figure represents more than double the annual average rainfall for the area.<sup>77</sup> The heavy rainfall overwhelmed the water management system in place at the site.<sup>78</sup> To maintain compliance with the terms of the site's environmental authority, 1850 megalitres of mine-affected water was transferred to the open pit for interim storage.<sup>79</sup> Storage of the excess water in an open pit resulted in significant operational and business risks for the operators of Century mine.<sup>80</sup> Despite efforts to avoid it, including transferring

water to pits and impairing production,<sup>81</sup> one non-compliant discharge of contaminated water occurred on 15 March 2011.<sup>82</sup>

### 13.3 Effects of mine discharges

The Commission received three submissions from environmental groups concerned that the release of water from mines had caused environmental harm.<sup>83</sup>

The main contaminant of concern for freshwater environments in releases from coal mines and coal seam gas projects during the 2010/2011 wet season was salt. DERM's monitoring indicates that the Fitzroy basin, where many coal mines are located, has experienced high salinity in the aftermath of the 2010/2011 wet season. DERM officers gave evidence that they believe that discharges from mines were not a significant contributor to the high salinity. Rather, the elevated salinity was caused by flows of groundwater into the river system during the flood.<sup>84</sup> That belief was based on the observation of the high levels of groundwater affecting the system, and the fact that despite mine discharges' ceasing in mid 2011, the high salinity continued.<sup>85</sup> DERM has found no evidence of harm to plant or animal species or the environment as a result of mine discharges during the 2010/2011 wet season,<sup>86</sup> or any concerning levels of contaminants other than salt released from mines.<sup>87</sup>

In the marine environment, there were concerns about the effect of mine discharges on native animals such as dugongs, dolphins and turtles. Those species have experienced a much higher mortality rate since the 2010/2011 floods than in previous years.<sup>88</sup> Damage to the ecosystem by way of coral bleaching and mortality of fringing reefs<sup>89</sup> (coral reefs close to shorelines) and degradation of seagrass beds has also been observed.<sup>90</sup>

DERM's investigations indicate that the loss of the seagrass meadows was a significant contributor to the death of dugongs and turtles which need them for food.<sup>91</sup> The seagrass was affected by the low salinity (relative to the ocean) and high sediment levels of the flood waters entering the marine ecosystem. Those waters appear as a noticeable flood plume of brown water entering blue: see photo below.



Flood plume near Keppel Islands, January 2011 (CQG Consulting)

DERM is unable to come to a definitive conclusion as to the causes of the ecological damage observed in the marine environments after the floods or the relative contribution of releases from mines.<sup>92</sup>

Both the state and federal governments and some mining companies undertake water quality monitoring in freshwater and marine environments.<sup>93</sup> DERM considers that it is the responsibility of the Great Barrier Reef Marine Park Authority to monitor the marine environment of the Great Barrier Reef.<sup>94</sup> That authority's monitoring program is aimed at detecting agricultural chemicals and fertilisers, not possible toxins from mines or coal seam gas projects.<sup>95</sup> DERM undertakes monitoring<sup>96</sup> upstream and downstream of mines, and requires mine operators to conduct monitoring and report results to DERM.<sup>97</sup> But it appears that DERM's water quality testing program undertaken in the Great Barrier Reef area in response to the 2010/2011 floods was restricted to testing for pesticides.<sup>98</sup> This omission in monitoring is concerning; it may make it impossible to determine the cumulative impacts of mine discharges on the marine environment.

DERM estimates it would take two to five years and significant work to come to a definitive conclusion as to the causes of the ecological damage.<sup>99</sup> The Commission considers that DERM should determine, as far as possible, the contribution, if any, that mine discharges made to the environmental harm observed. Such a conclusion is vital to inform DERM's response to future flooding at mines in Queensland.

## Recommendations

- 13.5 The Queensland Government should work collaboratively with the Commonwealth Government and mine operators to ensure co-ordinated and effective monitoring of salts, metals and other contaminants in marine environments that may be affected by mine discharges.
- 13.6 The Queensland Government should determine, as far as possible, the impact of mine discharges during the 2010/2011 wet season on freshwater and marine water quality and fauna and flora.

## 13.4 Environmental authorities

The *Environmental Protection Act* creates the two primary instruments which were used by DERM to deal with excess water caused by flooding at mine sites: environmental authorities and transitional environmental programs.<sup>100</sup> The environmental authorities of the five coal mines considered by the Commission are based on what are known as the Fitzroy model conditions,<sup>101</sup> a set of standard conditions created for coal mines in the Fitzroy basin. These conditions, and their interaction with transitional environmental programs, were the source of most complaints in submissions to the Commission from the mining industry. The remaining two case studies, the Century mine and the Moranbah coal seam gas project, are not operated within the Fitzroy model conditions regime.<sup>102</sup> This and the next part of the report, which discuss DERM's use of environmental authorities and transitional environmental programs to deal with flood, are concerned only with the coal mines covered by the Fitzroy model conditions.

### 13.4.1 The legislative regime

Mining is an 'environmentally relevant activity' under the *Environmental Protection Act*.<sup>103</sup> Consequently, an environmental authority is required to engage in it.<sup>104</sup> The authority allows the holder to carry out the mining activity subject to certain conditions.<sup>105</sup> It is an offence to breach any condition of an environmental authority.<sup>106</sup> Often, to apply for an environmental authority, the applicant must prepare an environmental impact statement,<sup>107</sup> and an environmental management plan<sup>108</sup> which proposes conditions and mechanisms to manage the potential environmental impact of the project.<sup>109</sup>

### 13.4.2 The Fitzroy model conditions

The Fitzroy model conditions were developed for inclusion in environmental authorities following severe flooding at the Ensham mine in 2008, and the consequent release of mine-affected water. In January 2008, the floodwaters at Ensham mine overtopped the then existing levee banks in a number of places. As a result of the flooding an estimated 150 000 megalitres of water collected in four open cut coal mining pits.<sup>110</sup> Ensham's production was substantially curtailed, and it appealed to the Queensland Government for assistance. The state agency responsible

for the environment issued two emergency directives and approved a transitional environmental program which allowed Ensham to discharge 138 000 megalitres of the water between February and September 2008.<sup>111</sup> Ensham voluntarily ceased discharging water from the mine on 9 September 2008, after water quality monitoring found the salinity of domestic water supplies for some townships downstream was at unacceptable levels.<sup>112</sup> These problems led to considerable and continuing community concern about the impacts of mining, and in particular, the effects of water discharges.<sup>113</sup>

The Queensland Government commissioned Professor Hart, an expert in water quality management and environmental chemistry, to perform a review of water quality issues, which led to the Review of the Fitzroy River Water Quality Issues report. DERM then initiated a water quality monitoring program to address community concerns regarding water quality<sup>114</sup> and produced A Study of the Cumulative Impacts on Water Quality of Mining Activities in the Fitzroy River Basin. This report recommended standardised conditions be imposed on the quantity and quality of water that could be discharged from mines across the region.<sup>115</sup>

In May 2009, the Queensland Government decided to implement that recommendation. It was determined that the standardised conditions should be included in environmental authorities by the end of that year. DERM was required to provide draft conditions to the responsible Ministers by 30 June 2009.<sup>116</sup> Throughout 2009, DERM consulted the mining industry about the conditions: at workshops and by providing drafts to the Resources Council and individual companies.<sup>117</sup> Despite this, the mining industry was not pleased with the process DERM adopted for the introduction of the Fitzroy model conditions. The Queensland Resources Council considered the consultation process in 2009 was too hasty, did not take into account many of the industry's concerns and forced it into acceding quickly to unsatisfactory provisions.<sup>118</sup>

After the model conditions were set, individual mines were required to make applications to DERM to include the conditions in new environmental authorities by December 2009.<sup>119</sup> (The Queensland Government indicated it would give the conditions legislative effect if operators did not adopt them voluntarily.<sup>120</sup>) That process meant that little site-specific amendment was possible, although it was open to mining companies to apply for non-standard conditions.<sup>121</sup> The environmental authorities of all five case study coal mines contain the full suite of the Fitzroy model conditions.<sup>122</sup>

The mining industry regarded the conditions as a 'blunt instrument' that did not take account of the differences between mines.<sup>123</sup> The industry was concerned also by the effect of the new conditions, which significantly reduced the ability of coal mine operators to discharge mine-affected water into watercourses. Salinity and volume limits had been lowered, while the flow required in watercourses before releases could be made was set higher.<sup>124</sup> There was no transitional period;<sup>125</sup> the conditions took effect immediately.

DERM knew that the new conditions decreased release opportunities; it considered that the conditions needed to be conservative to protect the environment. The conditions were intended to apply across the whole of the Fitzroy basin. There was insufficient scientific monitoring data available in 2009 to justify larger releases.<sup>126</sup> New monitoring requirements were also a feature of the model conditions. These were designed to ensure that data was collected for future consideration of release limits. A review of the conditions, using data gathered under them since 2009, was planned for the second half of 2011.<sup>127</sup>

### 13.4.3 The effect of the model conditions on water storage on site

The environmental authorities based on the Fitzroy model conditions meant that many mines were prevented from reducing their water storages in advance of the 2010/2011 wet season and held much more water on site than would otherwise have been the case.<sup>128</sup> Some mines were using pits as makeshift storage dams; others planned to do that if heavy rain fell.<sup>129</sup> Ensham mine, as an example, had water in its pits that had been there since 2008.<sup>130</sup>

Storage of water in pits at coal mines involves a vicious cycle: the longer water is stored in pits, the higher its salinity level, which may in turn preclude the water's release.<sup>131</sup>

The Fitzroy model conditions were not the only reason mines were dealing with more water than usual entering the 2010/2011 wet season. A lack of infrastructure, and the early onset of the wet season, no doubt affected the ability of some mines to cope. The rain that fell in mining regions of Queensland in 2010/2011 compounded an existing problem.

### 13.4.4 The industry pushes for amendments

The mining industry was concerned by the effect the model conditions were having on water management following the 2009/2010 wet season. Throughout 2010, the Queensland Resources Council pressed DERM and the Environment Minister to conduct a full review of the Fitzroy model conditions. Although the Minister for the Environment, Ms Kate Jones, indicated in March 2010 that a review of the conditions would occur before the next wet season,<sup>132</sup> DERM was not responsive to the Resource Council's proposal for a broad review, citing the fact that the conditions had been completed only recently. DERM indicated that individual mine operators could advise it, and apply for amendments to their authorities, if there were any difficulties with compliance.<sup>133</sup> In contrast to DERM's position, Ms Jones indicated in September 2010 that she was surprised that no review had gone ahead.<sup>134</sup> Finally, in October 2010, DERM agreed to hold a workshop later that year, which would address mine operator concerns about the conditions.<sup>135</sup> The chief executive of the Resources Council, Mr Michael Roche, by then held concerns for the situation at mines in the Bowen Basin; the wet season had started in August and large parts of the coalfields had experienced heavy rainfalls.<sup>136</sup>

On 3 November 2010, the workshop was held with representatives of DERM and mine operators. The workshop discussed the issues raised by the mining industry but made no major changes to release rates or quality limits. The review was limited because of the full review planned to occur in 2011. The amendments to the model conditions in November 2010 were so minor that they would not, even if implemented, have made a significant difference to water management for the 2010/2011 wet season.<sup>137</sup> In any case, the amendments were so late that no mining company was able to incorporate them into its environmental authority in time for the 2010/2011 wet season.<sup>138</sup>

DERM made it clear, in a letter to the Resources Council dated 24 November 2010, that it did not intend to make the widespread amendments to the Fitzroy model conditions sought by the mining industry.<sup>139</sup>

The Resources Council's hope that problems which had already arisen might be dealt with in advance of the next wet season was reasonable. DERM's arguments, which included the fact that the conditions were barely 12 months old, were also valid. DERM's preference was clearly that problems be dealt with by amendments to individual environmental authorities. The possibility of convincing mining companies to embrace that approach was diminished by the Minister's suggestion that the model conditions would be reviewed. It was unfortunate that DERM and the Minister did not present a consistent position.

In the result, it was not until December 2010 that there was any serious discussion between the Resources Council and DERM about ways for mines to deal with flood outside of their environmental authority conditions. The intervening months could have been usefully spent considering what emergency measures mining companies might need to employ if the predicted above average rainfall in the wet season eventuated. It is true, as DERM says, that companies could have applied for individual amendments to their environmental authorities. However, knowing that many mines had not so applied, and that many would not be able to comply with their environmental authorities if high rainfall occurred, it was incumbent on DERM to engage with the industry on how that threat could be met.

### 13.4.5 Performance of environmental authorities in the 2010/2011 wet season

The environmental authorities were not sufficient for mines to deal with the water entering their sites during the 2010/2011 wet season. From 1 December 2010, DERM received over 100 applications for transitional environmental programs to allow mines to release water in a way that would otherwise contravene their environmental authorities. That is not necessarily a reflection of deficiencies in the environmental authorities; DERM clearly indicated its intention to deal with floodwaters through transitional environmental programs.

### 13.4.6 Changes in the wake of the flood

After the difficulties experienced by the mining industry in the 2010/2011 wet season, the review of the Fitzroy model conditions planned for the second half of 2011 was brought forward.<sup>140</sup> DERM conducted workshops in May and June 2011 with representatives of the Resources Council and mining companies.<sup>141</sup> The thrust of the evidence from the mining industry was that the process of engagement with it in respect of these amendments was much improved from 2009.<sup>142</sup> The new version of the Fitzroy model conditions was approved within DERM on 3 August 2011.<sup>143</sup>

The new model conditions for dealing with flooding at mines contain these advantages for the mining industry:

- a greater ability for operators to obtain site specific amendments to the conditions<sup>144</sup>
- a relaxation of monitoring requirements during wet weather events if monitoring points are either unsafe or inaccessible<sup>145</sup>
- a narrower definition of mine-affected water which excludes some discharges from the conditions altogether<sup>146</sup>
- a stepped approach to discharge of mine-affected water into watercourses depending on the flow. Table 4 in the model conditions<sup>147</sup> creates different discharge conditions in low, medium and high rainfall events as indicated in the table below.<sup>148</sup>

Figure 13(a)

Receiving waters/ stream	Receiving Water Flow Recording Frequency	Receiving Water Flow Criteria for discharge (m <sup>3</sup> /s)	Maximum release rate (for all combined RP flows)	Electrical Conductivity and Sulphate Release Limits
e.g. Wet Creek	Continuous (minimum daily)	<b>Low Flow</b> $<XX$ m <sup>3</sup> /s for a period of <b>&lt;insert number of days&gt;</b> after natural flow events that exceed <b>XX</b> m <sup>3</sup> /s (where XX is a specified event flow trigger)	Insert $< xx$ ML/day or $< xx$ m <sup>3</sup> /s Volume/rate to be determined on case by case basis	Electrical conductivity (uS/cm): <insert water quality objective or 75th percentile of long term background reference data> Sulphate (SO <sub>4</sub> <sup>2-</sup> ): 250 mg/L
		<b>Medium Flow</b> $> XX$ m <sup>3</sup> /s (where XX is specified event flow trigger)	$< XX$ m <sup>3</sup> /s (where XX is the maximum release rate determined on case by case basis )	Electrical conductivity (uS/cm) <insert value determined on case specific basis but typically <1500 Sulphate (SO <sub>4</sub> <sup>2-</sup> ) (mg/L) <insert limit to be determined based on achieving downstream target of 250 (Maximum) >
			$< YY$ m <sup>3</sup> /s (where YY is the maximum release rate determined on case by case basis)	Electrical conductivity (uS/cm) <insert value determined on case specific basis but typically <3500 Sulphate (SO <sub>4</sub> <sup>2-</sup> ) (mg/L) <insert limit to be determined based on achieving downstream target of 250 (Maximum)>
		<b>High Flow</b> $> ZZ$ m <sup>3</sup> /s (where ZZ is a specified high flow event trigger)	$< ZZ$ m <sup>3</sup> /s (where ZZ is the maximum release rate determined on case by case basis)	Electrical conductivity (uS/cm) <insert value determined on case specific basis but typically within a range of <3500 to <10,000 Sulphate (SO <sub>4</sub> <sup>2-</sup> ) (mg/L) <insert limit to be determined based on achieving downstream target of 250 (Maximum)>

Extract from Table 4, Final Model Water Conditions for Coal Mines in the Fitzroy Basin, 2011, page 7.

That table is a promising step in the management of the problem of excess water at mine sites during heavy rainfall events. However, it will only be of benefit to the individual mining operators who are able to agree with DERM on values to be inserted in it.

DERM will need to take a whole of catchment approach to the question of the quality and volumes that can be discharged by each mine under low, medium and high flows, similar to its approach to the grant of transitional environmental programs in 2010/2011.<sup>149</sup> DERM (as opposed to the mining companies) is in the best position to establish what can be discharged by each mine during low, medium and high flow events without causing environmental damage. It will need to take an active role in determining the values to be inserted into Table 4. It cannot expect mining companies to make the complex calculations required to determine the interplay between discharges from different mines; indeed, it already has a system in place to make those calculations.

The 2011 amendments to the Fitzroy model conditions have substantially addressed the Resources Council's concerns.<sup>150</sup> However, they are not a panacea for all problems experienced during the 2010/2011 wet season. DERM has estimated that with the new conditions in place, just under half of those granted transitional environmental programs in 2010/2011 would have to apply again if a wet season of a similar magnitude occurred.<sup>151</sup> For example, the new conditions will not enable Ensham mine to discharge the 20 000 megalitres of water left over from the 2008 and 2010/2011 flooding events it was still holding as at November 2011.<sup>152</sup>

The transition to new environmental authority conditions should be carefully managed. DERM should work with mining companies to aid a transition to the new conditions where they differ markedly from the status quo. Mine operators are voluntary participants in the industry, and by engaging in it subject themselves to the regulatory scheme under the *Environmental Protection Act*. But, particularly given the substantial capital expenditure involved in starting a mining project, they are entitled to some foreknowledge of conditions and should not face the imposition of conditions without transitional periods.

## Recommendations

- 13.7 The Department of Environment and Resource Management should assist mine operators in their applications for amended environmental authorities to ensure, as far as possible, that each environmental authority contains a tailored version of Table 4 of the model conditions. The Department of Environment and Resource Management should provide to mining companies its monitoring data and its suggested values for Table 4 on the basis of an assessment of the catchment which takes into account the cumulative effect of different operators' releases.
- 13.8 Unless the Department of Environment and Resource Management has decided not to permit discharges, it should assist each mine operator in its application for an environmental authority to ensure, as far as possible, that each authority includes provisions for discharges during times of heavy rainfall and flood.

## 13.5 Transitional environmental programs

As is clear from section 13.4, environmental authorities were not a complete solution to dealing with flooding at mines during the 2010/2011 wet season. They may never be. Transitional environmental programs were DERM's mechanism of choice in the 2010/2011 wet season for dealing with the discharge of excess water from mines caused by flooding.<sup>153</sup>

A transitional environmental program is one of the regulatory tools in the *Environmental Protection Act* available for use by DERM. The program must either reduce environmental harm caused by an activity, or move an activity through the transition from non-compliance to compliance with an environmental authority or other instrument.<sup>154</sup> A person can apply for a transitional environmental program or DERM can require the submission of a draft program.<sup>155</sup> DERM has 20 business days to consider whether or not to grant an application for a transitional environmental program.<sup>156</sup> The program, once approved by DERM, authorises any action done in compliance with it, despite anything in a regulation or environmental authority.<sup>157</sup>

The application of the Fitzroy model conditions and the lack of water management infrastructure at mine sites were both partly responsible for a greater build up of water than would otherwise have been the case and, in turn, an increase in the need for transitional environmental programs during the 2010/2011 wet season. In total, over 100 transitional environmental programs were approved by DERM after 1 December 2010. The Commission acknowledges that, given the severity of the wet season experienced in many parts of Queensland, it is likely that some transitional environmental programs would have been needed even if the Fitzroy model conditions had not been introduced.

### 13.5.1 DERM's approach to granting transitional environmental programs in the 2010/2011 wet season

DERM's approach to assessing applications for transitional environmental programs was to balance the environmental harm to be caused by allowing the discharge against the economic benefits to be gained from production increasing as a result of the discharge,<sup>158</sup> with the proviso that unacceptable levels of environmental harm could not be permitted.<sup>159</sup>

The dominant consideration governing the grant of applications for transitional environmental programs was the cumulative environmental impact of releases from different mines.<sup>160</sup> That required a catchment-wide consideration of releases, and environmental impacts, for each application. Conditions on discharge were set to give each mine a window of opportunity to discharge water.<sup>161</sup> DERM maintained control of the process by monitoring waterways downstream and directing discharges at particular mines to stop, if necessary, in order to keep downstream water quality measurements within appropriate bounds.<sup>162</sup>

That approach appears to provide a sound basis for making decisions across a range of mines. It requires significant co-operation between officers of DERM and is likely to require one person to take overall responsibility for all mines in a particular catchment. It is a credit to DERM officers that they were able to manage the process despite the inadequacies of the legislative scheme and guidance material provided. However, see section 13.5.3 *Consistency of decision-making*.

DERM suggested to some mine operators at pre-wet season inspections that they should apply for transitional environmental programs in advance if they anticipated having problems dealing with heavy rainfall.<sup>163</sup> It is hard to see how a transitional program could be used in that way, given that DERM considered the cumulative impact of discharges from many mines within a catchment.<sup>164</sup> If pre-emptive programs were to be granted, they would need to be drafted conservatively in anticipation of applications from other mine operators, and amended as such applications were received.

### 13.5.2 The need for timely approvals

In its letter of 24 November 2010, DERM indicated to the Queensland Resources Council that transitional environmental programs were its mechanism of choice to deal with excess water at mines. DERM was active in promoting transitional environmental programs to mining companies. It provided information about applying for programs and a template application, and encouraged mine operators to start a dialogue with DERM as early as possible.<sup>165</sup>

Mr Roche gave evidence that the process of approving transitional environmental programs in December 2010 was excellent; DERM had delivered on promises to increase staffing over the holiday period and applications were processed promptly.<sup>166</sup> But, by January 2011, the rains had stopped in many mining areas. The programs that had been approved in December 2010 were of little use to mine operators with storages and pits full of water when flows in nearby waterways were too low to permit discharge.<sup>167</sup> The Resources Council contacted DERM numerous times over the first weeks of January 2011 to try to hasten the processing of transitional environmental program applications.<sup>168</sup> Mr Roche considered that DERM 'gave it their best shot', but could not meet the council's expectations for a response to the flooding at mines around Queensland within the transitional environmental program regime.<sup>169</sup>

Mines wishing to release into ephemeral (inconsistently flowing) watercourses were in particular need of timely approvals. Rio Tinto's Hail Creek mine is one such mine. Its representative gave evidence that an approval time of hours, as opposed to days, was needed, if the opportunity to discharge under a transitional environmental program were not to be lost.<sup>170</sup> While Rio Tinto's applications for transitional environmental approvals were approved

quickly (in 11, 8 and 14 days respectively), such timeframes are insufficient to make use of a flood flow which can move through a river system in a matter of hours.

DERM indicated that it did prioritise applications, according to their urgency, on the basis of the information provided by mine operators.<sup>171</sup> It did not, and could not, process applications within hours because of the rigour with which it assessed them. The process of prioritisation grew organically from the situation DERM found itself in during the 2010/2011 wet season and was not an established procedure.<sup>172</sup> That procedure should now be formalised. It should contain a short list of factors that indicate urgency. That may involve some policy decisions; for example, threats to human safety or health are likely to outweigh potential economic harm.

The Commission has identified two possible mechanisms to avoid delay: providing pre-emptive relaxations in advance of rainfall or flooding events, and providing a general relaxation to mines in an entire catchment immediately following a rainfall event.

Pre-emptive approvals could apply to those mines in the headwaters of a catchment or near ephemeral streams when rainfall of high volume is forecast. They could also apply to mines downstream in a catchment towards which floodwaters are travelling. In both scenarios, such an approval could allow greater volumes of water to be discharged. Quick approvals would be required, some in less than 24 hours, to respond to a particular rainfall forecast.

Given their nature, catchment-wide relaxations would have to be conservative to ensure that no environmental harm resulted. However, even a conservative exemption would assist mines to remove excess water from their sites quickly without the need for a drawn out application process. DERM is in the best position to determine accurately the quality and volumes of water that can be discharged from each mine without causing environmental harm. It can provide each mine within a catchment with volume and quality limits, conditioned on flow in the nearby waterway, for discharges when heavy rain falls or flooding occurs. If particular mines consider they need to make further discharges, a further application can be lodged. Such a blanket approach would not be appropriate in all circumstances, but where large regions of the state are flooding at once, it would allow the process of discharge to start quickly and ensure the opportunity to discharge into high flowing rivers was not lost in the struggle with paperwork in Brisbane.

Any approval could be conditioned by DERM in the same way as transitional environmental programs during the 2010/2011 wet season, and could include a requirement that a particular rainfall level or waterway flow rate is actually observed before any discharges are made.

### 13.5.3 Consistency of decision-making

For transitional environmental programs to operate consistently with the *Environmental Protection Act* and environmental authorities granted, there must be some degree of predictability about the type of programs that DERM is willing to grant. Decisions will, of course, be made by reference to the object of the Act to support ecologically sustainable development, but the legislative scheme for granting transitional environmental program applications does not ensure consistency. There are numerous criteria in the legislation. The procedural guide, too, does not assist DERM decision makers to make consistent decisions. This makes it difficult for mine operators to plan their response to environmental authority conditions in terms of building further infrastructure or changing operational plans. It should be possible for operators to determine, in advance, how DERM will make decisions during flood.

#### Relevant considerations

In making a decision about whether or not to grant a transitional environmental program, DERM must consider the ‘standard criteria’,<sup>173</sup> regulatory requirements,<sup>174</sup> additional information provided by the applicant,<sup>175</sup> and any views expressed in a conference held about a draft program.<sup>176</sup>

The ‘standard criteria’ are defined in the *Environmental Protection Act 1994* as:

- (a) the principles of ecologically sustainable development as set out in the ‘National Strategy for Ecologically Sustainable Development’; and
- (b) any applicable environmental protection policy; and

- (c) any applicable Commonwealth, State or local government plans, standards, agreements or requirements; and
- (d) any applicable environmental impact study, assessment or report; and
- (e) the character, resilience and values of the receiving environment; and
- (f) all submissions made by the applicant and submitters; and
- (g) the best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows—
  - (i) an environmental authority;
  - (ii) a transitional environmental program;
  - (iii) an environmental protection order;
  - (iv) a disposal permit;
  - (v) a development approval; and
- (h) the financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) as they would relate to the type of activity or industry carried out, or proposed to be carried out, under the instrument; and
- (i) the public interest; and
- (j) any applicable site management plan; and
- (k) any relevant integrated environmental management system or proposed integrated environmental management system; and
- (l) any other matter prescribed under a regulation.<sup>177</sup>

The regulatory requirements under the *Environmental Protection Regulation 2008* are wide ranging. The general considerations include environmental protection policies,<sup>178</sup> environmental values as declared under the regulation,<sup>179</sup> and characteristics specific to the site: its nature, persons likely to be affected<sup>180</sup> and potential contaminants.<sup>181</sup> Specific environmental impact considerations include the impact of the activity itself,<sup>182</sup> the direct and cumulative effect of introducing the contaminant to the area,<sup>183</sup> greenhouse gas emissions and the environment's remaining capacity to survive future contamination as a result of the proposed release.<sup>184</sup> The regulation also requires consideration of whether and what conditions should be imposed about a large range of matters,<sup>185</sup> including monitoring requirements.<sup>186</sup> If the discharge under the transitional program is onto land<sup>187</sup> or into a watercourse,<sup>188</sup> there are still more considerations including the flow of the water, the mixing of the contaminant and clean water, and storage of water on land.

The Assistant Director-General of DERM described the process of considering all the criteria as a challenge, but considered it a normal part of administrative decision-making by government officers.<sup>189</sup>

## Procedural guide

DERM publishes a procedural guide to assist its officers in deciding whether or not to approve an application.<sup>190</sup> The guide was revised following the flood;<sup>191</sup> the versions provided to the Commission are dated 24 January 2011<sup>192</sup> and 2 June 2011.<sup>193</sup> A version of it was available to officers during the 2010/2011 wet season.<sup>194</sup> The procedural guide is a checklist designed to assist the officers in considering all relevant matters and coming to a conclusion.<sup>195</sup> The record of the officer's decision is contained in an assessment report, in which considerations and conclusions must be set out.<sup>196</sup>

The 24 January 2011 version of the procedural guide for DERM officers is not particularly helpful: it lists criteria and their source but does not give any guidance about what they might mean.<sup>197</sup> The part of the guide that refers to the standard criteria contains an empty table for the insertion of relevant considerations next to headings which correspond to each criterion.<sup>198</sup> No further guidance is given. This document does nothing more than ensure the scores of considerations applicable are brought to the attention of the decision maker.

The 6 June 2011 version of the procedural guide attempts to give more guidance but, in a number of respects, is likely to add to the difficulty likely to be experienced by DERM officers in dealing with the criteria. It contains more detail about the process that the decision maker should go through in order to comply with the Act, and explains what the applicable criteria mean and includes examples.<sup>199</sup> The part of the guide that relates to the

standard criteria might cause problems. It lists a series of questions that should be answered for each of the criteria. Some of these questions are helpful and succinct, for example: ‘Does the decision/action allow for broad community involvement on issues that affect them?’ Others, on the other hand, are long, seemingly impossible to answer and appear beyond DERM’s expertise. Some examples are:

- Has the decision effectively integrated long- and short-term economic, environmental, social and equity considerations?
- Does the decision have due regard to the global dimensions of environmental impacts and policies?
- Has the need to maintain and enhance international competitiveness in an environmentally sound manner been considered when making the decision?<sup>200</sup>

The questions must be answered, and determinations made by relatively senior public service officers on the recommendation of junior professional officers. These junior officers are unlikely to be equipped to answer the questions posed; it is difficult to imagine a person who could answer all of them.

The procedural guide should assist in understanding the relevant considerations, how they should be applied and the priority, if any, that should be accorded to particular criterion. The guide should be public so as to increase mine operators’ ability to understand the way in which DERM makes decisions.

### Rationalisation of criteria

For any particular application, these instruments – the standard criteria, the regulatory requirements and the documents referenced in them – set out well over 100 criteria to be taken into account. The legislative scheme is convoluted and not conducive to consistent decision-making. The procedural guide does not assist. The criteria should be rationalised, and if possible prioritised, to assist both DERM officers and mine operators regulated by them.

The Commission recognises that the gamut of considerations relevant to the grant of a transitional environmental program is so wide because of the range of activities to which a program could relate; the programs are not specifically tailored as a flood response. Rationalisation of criteria could be achieved in a number of ways. Specific criteria for granting transitional environmental programs in response to flood could be identified as a subset of the criteria for granting programs generally. Alternatively, a new mechanism to relax other environmental conditions for discharge of water during floods could be created with its own set of criteria. The policy choice as to how the rationalisation of criteria should occur is one for the Queensland Government.

### 13.5.4 A proper use of transitional environmental programs?

Section 330 of the *Environmental Protection Act* reads:

A transitional environmental program is a specific program that, when complied with, achieves compliance with this Act for the activity to which it relates by doing 1 or more of the following—

- (a) reducing environmental harm caused by the activity;
- (b) detailing the transition of the activity to an environmental standard;
- (c) detailing the transition of the activity to comply with—
  - (i) a condition, including a standard environmental condition, of an environmental authority or code of environmental compliance; or
  - (ii) a development condition.

It should also be noted that a transitional program may only be granted if it assists to achieve compliance with an environmental authority in the manner set out in paragraph (a), (b) or (c). For current purposes, (a) is the only basis upon which a program might be granted for removal of flood waters from a mine site.

However, it might be queried whether paragraph (a) does in fact authorise the granting of such programs. The word ‘activity’ must maintain its meaning throughout the section. The program must reduce the harm caused by that ‘activity’. It cannot really be said that a program which authorises the release of mine-affected water reduces the environmental harm caused by releasing that water. The discharge will cause the same amount of environmental harm whether or not it was done in accordance with a transitional environmental program.

The Assistant Director-General of DERM, pointed out that the program would reduce the harm in comparison to the greater environmental harm that might occur if the activity were unregulated.<sup>201</sup> That may be an accurate representation of how the system works in practice. On one view, however, it is not authorised by the Gilbertian form of section 330(a) which requires that the program must, itself, reduce the environmental harm caused by the very thing it allows.

More than one interpretation of this section may be open. To avoid any suggestion that transitional environmental programs granted by DERM are not authorised by section 330(a), this part of the legislation should be clarified.

### 13.5.5 Adequacy of DERM's response to flooding

The evidence was mixed as to whether the transitional environmental program was an effective response measure to the flooding suffered during the 2010/2011 wet season.

The measure by which mining companies judged DERM's response was its ability to return them to full production. Rio Tinto considered that the programs were simply ineffective in addressing the volume of water received by its Hail Creek mine.<sup>202</sup> The Ensham coal mine was satisfied with the terms of its programs, which resulted in 7000 megalitres of water being released,<sup>203</sup> even though, moving into the 2011/2012 wet season, it retained some water in its pits. A representative of DERM who oversaw the consideration of many transitional environmental program applications disagreed that a failure to empty all mines of water meant that the process was ineffective. Rather, he asserted it simply indicated that the possible environmental impacts of releases were too large to allow all water to be discharged.<sup>204</sup> It is clear to the Commission that the grant of transitional environmental programs to mine operators during floods at least allowed them to restart production more quickly than would otherwise be the case.

There are, however, concerns about the time taken to process applications, whether the use to which the mechanism was put is consistent with its purpose as stated in the Act, and the lack of predictability of application outcomes. Those concerns should be resolved before transitional environmental programs are considered an effective response to flooding.

## Recommendations

- 13.9 The Queensland Government should legislate to clarify the purposes for which a transitional environmental program can be granted. In particular, if the government considers the transitional environmental program the appropriate regulatory mechanism to deal with the discharge of water from mines during flood, section 330 of the *Environmental Protection Act 1994* should be clarified to make it clear that it extends to that use.
- 13.10 The Queensland Government should refine the criteria which must be considered in assessment of applications for relaxation of environmental authority conditions, by transitional environmental program or otherwise, in response to flood.
- 13.11 The Queensland Government should consider amending the *Environmental Protection Act 1994* so that it allows for the relaxation of environmental authority conditions, by transitional environmental program or otherwise, as to discharge of water:
  - pre-emptively, in advance of rainfall or flooding events, or
  - for all mines in a catchment that is flooding.
- 13.12 The Queensland Government should prepare a procedural guide for officers deciding whether to grant a relaxation of environmental authority conditions, by transitional environmental program or otherwise, with guidance as to:
  - the meaning of each criterion
  - examples of the types of things that may be relevant to each criterion
  - the priority, if any, to be afforded to different criteria.
- 13.13 The Queensland Government should make public the procedural guide used by Department of Environment and Resource Management officers to decide whether to grant a transitional environmental program.

## 13.6 A third way – emergency directions?

By late January 2011, the Queensland Resources Council considered that the usefulness of transitional environmental programs had been exhausted. It began pushing for DERM to issue emergency directions allowing mines to discharge water before further rainfall occurred.<sup>205</sup> The Queensland Government rejected the push,<sup>206</sup> possibly under a misapprehension as to the breadth of what the Resources Council was seeking.<sup>207</sup> Mr Roche indicated by letter to the Premier, dated 28 January 2011, that the council envisaged the ‘release of larger quantities of water from mines, irrespective of flows in the receiving streams, provided that water does not exceed some agreed level of salinity...’<sup>208</sup> In evidence before the Commission, he said that either of two alternatives - a direction across the board or directions granted mine-by-mine - would have sufficed.<sup>209</sup> The mining companies’ reception to the proposal for emergency directions was mixed, but, for the most part, they supported further release opportunities.<sup>210</sup>

The emergency directions power is set out in section 468 of the *Environmental Protection Act*. The power allows DERM to direct the release of a contaminant (with or without reasonable conditions) when:

- it is necessary and reasonable to release the contaminant because of an emergency
- there is no other practicable alternative to the release.

Actions that might otherwise be subject to enforcement action, including depositing contaminants and causing environmental harm or nuisance, will not be unlawful when undertaken pursuant to an emergency direction.<sup>211</sup> The Act requires that the person to whom an emergency direction is given comply with the direction and take all reasonable and practicable precautions to prevent or minimise environmental harm, the risk of death or injury to humans and animals, and loss or damage to property.<sup>212</sup>

The Queensland Resources Council has submitted that, in light of the delays associated with the transitional environmental program mechanism, the use of emergency directions should have been expanded to allow mine operators to make releases when the water held was of better quality and flow conditions were such as to allow releases to be made with lower environmental impact.<sup>213</sup>

The Commission does not consider that this would have been an appropriate use of the emergency directions power. Emergency directions, by their nature, will often be made in circumstances where the likely impact of the release is not fully understood. They are an appropriate mechanism for dealing with unforeseen emergencies where the available information suggests that the emergency is, if action is not taken, likely to result in harm to environmental or other values that outweighs the potential impact of the contaminant release.<sup>214</sup> On the other hand, pre-emptive releases made to reduce the likelihood of an emergency arising as a result of foreseeable events, such as elevated rainfall during a wet season, can be properly managed through the environmental authorities or a short-term relaxation that allows for a consideration of the effects of the release, such as a transitional environmental program.

### 13.6.1 The Moranbah North emergency direction

The emergency direction process was employed only twice during the 2010/2011 wet season, both times in relation to the Moranbah North coal mine owned by Anglo American Metallurgical Coal.

On Sunday 19 December 2010, Anglo American advised DERM that, following significant rainfall in the area, one of the dams at the Moranbah North coal mine was at risk of overtopping.<sup>215</sup> Potentially, the dam could have collapsed, with the consequence that a large uncontrolled quantity of mine-affected water would be released.<sup>216</sup> Anglo American requested that an emergency direction be issued to allow water to be released from the dam.<sup>217</sup> Approximately 90 minutes later, DERM authorised Anglo American to discharge water from the dam into the Isaac River. The emergency direction applied until 5.00 pm on Friday 24 December 2010 or until a transitional environmental program authorising the release could be approved.<sup>218</sup>

A further request for an emergency direction was made the following day in respect of another dam that had exceeded its safe storage capacity. That request was also granted on the day it was made.<sup>219</sup>

Given that the emergency directions power was only employed in relation to one mine during the 2010/2011 wet season, it is difficult to draw any firm, broadly applicable conclusions as to its effectiveness. The evidence before the Commission suggests that the emergency directions process in relation to Moranbah North coal mine worked well. The risk of the storages overtopping was the type of emergency contemplated by DERM’s internal guidance

material.<sup>220</sup> Both requests for emergency directions were approved on the day they were made. The emergency directions allowed Anglo American to prevent overtopping of its dams on the site by discharging 13.36 megalitres of mine-affected water into the Isaac River between 21 and 23 December 2010.<sup>221</sup>

### 13.6.2 Definition of emergency

The *Environmental Protection Act* does not define the term ‘emergency’. DERM considers that emergency directions can only be granted in circumstances where there is an imminent risk to the environment, property, human health or safety.<sup>222</sup> It propounds that view in its procedural guide, which guides the decision-making of DERM’s officers.<sup>223</sup> The Queensland Resources Council has expressed a view that the emergency directions power should be construed more broadly. It submits that, when the emergency directions power is read in the context of the Act’s definition of environment as including economic and social conditions,<sup>224</sup> it is wide enough to be used in the case of economic emergencies.<sup>225</sup> In DERM’s view, a decision to release a contaminant into the environment to relieve economic hardship requires a more involved balancing process than that possible for an emergency direction, so releases are more appropriately authorised following an application for a transitional environmental program.<sup>226</sup>

There is no obvious textual reason why an economic emergency might not serve as the basis for use of the emergency directions power. That does not mean that it should. It is open to the executive, acting through the responsible Minister, to decide the bases upon which such a power should be used. The relevant Ministers and DERM did as much in January 2011 when they decided, and told the Resources Council, that the grant of a direction under section 468 would not be used to relieve mines of water that was causing only a loss of production and not posing a pressing environmental or human safety risk.<sup>227</sup> Whether that course of action was in the public interest is a policy question to be answered by government.

### 13.6.3 Procedural guide

In deciding whether to issue an emergency direction, DERM requires its officers to have reference to a procedural guide.<sup>228</sup> The guide directs DERM officers to the factors they should consider to determine whether the direction will satisfy the requirements of section 468 of the *Environmental Protection Act*. Evidence before the Commission indicated that the procedural guide is a public document,<sup>229</sup> but it is marked for internal use and does not appear to be available on DERM’s website. It would be appropriate for the guide to be made public; its list of the factors to be considered when making a decision on the issue of an emergency direction would assist mine operators in understanding how DERM intends to use the tool.

## Recommendations

- 13.14 The Queensland Government should consider amending the *Environmental Protection Act 1994* to provide a definition of the term ‘emergency’ for the purposes of section 468 of that Act.
- 13.15 The Queensland Government should make public the procedural guide used by Department of Environment and Resource Management officers to decide whether to grant an emergency direction.

### 13.6.4 Verbal approvals

The *Environmental Protection Act* requires that an emergency direction be given in writing. That requirement is understandable, as it ensures that both parties have a record of the direction’s precise terms. It seems odd, however, that written notice is required for emergency directions but not for the approval of transitional environmental programs. For the latter, the *Environmental Protection Act* leaves open the possibility of verbal approvals being given, requiring that written notice of a decision be provided to the operator within eight business days.<sup>230</sup> In fact, a verbal approval for a transitional environmental program was given to Anglo American in respect of the Dawson Mine during the 2010/2011 wet season.<sup>231</sup> DERM contended that this was done to provide an expedited approval of a low risk release, thereby avoiding the need for possibly more damaging non-compliant releases.<sup>232</sup> A representative of DERM said that verbal approvals might be given where there is urgency, although that is not the usual approach.<sup>233</sup>

It is clear, though, that emergency directions are more likely to need urgent communication than the grant of transitional environmental programs. The Queensland Resources Council has submitted that the requirement should be relaxed so that a direction can be made orally and subsequently confirmed in writing.<sup>234</sup> Situations may arise where, for example, a failure of communication systems leaves a mine operator unable to receive an emergency direction by email. It seems appropriate that the position on verbal approvals under the *Environmental Protection Act* be made consistent, and that verbal emergency directions be permitted.

## *Recommendation*

- 13.16 The Queensland Government should amend the *Environmental Protection Act 1994* so as to permit an emergency direction to be given orally where it is not practicable to provide the direction in writing, with provision for its subsequent confirmation in writing.

## 13.7 Maintaining the experience gained in 2010/2011

A representative of DERM said that the wet season had been an education for both DERM and mining companies about how the transitional environmental program would work in practice. He said that since the flood, DERM had taken steps to refine communication and assessment processes.<sup>235</sup> The question now is how DERM can ensure the valuable experience gained during the event is not lost. DERM should include in internal guidance documents information about problems encountered during the 2010/2011 wet season and effective solutions that were implemented.

However the government decides to amend the regulatory scheme, workshops and training for both mining industry staff and DERM officers regarding the new approval process would assist in a common understanding of the new scheme.

## 13.8 Abandoned mines

The term ‘abandoned mines’ is used in this section to describe mine sites which have not been fully rehabilitated and for which there is no person identifiable as being the owner or as being responsible for the rehabilitation of the site.

### 13.8.1 Effect of flooding on abandoned mines

In addition to the obvious risks which may be present on site, abandoned mines pose the following risks during floods:

- acid mine drainage, which can result in low water quality and damage to aquatic animals and plants<sup>236</sup>
- discharge of contaminated water from tailings dams overtopping, or seepage through dam or pit walls<sup>237</sup>
- health and environmental risks from the release into watercourses of contaminants such as cyanide, chemicals or fuels that have been kept on the mine site<sup>238</sup>
- sediment issues caused by the lack of vegetation at open cut and surface strip mines.<sup>239</sup>

There are ways in which abandoned mines can be rehabilitated so as to minimise the environmental impacts of flooding. Options include:

- controlling the source of the contamination, for example by sealing underground mines, storing wastes away from rain water or solidifying or encapsulating wastes<sup>240</sup>
- controlling the movement of the contamination away from the mine, for example by using biological measures such as wetlands<sup>241</sup>
- controlling the amount of rainfall that flows from the abandoned mine into creeks, for example by revegetating
- diverting rainwater away from areas in which it will become contaminated.<sup>242</sup>

## The 2010/2011 wet season

The Commission selected the Mt Oxide mine site (abandoned) as a case study for its investigation into flooding at mine sites. The mine is located on Chidna station, north-west of Mt Isa.<sup>243</sup> A number of different operators mined copper there from the 1920s until the 1990s;<sup>244</sup> the last mining leases were surrendered in 1999.<sup>245</sup>

Tributaries of Cave Creek drain runoff from the Mt Oxide site. Cave Creek is part of the catchment of the Leichardt River, which flows into the Gulf of Carpentaria.<sup>246</sup> The tributaries to Cave Creek, and Cave Creek itself, on Chidna station flow an iridescent blue after rainfall.<sup>247</sup> Blue discolouration occurs for more than one kilometre downstream of the mine site.<sup>248</sup> The water flowing out of the abandoned mine is acidic; when it mixes with stormwater, dissolved copper settles out as a bright blue precipitate. This precipitate gathers on creek beds making the water look blue.<sup>249</sup> The exact sources of the contamination are difficult to identify, but include stockpiles of waste material<sup>250</sup> and leakage from the mine pit.<sup>251</sup>

The water quality in Cave Creek was sampled in March 2011. The presence of metals exceeded the acceptable levels set for the protection of ecosystems and human and livestock drinking water.<sup>252</sup> Sediment samples also exceeded the sediment quality guidelines.<sup>253</sup>

The contamination may harm livestock and wildlife that drink the contaminated water or lick precipitate from rocks and earth.<sup>254</sup> Fish and other aquatic life present on the property may also be harmed; they have the least resistance to copper contamination.<sup>255</sup> The photograph below shows the contamination present at Mt Oxide.

Mt Oxide is an example of the sort of environmental damage that may occur during a flood. Similar environmental damage may be occurring in other parts of the state. It is not possible to determine the impact of the 2010/2011 floods on abandoned mines, or the resulting impact on the environment, because of the lack of monitoring and physical inspections, and information collected on those mines. That paucity of information makes it necessary for the Commission to examine the wider issue of abandoned mine management, in order to address the impact of floods.



*Contaminated creek near Mt Oxide Mine, abandoned (photo supplied)*

## 13.8.2 The abandoned mine land program

The Queensland Government's current estimate is that there are approximately 12 000 abandoned mines located on private land, and 3000 on state-owned land in Queensland.<sup>256</sup> The Queensland Government, through the Department of Employment, Economic Development and Innovation, maintains an abandoned mine land program, the primary purpose of which is to ensure human safety.<sup>257</sup> Its secondary purpose is to minimise environmental harm,<sup>258</sup> although it does not hold any environmental authority under the *Environmental Protection Act*. The program is overseen by the abandoned mines co-ordinator, Mr Oskar Kadletz, who was appointed in 2011.<sup>259</sup>

It should be said at the outset that Mr Kadletz impressed the Commission as a dedicated public servant who held deep concerns about the matters for which he was responsible. The fact that the program has, as will be made clear below, been limited in its effectiveness cannot be attributed to his performance.

The abandoned mine land program is chiefly intended to deal with problems arising from abandoned mines on state-owned land; the government considers the owner of the land on which the mine is located to have primary responsibility for it.<sup>260</sup> The Department of Employment, Economic Development and Innovation will take action under the program in respect of abandoned mines on private land only if there is an associated public hazard;<sup>261</sup> it can act with the permission of the landholder or without permission under section 344B of the *Mineral Resources Act 1989*.<sup>262</sup> The department determines what rehabilitation action to take at the site.

## 13.8.3 Mt Oxide mine (abandoned)

Mt Oxide serves as an example by which to assess the Department of Employment, Economic Development and Innovation's efforts to manage abandoned mines. The mine came to the attention of the department in 2009 upon complaints made by the owner of the land on which the mine is located.<sup>263</sup> Prior to the 2010/2011 wet season, the department commissioned an expert panel to give advice on options for rehabilitation. The department was also, before the 2010/2011 wet season, sampling water quality at the site.<sup>264</sup>

In an attempt to minimise the environmental harm occurring at the site, the Department of Employment, Economic Development and Innovation:

- covered stockpiles with high density polyethylene (black plastic)<sup>265</sup>
- provided lick blocks to cattle on the property to reduce their attraction to the contaminated water<sup>266</sup>
- moved waste stockpiles out of the waterway<sup>267</sup> and
- cleaned blue copper precipitate out of the creeks.<sup>268</sup>

No site visits were made during any previous wet season because of concerns about access and the safety of personnel.<sup>269</sup>

The management of the Mt Oxide mine prior to the 2010/2011 wet season was unsatisfactory in more than one respect. Firstly, the lack of a systematic approach to abandoned mine management meant that the Department of Employment, Economic Development and Innovation did not start its investigations until 2009, when the landholder made complaints to the Queensland Government.<sup>270</sup> According to the landholder's statement to the Commission, water quality concerns were identified as early as 2001.<sup>271</sup> Queensland Government sampling effectively ceased in 2003, following the end of the mining lease.<sup>272</sup> It may be that the contamination would have been addressed earlier had there been a systematic risk assessment and regular site inspection program in place.

Secondly, the pace at which rectifying works have proceeded since the department began managing the site in 2009 leaves much to be desired. The expert panel was formed in 2009. From the minutes of its meeting in July 2011, it appears it was discussing investigations of a very preliminary nature. For example, the panel agreed to undertake a library search for information as to the impact of the contamination on wallabies and birds.<sup>273</sup> There is no obvious reason, apart from lack of resources, why research of such a basic type had to wait until 2011.

This same lack of resources appears responsible for the failure to proceed with the rehabilitation of Mt Oxide mine sooner. Mr Kadletz explained that he had to apply the funding available to the sites deemed to have the highest priority; Mt Morgan, for example, was considered a higher priority than Mt Oxide.<sup>274</sup>

It should be noted that some work has been completed since the 2010/2011 wet season. A remote weather station which reports to the Department of Employment, Economic Development and Innovation via satellite uplink was installed in the first half of 2011.<sup>275</sup> Additional monitoring sites to measure stream flow and mine pit water levels are planned.<sup>276</sup> Works to be completed in 2011 and 2012 include installation of a water evaporator, maintenance work on the plastic covers, and identifying projects to be put to tender for the removal or remediation of stockpiles.<sup>277</sup>

The short term goal of the Department of Employment, Economic Development and Innovation's operations at Mt Oxide is to reduce the flow of contaminated water from the site.<sup>278</sup> Mr Kadletz said that to understand the hydrology of the site, it was necessary to monitor conditions in wet and dry seasons over many years: another reason that the department should attend to abandoned mines as quickly as possible.<sup>279</sup>

The medium and long term goals at Mt Oxide are to remove the contaminating material or encapsulate it onsite.<sup>280</sup> Obstacles in the way of these goals include the need for agreement from the current exploration permit holder, whose authorisation covers the Mt Oxide site, resource constraints and the requirement for a tendering process.<sup>281</sup> Mr Kadletz said that he was not aware of any 'really good answers in the world' to the problems of removing and encapsulating the Mt Oxide material.<sup>282</sup>

No timelines have been set by the Department of Employment, Economic Development and Innovation, for the achievement of these goals.<sup>283</sup> Consequently, it is unknown for how long the waters of Mt Oxide will continue to flow iridescent blue.

### 13.8.4 Taking responsibility for abandoned mines

The Commission considers that an agency of the Queensland Government should take responsibility for the management of all abandoned mines. The subject of responsibility was discussed by the Service Delivery and Performance Commission (a Queensland Government entity) in its 2007 report 'Review of the Roles and Responsibilities of the Department of Natural Resources, Mines and Water, Environmental Protection Agency and Department of Primary Industries and Fisheries'. The report reasoned that because the Queensland Government authorised access to the resources at a mine site, it was ultimately responsible for any inadequate rehabilitation of the site.<sup>284</sup> The Service Delivery and Performance Commission recommended that the then Department of Mines and Energy (now part of the Department of Employment, Economic Development and Innovation) take immediate responsibility for managing all existing and new abandoned mine sites.<sup>285</sup> It appears that the Queensland Government did not adopt that recommendation; as outlined above, the evidence was that the state considered abandoned mines on private land to be the responsibility of the landholder.

The situation at Mt Oxide demonstrates the type of environmental harm that can be caused by abandoned mines in times of flood. One agency's having responsibility for all abandoned mines might assist in identifying which mines might cause harm and responding to that possibility. There would also be a practical advantage in the Queensland Government's taking responsibility for abandoned mines; imposing responsibility for abandoned mines on landholders may deter them from reporting environmental harm that may be occurring. Adopting the recommendation of the Service Delivery and Performance Commission would be a useful first step. That recommendation is endorsed.

#### *Recommendation*

13.17 The Queensland Government should determine which of its agencies should take responsibility for the management of all existing and new abandoned mine sites in Queensland.

### 13.8.5 Steps in the management of abandoned mines

The Commission engaged Associate Professor David Laurence to provide an expert opinion on flooding and abandoned mines. Dr Laurence outlined a four step process for the appropriate management of abandoned mines:<sup>286</sup>

1. collection of data and information
2. risk assessment

3. decision as to prioritisation
4. decision as to rehabilitation works.

A similar approach is outlined in the Commonwealth Government publication ‘Strategic Framework for Managing Abandoned Mines in the Mineral Industry’.<sup>287</sup> That publication focuses on the development of a consistent approach in all states and territories to the collection of information about, and management of, abandoned mines.

## Collection of data and information

The first step in the management of abandoned mines is to collect basic data on each mine, including the type of minerals or ore present, size and basic mine features. The Strategic Framework identified data collection as integral to appropriate management.<sup>288</sup>

The Department of Employment, Economic Development and Innovation’s source of information on all known abandoned mines in Queensland is the Queensland Minerals Occurrence database.<sup>289</sup> Compiled by geologists, and not specifically designed for use in the management of abandoned mines, it contains information about the features of each site such as shafts, open cuts, processing areas and tailings dams. It also identifies whether the mine is on private or state-owned land. The database suggests the majority of known abandoned mines are small in size and isolated from towns.<sup>290</sup>

The database is not exhaustive. Upon inspection the Department of Employment, Economic Development and Innovation has found that some mines have more features than the database suggests and others actually comprise a group of smaller mining operations treated as one.<sup>291</sup> For some sites, the information is more than 40 years old.<sup>292</sup> Very few of the mines on the list have been individually inspected. When staff from the Department of Employment, Economic Development and Innovation or DERM visit other mines in the area, they try to inspect abandoned mines to gather further information.<sup>293</sup> Constraints on resources mean that the Department of Employment, Economic Development and Innovation must prioritise the collection of information at what it knows to be high risk sites.<sup>294</sup>

This database represents, for most abandoned mines in Queensland, the entirety of information collected.<sup>295</sup> The Department of Employment, Economic Development and Innovation has further information on some individual sites which it has inspected, or on which it is completing or has completed rehabilitation works.<sup>296</sup>

A new abandoned mines database is currently under construction by the Department of Employment, Economic Development and Innovation. It will contain all the information in the Queensland Minerals Occurrence database,<sup>297</sup> and add some analysis machinery that will be dealt with below in *Risk assessment*. The Commission considers it would be useful for the Queensland Government to review the information held by all of its agencies, and seek information from the public, to add to this database.

## Risk assessment

Risk assessments are an integral part of abandoned mine management – they allow the identification of risks and mitigation options and the proper allocation of resources.<sup>298</sup> The risk assessment should consider all relevant information and data available on the abandoned mine, and deal with public safety, social, economic and environmental risks.<sup>299</sup> Public safety is the most important consideration, and should be emphasised accordingly.<sup>300</sup> The risk posed by flood is another important factor.

Ideally, risk assessment would be conducted after a site inspection of the abandoned mine.<sup>301</sup> Given the large number of abandoned mines in Queensland, any process of inspection will face obvious practical challenges. The order of performing the site inspections will have to be prioritised in some way (see next section *Prioritisation of sites for site inspection*).

In 2005, the Department of Employment, Economic Development and Innovation completed a desktop risk assessment.<sup>302</sup> (The spreadsheet containing the results of the risk assessment was tendered in the Commission’s public hearings.<sup>303</sup>) It enabled the department to arrive at a numerical representation of the risk at each known abandoned mine. The risk was determined on the basis of the features of the mine contained in the database, including the number of mine features (pits, shafts, declines), dredging activities, the size of the mineral deposits at the site, depth and width of the workings, and number of gullies, as well as the size of population nearby.<sup>304</sup>

The risk number assigned was described as a rough evaluation, obtained by assigning a level of risk for each feature and adding together the risk for all features at a particular abandoned mine.<sup>305</sup> Mr Kadletz gave evidence that he believed environmental risk was incorporated into the risk number,<sup>306</sup> although that fact was not discernible from any of the columns in the spreadsheet. It may be that the features of the mine were assigned risk ratings on the basis of how that feature would ordinarily affect the surrounding environment. In any case, it is clear that the full environmental impact of an overwhelming majority of the known abandoned mines cannot be known because a site inspection has not been completed.

Mr Kadletz gave evidence that flood risk was not a risk directly taken into account by the review, but might have formed part of the incorporation of environmental risks.<sup>307</sup> He agreed that to obtain information on the effects of flood, some sort of observation or monitoring of those effects was necessary.<sup>308</sup>

The Department of Employment, Economic Development and Innovation's risk assessment process had these obvious limitations:

- it did not involve site inspections, and was done as a desktop exercise
- it did not take into account economic, social or flooding risks
- the extent to which environmental risks were considered is not discernible
- it did not involve parties with an interest and who might have valuable information, such as industry and the community.

The new abandoned mines database proposed by the Department of Employment, Economic Development and Innovation will contain a new risk assessment module.<sup>309</sup> No evidence was provided by the department as to how this risk assessment module would function. If it is to rely on the information currently available in the database, it will continue to be inadequate. It seems unlikely that the department will be able to undertake a proper risk assessment of the bulk of abandoned mines without considerably more funding.

Dr Laurence gave evidence that a risk assessment should be conducted by a group which includes local landholders and experts who, collectively, have knowledge of the mine and relevant technical expertise (for example, geotechnical or hydrological).<sup>310</sup>

### Prioritisation of sites for site inspection

Mr Kadletz agreed with Dr Laurence that a physical inspection of a site was essential when making a risk assessment<sup>311</sup> and was necessary to obtain an understanding of the effects the mine might have on the environment during flooding.<sup>312</sup> He gave evidence that there was no current plan to do site inspections of all known abandoned mines,<sup>313</sup> citing the program's lack of funding as the reason.<sup>314</sup>

Mr Kadletz estimated that there were 120 to 130 medium sized abandoned mine sites most likely to have infrastructure, such as tailings dams, that might be affected by flood.<sup>315</sup> The risk assessment spreadsheet indicates that there are 317 giant, very large, large or medium sized abandoned mines.<sup>316</sup> These are the mines that should be prioritised for physical site inspection.

### Prioritisation of sites for rehabilitation

It is clear that the Queensland Government cannot commence rehabilitation work at all 15 000 abandoned mines in Queensland immediately. It may be that there is no need to accelerate the rehabilitation of some mines, if they are low risk but will take substantial resources to rectify. The risk assessment process and completion of site inspections will assist in prioritisation of sites for rehabilitation.

The Department of Employment, Economic Development and Innovation, in using its resources, currently gives priority to abandoned mine sites that:

- have been the subject of community concerns<sup>317</sup>
- are already the subject of rehabilitation programs, including Mt Morgan mine, Mt Oxide mine, Horn Island and Croydon<sup>318</sup>
- were identified as the highest risk sites by the desktop risk assessment performed in 2005.<sup>319</sup>

This method of prioritisation is inappropriate. As already explained, it is not the product of any proper risk assessment. Nor is it systematic, being, at least in part, reactive to concerns expressed by the community. Mr

Kadletz said that it worked well, proposing Mt Oxide as an example of a high-risk remote site identified to the Department of Employment, Economic Development and Innovation by a land holder.<sup>320</sup> But the lack of data held on abandoned mines makes it impossible to determine whether the Mt Oxide case is representative, or whether it is simply an instance in which the affected land holder was particularly persistent or attentive.

A particular problem arises with respect to remote sites, which are assigned a lesser risk number than mines close to communities.<sup>321</sup> Remoteness from relevant populations may be a factor lowering risk, but that very distance increases the chance that high levels of environmental damage are occurring without the department's knowledge. As Mr Kadletz agreed, because of remoteness and the lack of consideration of flooding in the risk assessment, sites with problems like those of Mt Oxide will not be prioritised for a full risk assessment.<sup>322</sup>

## Rehabilitation

Once it is established which mines should be rehabilitated, decisions must be made about what rehabilitation activities will be undertaken. The first step is to commission the further studies and investigations necessary to obtain a list of options for rehabilitation. Such studies and investigations will depend on the individual mine and may involve:

- hydrological studies to gain an understanding of overland flow and groundwater<sup>323</sup>
- geotechnical studies to investigate the stability and competency of any pit walls, tailings dams or levees<sup>324</sup>
- characterising the waste material present on the site<sup>325</sup>
- evaluating the mine for potential reopening.<sup>326</sup>

Once those investigations are complete, the decision as to the rehabilitation measures that should be taken will depend on the particular characteristics of the site and the resources available.

## Recommendations

- 13.18 The Department of Employment, Economic Development and Innovation should assemble all information currently available to the abandoned mine land program into a single database. The Queensland Government should ensure, using whatever information is available, that the list of abandoned mines is as complete as possible. This should at least include a review of all information held by the Department of Environment and Resource Management and the Department of Employment, Economic Development and Innovation.
- 13.19 The Queensland Government should seek information about the size, features and condition of abandoned mines, including whether the mine or its surrounding environment were adversely affected by flood, from private landholders who have abandoned mines on their properties.

## (Endnotes)

1 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4766: line 2].

Exhibit 746, Statement of Pier Westerhuis, 26 September 2011 [p7: para 24].

2 For example, see Exhibit 604, Statement of Stuart Ritchie, 14 September 2011 [p7: para 32-34], Annexure SJR6; Transcript, Stuart Ritchie, 22 September 2011, Brisbane [p3073: line 26]; Exhibit 737, Statement of Karl Spaleck, 30 September 2011 [p2: para 8]; Exhibit 746, Statement of Pier Westerhuis, 26 September 2011 [p5: para 9(c)]; Exhibit 606, Statement of Mark Heaton, 6 September 2011 [p2: para 5].

4 State Budget 2010-2011 Mid Year Fiscal and Economic Review [p7].

3 For example, see Exhibit 604, Statement of Stuart Ritchie, 14 September 2011 [p10: para 56(a)].

5 Budget Paper 2 - Budget Strategy and Outlook 2011-2012 [p59].

6 Budget Paper 2 - Budget Strategy and Outlook 2011-2012 [p60].

7 Percentage calculated from \$257.707 billion gross state product – Qld State Accounts for the June Quarter 2011 [p17].

- 8 Exhibit 945, Statement of Michael Roche, 26 October 2011, Annexure 2, Item 27.
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- 9 Section 3, *Environmental Protection Act 1994*.
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- 10 Submission of the Queensland Resources Council, 11 March 2011; Submission of Rio Tinto Coal Australia Pty Ltd, 11 March 2011; Submission of Anglo American Metallurgical Coal Pty Ltd, 1 April 2011.
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- 11 Submissions of the Queensland Greens, 4 April 2011, 8 April 2011, 20 September 2011; Submission of the Queensland Conservation Council, 4 April 2011.
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- 12 Submission of the State of Queensland, DERM-06 [p15-16].
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- 13 Submission of Rio Tinto Coal Australia Pty Ltd, 11 March 2011 [p3]; Exhibit 604, Statement of Stuart Ritchie, 14 September 2011 [p2: para 10(c); p6: para 25, 27].
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- 14 Exhibit 938, Statement of Glenn Burlinson, 19 October 2011 [p2: para 11].
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- 15 Exhibit 1018, First Statement of Pier Westerhuis, 12 May 2011 [p1: para 3].
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- 16 Submission of Anglo American Metallurgical Coal [p1].
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- 17 Submission of Anglo American Metallurgical Coal [p1].
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- 18 Exhibit 924, Statement of Andrew Brier (Moranbah CSG), 27 September 2011 [p2: para 6, 7].
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- 19 Exhibit 738, Statement of Robert Lawrence, 27 September 2011 [p2: para 4].
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- 20 Transcript, Stuart Ritchie, 22 September 2011, Brisbane [p3069: line 29].
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- 21 Transcript, Graham Cordingley, 8 November 2011, Brisbane [p4688: line 50].
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- 22 Transcript, Graham Cordingley, 8 November 2011, Brisbane [p4689: line 15].
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- 23 Transcript, Karl Spaleck, 5 October 2011, Brisbane [p3727: line 54].
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- 24 Transcript, Stuart Ritchie, 22 September 2011, Brisbane [p3070: line 6].
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- 25 Transcript, Stuart Ritchie, 22 September 2011, Brisbane [p3069: line 46].
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- 26 Section 3 of the *Environmental Protection Act 1994* states 'The object of this Act is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development)'.
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- 27 Exhibit 938, Statement of Glenn Burlinson, 19 October 2011 [p5: para 28]; Exhibit 737, Statement of Karl Spaleck, 30 September 2011 [p5: para 22]; Exhibit 746, Statement of Pier Westerhuis, 26 September 2011 [p6: para 15]; Transcript, Karl Spaleck, 5 October 2011, Brisbane [p3731: line 16]; Transcript, Stuart Ritchie, 22 November 2011, Brisbane [p3091: line 26]; Transcript, Robert Lawrence, 8 November 2011, Brisbane [p4790: line 1].
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- 28 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4770: line 15].
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- 29 Transcript, Stuart Ritchie, 22 September 2011, Brisbane [p3091: line 19].
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- 30 Exhibit 737, Statement of Karl Spaleck, 30 September 2011 [p5: para 22].
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- 31 Exhibit 938, Statement of Glenn Burlinson, 19 October 2011 [p5: para 29-31].
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- 32 Exhibit 606, Second Statement of Mark Heaton, 15 September 2011 [p1: para 1].
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- 33 Exhibit 606, Second Statement of Mark Heaton, 15 September 2011 [p1: para 1].
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- 34 Exhibit 746, Second Statement of Pier Westerhuis, 26 September 2011 [p5: para 12(a)].
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- 35 Exhibit 748, Statement of Andrew Brier (Ensham Mine), 27 September 2011 [p2: para 9].
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- 36 Exhibit 923, Statement of Graham Cordingley, 26 September 2011 [p4: para 17; p5: para 23].
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- 37 Exhibit 938, Statement of Glenn Burlinson, 19 October 2011 [p6: para 42]; Exhibit 933, Statement of Andrew Brier (Rolleston), 27 September 2011 [p2: para 10].
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- 38 Exhibit 938, Statement of Glenn Burlinson, 19 October 2011 [p5: para 34].
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- 39 Transcript, Karl Spaleck, 5 October 2011, Brisbane [p3731: line 23]; Exhibit 606, Second Statement of Mark Heaton, 15 September 2011 [p1: para 1].
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- 40 Correspondence from Commonwealth of Australia, 1 December 2011, Request for information- Bureau of Meteorology – Forecasting relevant to the mining industry [p2: para 2].

- 41 Exhibit 738, Statement of Robert Lawrence (Century Mine), 27 September 2011 [p2: para 8]; Transcript, Robert Lawrence, 8 November 2011, Brisbane [p4788: line 28].
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- 42 Exhibit 936, Statement of Andrew Brier (Moranbah North), 27 September 2011 [p2: para 9].
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- 43 Exhibit 934, Statement of Andrew Brier (Hail Creek), 27 September 2011 [p2: para 8].
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- 44 Exhibit 748, Statement of Andrew Brier (Ensham Mine), 27 September 2011 [p2: para 8, 11]; Annexures ASB-E01-01 – ASB-E01-05.
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- 45 Exhibit 937, Statement of Andrew Brier (Dawson), 27 September 2011 [p2: para 8].
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- 46 Exhibit 738, Statement of Robert Lawrence (Century Mine), 27 September 2011 [p2: para 9]; Annexure RAL-CM01-03; Annexure RAL-CM-01-06; Transcript, Robert Lawrence, 8 November 2011, Brisbane [p4787: line 52; p4788: line 1].
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- 47 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4767: lines 8-12]; Exhibit 748, Statement of Andrew Brier (Ensham), 27 September 2011 [p1: para 4]; Exhibit 924, Statement of Andrew Brier (Moranbah CSG), 27 September 2011; Exhibit 933, Statement of Andrew Brier (Rolleston), 27 September 2011 [p1: para 4]; Exhibit 934, Statement of Andrew Brier (Hail Creek), 27 September 2011 [p1: para 4]; Exhibit 936, Statement of Andrew Brier – (Moranbah North), 27 September 2011 [p1: para 4]; Exhibit 937, Statement of Andrew Brier (Dawson), 27 September 2011 [p1: para 4].
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- 48 Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p28: para 166].
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- 49 Exhibit 604, Statement of Stuart Ritchie, 14 September 2011 [p7: para 33]. Water storages at mine sites are required to have a limited safety margin (or ‘freeboard’) that can be temporarily consumed if needed. This is generally how the storages are able to be above 100 per cent capacity. See Transcript, Stuart Ritchie, 22 September 2011, Brisbane [p3072: line 14].
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- 50 Submission of Rio Tinto Coal Australia Pty Ltd [p3].
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- 51 Submission of Rio Tinto Coal Australia Pty Ltd [p3]; Transcript, Stuart Ritchie, 22 September 2011, Brisbane [p3074: line 1].
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- 52 Exhibit 934, Statement of Andrew Brier (Hail Creek), 27 September 2011 [p4: para 19].
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- 53 Submission of Rio Tinto Coal Australia Pty Ltd [p3]; Exhibit 604, Statement of Stuart Ritchie, 14 September 2011 [p11: para 64].
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- 54 Submission of Rio Tinto Coal Australia Pty Ltd, 11 March 2011 [p3].
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- 55 Exhibit 604, Statement of Stuart Ritchie, 14 September 2011 [p11: para 64].
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- 56 Exhibit 604, Statement of Stuart Ritchie, 14 September 2011 [p12: para 64].
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- 57 Exhibit 938, Statement of Glenn Burlinson, 19 October 2011 [p8: para 57].
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- 58 Exhibit 938, Statement of Glenn Burlinson, 19 October 2011 [p3: para 21-25].
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- 59 Exhibit 938, Statement of Glenn Burlinson, 19 October 2011 [p8: para 60].
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- 60 Exhibit 938, Statement of Glenn Burlinson, 19 October 2011 [p8: para 56].
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- 61 Exhibit 938, Statement of Glenn Burlinson, 19 October 2011 [p3: para 20].
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- 62 Exhibit 1018, First Statement of Pier Westerhuis, 12 May 2011 [p1: para 6].
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- 63 Exhibit 1018, First Statement of Pier Westerhuis, 12 May 2011 [p1: para 6].
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- 64 Exhibit 746, Second Statement of Pier Westerhuis, 26 September 2011 [p7: para 24].
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- 65 Exhibit 941, Third Statement of Pier Westerhuis, 2 November 2011 [p7: para 19].
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- 66 Exhibit 606, Second Statement of Mark Heaton, 15 September 2011 [p2: para 3].
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- 67 See section 13.6.1 The Moranbah North Emergency Direction.
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- 68 Exhibit 936, Statement of Andrew Brier (Moranbah North), 27 September 2011 [p5: para 25]; Annexure ASB-MN03-15.
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- 69 Exhibit 937, Statement of Andrew Brier (Dawson Mine), 27 September 2011 [p3: para 14].
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- 70 Exhibit 606, Statement of Mark Heaton, 6 September 2011 [p2: para 5].
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- 71 Statement of Carl Grant, 1 November 2011 [p6: para 10].
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- 72 Exhibit 924, Statement of Andrew Brier (Moranbah CSG), 27 September 2011 [p4: para 25].
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- 73 Exhibit 924, Statement of Andrew Brier (Moranbah CSG), 27 September 2011 [p4: para 28].
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- 74 Exhibit 924, Statement of Andrew Brier (Moranbah CSG), 27 September 2011 [p4: para 29]; Annexure ASB-MCSG02-09.
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- 75 Exhibit 737, Statement of Karl Spaleck, 30 September 2011 [p1: para 4].
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- 76 Exhibit 737, Statement of Karl Spaleck, 30 September 2011 [p1: para 3].
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- 77 Exhibit 737, Statement of Karl Spaleck, 30 September 2011 [p1: para 3].
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- 78 Exhibit 737, Statement of Karl Spaleck, 30 September 2011 [p2: para 6].
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- 79 Exhibit 737, Statement of Karl Spaleck, 30 September 2011 [p2: para 8].
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- 80 Exhibit 737, Statement of Karl Spaleck, 30 September 2011 [p3: para 9(c)(ii)].
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- 81 Exhibit 737, Statement of Karl Spaleck, 30 September 2011 [p2: para 8].
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- 82 Exhibit 737, Statement of Karl Spaleck, 30 September 2011 [p2: para 7]; Exhibit 738, Statement of Robert Lawrence, 27 September 2011 [p4: para 18]; Annexure RAL-CM02-04.
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- 83 Submissions of the Queensland Greens, 4 April 2011, 8 April 2011, 20 September 2011; Submission of the Queensland Conservation Council, 4 April 2011.
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- 84 Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p25: para 147]; Exhibit 748, Statement of Andrew Brier (Ensham), 27 September 2011 [p11: para 64]; Exhibit 933, Statement of Andrew Brier (Rolleston), 27 September 2011 [p11: para 61]; Exhibit 934, Statement of Andrew Brier (Hail Creek), 27 September 2011 [p12: para 65]; Exhibit 936, Statement of Andrew Brier (Moranbah North), 27 September 2011 [p12: para 70]; Exhibit 937, Statement of Andrew Brier (Dawson), 27 September 2011 [p12: para 65].
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- 85 Transcript, Michael Birchley, 9 November 2011, Brisbane [p4801: line 30]; Transcript, Andrew Brier, 8 November 2011, Brisbane [p4779: line 30].
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- 86 Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p26: para 149, 152]; Exhibit 748, Statement of Andrew Brier (Ensham), 27 September 2011 [p12: para 66, 69]; Exhibit 924, Statement of Andrew Brier (Moranbah CSG), 27 September 2011 [p13: para 90]; Exhibit 933, Statement of Andrew Brier – (Rolleston), 27 September 2011 [p12: para 63, 66]; Exhibit 934, Statement of Andrew Brier (Hail Creek), 27 September 2011 [p12: para 67, 70]; Exhibit 936, Statement of Andrew Brier (Moranbah North), 27 September 2011 [p12: para 72, p13: para 75]; Exhibit 937, Statement of Andrew Brier (Dawson), 27 September 2011 [p12: para 67; p13: para 70].
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- 87 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4780: line 29].
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- 88 Statement of Julia Playford, 24 November 2011 [p3: para 12, 15].
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- 89 Statement of Peter McGinnity, 24 November 2011 [p11: para 40].
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- 90 Statement of Julia Playford, 24 November 2011 [p3: para 12]; Statement of Peter McGinnity, 24 November 2011 [p3: para 10].
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- 91 Statement of Julia Playford, 24 November 2011 [p3: para 12]; Statement of Peter McGinnity, 24 November 2011 [p3: para 10].
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- 92 Statement of Julia Playford, 24 November 2011 [p8: para 35].
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- 93 Statement of Julia Playford, 24 November 2011 [p4: para 19-26]; Statement of Peter McGinnity, 24 November 2011 [p7: para 21-24].
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- 94 Statement of Robert Speirs, 25 November 2011 [p7].
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- 95 Statement of Peter McGinnity, 24 November 2011 [p8: para 26-27].
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- 96 Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p20: para 113].
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- 97 Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p20: para 112 – p21: para 122].
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- 98 Statement of Julia Playford, 24 November 2011 [p7: para 32].
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- 99 Statement of Julia Playford, 24 November 2011 [p9: para 42].
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- 100 Sections 148 and 330 of the *Environmental Protection Act 1994*.
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- 101 Exhibit 934, Statement of Andrew Brier (Hail Creek), 27 September 2011 [p3: para 15]; Exhibit 933, Statement of Andrew Brier (Rolleston), 27 September 2011 [p4: para 16]; Exhibit 748,

- Statement of Andrew Brier (Ensham Mine), 27 September 2011 [p3: para 15]; Exhibit 936, Statement of Andrew Brier (Moranbah North), 27 September 2011 [p13: para 16]; Exhibit 937, Statement of Andrew Brier (Dawson Mine), 27 September 2011 [p4: para 15].
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- 102 See Exhibit 738, Statement of Robert Lawrence, 27 September 2011 [p4: para 19]; Exhibit 924, Statement of Andrew Brier (Moranbah CSG), 27 September 2011 [p5: para 30].
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- 103 Section 18(b), *Environmental Protection Act 1994*.
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- 104 Sections 426, 426A, *Environmental Protection Act 1994*.
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- 105 See sections 148(4), 168A, 168B and 176, *Environmental Protection Act 1994*.
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- 106 Section 430, *Environmental Protection Act 1994*.
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- 107 Section 162, *Environmental Protection Act 1994*. An environmental impact statement outlines the potential adverse and beneficial environmental, economic and social impacts of the project, and proposes solutions to minimise any harm. See section 40(a) of the *Environmental Protection Act 1994*.
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- 108 Section 163B, *Environmental Protection Act 1994*.
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- 109 Section 39, *Environmental Protection Act 1994*.
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- 110 Exhibit 748, Statement of Andrew Brier (Ensham Mine), 27 September 2011 [p14: para 81].
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- 111 Exhibit 746, Statement of Pier Westerhuis, 26 September 2011, Annexure PW-14-17 [p11: para 50-55]; Exhibit 748, Statement of Andrew Brier (Ensham Mine), 27 September 2011 [p14: para 81].
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- 112 Statement of Andrew Brier (Ensham Mine), 27 September 2011 [p14: para 82].
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- 113 Statement of Andrew Brier (Ensham Mine), 27 September 2011 [p14: para 82].
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- 114 Statement of Andrew Brier (Ensham Mine), 27 September 2011 [p14: para 83].
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- 115 Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p13: para 73 – p14: para 75].
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- 116 Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p13: para 73 – p14: para 79].
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- 117 Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p15: para 83].
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- 118 Exhibit 949 Statement of Frances Hayter, 7 September 2011, Annexure C, items 2, 4 [p6: para 13]; Submission of the Queensland Resources Council, 11 March 2011 [p8].
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- 119 Submission of the Qld Resources Council [p7]; Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p14: para 76].
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- 120 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-06-01c [p6]; Exhibit 604, Statement of Stuart John Ritchie, 14 September 2011 [p5: para 18(c)(ii)]; Transcript, Stuart Ritchie, 22 September 2011, Brisbane [p3071: lines 38-40]; Transcript, Michael Roche, 10 November 2011, Brisbane [p4862: line 21-28].
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- 121 Transcript, Michael Roche, 10 November 2011, Brisbane [p4862: line 39].
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- 122 Exhibit 934, Statement of Andrew Brier (Hail Creek), 27 September 2011 [p3: para 15]; Exhibit 933, Statement of Andrew Brier (Rolleston), 27 September 2011 [p4: para 16]; Exhibit 748, Statement of Andrew Brier (Ensham Mine), 27 September 2011 [p3: para 15]; Exhibit 936, Statement of Andrew Brier (Moranbah North), 27 September 2011 [p3: para 16]; Exhibit 937, Statement of Andrew Brier (Dawson Mine), 27 September 2011 [p4: para 15].
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- 123 Transcript, Michael Roche, 10 November 2011, Brisbane [p4862: line 33-35].
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- 124 Exhibit 606, Statement of Mark Heaton, 6 September 2011 [p1: para 2]; Transcript, Michael Roche, 10 November 2011, Brisbane [p4854: line 29; p4862: line 32]; Exhibit 604, Statement of Stuart John Ritchie, 14 September 2011, Annexure SJR 4 [p3: para 18(a)].
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- 125 Exhibit 949, Statement of Frances Hayter, 7 September 2011 Annexure G [p2: para 2.6].
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- 126 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4766: line 22].
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- 127 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4766: line 25]; Exhibit 949, Statement of Frances Hayter, 7 September 2011 [p9: para 18].
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- 128 Exhibit 945, Statement of Michael Roche, 26 October 2011 [p12: para 53].
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- 129 For example see Exhibit 934, Statement of Andrew Brier (Hail Creek), 27 September 2011 [p2: para 10].
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- 130 Exhibit 746, Statement of Pier Westerhuis, 26 September 2011 [p5: para 9(c)]; Exhibit 748,

- Statement of Andrew Brier (Ensham),  
27 September 2011 [p3: para 14; p14: para 82].
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- 131 Exhibit 748, Statement of Andrew Brier (Ensham), 27 September 2011 [p15: para 87]; Exhibit 938, Statement of Glenn Burlinson, 19 October 2011 [p12: para 80]; Exhibit 604, Statement of Stuart Ritchie, 14 September 2011 [p4: para 18(b)].
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- 132 Exhibit 945, Statement of Michael Roche, 26 October 2011 [p12: para 51].
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- 133 Exhibit 949, Statement of Frances Hayter, 7 September 2011, Annexure D, item 1.
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- 134 Transcript, Michael Roche, 10 November 2011, Brisbane [p4855: line 10].
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- 135 Exhibit 945, Statement of Michael Roche, 26 October 2011 [p12: para 55]. See also Transcript, Michael Roche, 10 November 2011, Brisbane [p4888: line 50].
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- 136 Transcript, Michael Roche, 10 November 2011, Brisbane [p4888: line 29].
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- 137 Exhibit 949, Statement of Frances Hayter, 7 September 2011 [p9: para 15(d)].
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- 138 Submission of Queensland Resources Council, 11 March 2011, Appendix B.
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- 139 Exhibit 949, Statement of Frances Hayter, 7 September 2011, Annexure D, item 7 [p8: para 14].
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- 140 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4766: line 25]; Exhibit 949, Statement of Frances Hayter, 7 September 2011 [p9: para 18].
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- 141 Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p17: para 90].
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- 142 Exhibit 949, Statement of Frances Hayter, 7 September 2011 [p11: para 20].
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- 143 Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p17: para 92].
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- 144 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-06-24b, Fitzroy Model Conditions 2011 [p5]; Exhibit 949, Statement of Frances Hayter, 7 September 2011 [p12: para 22(a)].
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- 145 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-06-24b, Fitzroy Model Conditions [p10]; Exhibit 949, Statement of Frances Hayter, 7 September 2011 [p13: para 22(c)].
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- 146 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-06-24b, Fitzroy Model Conditions [p1-2]; Exhibit 949, Statement of Frances Hayter, 7 September 2011 [p15: para 22(f)], Appendix E.
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- 147 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-06-24b, Fitzroy Model Conditions 2011 [p7].
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- 148 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-06-24b, Fitzroy Model Conditions [p5-6]; Exhibit 949, Statement of Frances Hayter, 7 September 2011 [p12: para 22(b)].
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- 149 See section 13.5.1 *DERM's approach to granting transitional environmental programs in the 2010/2011 wet season.*
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- 150 Exhibit 949, Statement of Frances Hayter, 7 September 2011 [p11: para 19 – p19: para 42].
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- 151 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-06-24a, Briefing note to General Manager – Strategic Implementation, Coal and Coal Seam Gas, 3 August 2011 [p2].
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- 152 Exhibit 941, Statement of Pier Westerhuis, 2 November 2011 [p9: para 32]; Exhibit 748, Statement of Andrew Brier (Ensham), 27 September 2011 [p13: para 75-77].
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- 153 Transcript, Michael Birchley, 9 November 2011, Brisbane [p4799: line 40].
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- 154 Section 330 of the *Environmental Protection Act 1994*. See section 13.5.4 *A proper use of transitional environmental programs?*
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- 155 Sections 332-333 of the *Environmental Protection Act 1994*.
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- 156 Section 337 of the *Environmental Protection Act 1994*.
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- 157 Section 346 of the *Environmental Protection Act 1994*.
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- 158 Transcript, Michael Birchley, 9 November 2011, Brisbane [p4797: line 38]; Transcript, Andrew Brier, 8 November 2011, Brisbane [p4774: line 33].
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- 159 Transcript, Michael Birchley, 9 November 2011, Brisbane [p4797: line 38].
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- 160 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4767: line 44; p4768: line 10].
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- 161 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4769: line 1].
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- 162 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4769: line 1; p4769: line 48]. See for example, the directions given to Rio Tinto: Statement of Stuart Ritchie, 14 September 2011, Annexure SJR 7.12.
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- 163 Exhibit 747, Statement of Michael Birchley, 19 October 2011 [p18: para 98].
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- 164 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4767: line 43 – p4769: line 11].
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- 165 Transcript, Michael Roche, 10 November 2011, Brisbane [p4864: line 19 – p4868].
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- 166 Transcript, Michael Roche, 10 November 2011, Brisbane [p4856: line 50].
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- 167 Transcript, Michael Roche, 10 November 2011, Brisbane [p4856: line 56; p4890: line 6].
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- 168 Exhibit 945, Statement of Michael Roche, 26 October 2011 [p6: para 20 – p8: para 29]; Annexure 2 items 1-9; Transcript, Michael Roche, 10 November 2011, Brisbane [p4856-4875]; Exhibit 949, Statement of Frances Hayter, 7 September 2011 [p17: para 35 – p18: para 36]; Exhibit 948, Statement of Michael Roche, 9 November 2011 [p6: para 20 – p8: para 29].
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- 169 Transcript, Michael Roche, 10 November 2011, Brisbane [p4857: line 6]. See also Exhibit 945, Statement of Michael Roche, 26 October 2011 [p6: para 20 – p8: para 29]; Annexure 2 items 1-9.
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- 170 Exhibit 604, Statement of Stuart Ritchie, 14 September 2011 [p8: para 42; p9: para 50]; Transcript, Stuart Ritchie, 22 September 2011, Brisbane [p3078: line 14].
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- 171 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4770: line 42; p4771: line 21].
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- 172 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4771: line 44].
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- 173 Section 338(1)(b)(i), *Environmental Protection Act 1994*; Schedule 4 – standard criteria, *Environmental Protection Act 1994*; Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p5: para 24]; Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-02-06; Transcript, Michael Birchley, 8 November 2011, Brisbane [p4794: lines 27-30].
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- 174 Section 338(1)(a), *Environmental Protection Act 1994*.
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- 175 Section 338(1)(b)(ii), *Environmental Protection Act 1994*.
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- 176 Section 338(1)(b)(iii), *Environmental Protection Act 1994*; Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p8: para 42].
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- 177 Schedule 4, *Environmental Protection Act 1994*.
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- 178 Section 51(1)(a), *Environmental Protection Regulation 2008*.
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- 179 Section 51(1)(aa), *Environmental Protection Regulation 2008*; Section 9, *Environmental Protection Act 1994* defines environmental value as ‘(a) a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or (b) another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation’.
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- 180 Section 51(2), *Environmental Protection Regulation 2008*.
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- 181 Section 51(1)(b), (c), *Environmental Protection Regulation 2008*.
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- 182 Section 51(1)(e), *Environmental Protection Regulation 2008*.
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- 183 Section 51(1)(d), *Environmental Protection Regulation 2008*.
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- 184 Section 51(1)(g), (h), *Environmental Protection Regulation 2008*; Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p9: para 52(c)].
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- 185 Section 52(1), *Environmental Protection Regulation 2008*; Transcript, Michael Birchley, 8 November 2011, Brisbane [p4795: lines 42-48]; Exhibit 747, Statement of Michael Birchley, 5 September 2011 [p9: para 52]; Transcript, Michael Birchley, 8 November 2011, Brisbane [p4795: lines 42-48].
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- 186 Section 49, *Environmental Protection Regulation 2008*.
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- 187 Section 55, *Environmental Protection Regulation 2008*; Transcript, Michael Birchley, 8 November 2011, Brisbane [p4795: lines 26-30].
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- 188 Section 56, *Environmental Protection Regulation 2008*; Transcript, Michael Birchley, 8 November 2011, Brisbane [p4795: lines 32-33].
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- 189 Transcript, Michael Birchley, 8 November 2011, Brisbane [p4795: line 4].
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- 190 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB 04-01; Annexure MFB 04-02; Transcript, Michael Birchley, 8 November 2011, Brisbane [p4795: lines 50-58; p4796: lines 12-13].
- 191 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4773: line 54].
- 192 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-03-26.
- 193 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-03-27.
- 194 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4774: line 2].
- 195 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB 04-02 [p9].
- 196 See for example: Department of Environment and Resource Management, Assessment Report – Hail Creek Coal Mine, 10 June 2011.
- 197 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-03-26 [p4].
- 198 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-03-26 [p4-5].
- 199 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-03-27 [p6].
- 200 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-03-27 [p7-9].
- 201 Transcript, Michael Birchley, 9 November 2011, Brisbane [p4793: line 50 – p4794: line 20].
- 202 Exhibit 604, Statement of Stuart John Ritchie, 14 September 2011 [p10: para 55]; Transcript, Stuart Ritchie, 22 September 2011, Brisbane [p3079: lines 30-40].
- 203 Exhibit 746, Statement of Pier Westerhuis, 26 September 2011 [p8: para 30].
- 204 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4777: line 22].
- 205 Exhibit 945, Statement of Michael Roche, 26 October 2011 [p8: para 30 – p11: para 50]; Annexure 2, items 10-28; Transcript, Michael Roche, 10 November 2011, Brisbane [p4860-61; 4877-4892]; Exhibit 949, Statement of Frances Hayter, 7 September 2011 [p19: para 43].
- 206 Exhibit 945, Statement of Michael Roche, 26 October 2011 [p10: para 40, 41; p11: para 49-50]; Annexure 2, items 18,19,27 and 28.
- 207 Exhibit 945, Statement of Michael Roche, 26 October 2011 [p11: para 49-50]; Annexure 2, items 27, 28.
- 208 Exhibit 945, Statement of Michael Roche, 26 October 2011, Annexure 2, item 20.
- 209 Transcript, Michael Roche, 10 November 2011, Brisbane [p4859: line 25].
- 210 Transcript, Michael Roche, 10 November 2011, Brisbane [p4882: line 5].
- 211 Section 493A(2)(g), *Environmental Protection Act 1994*.
- 212 Section 479, *Environmental Protection Ac 1994*.
- 213 Exhibit 949, Statement of Frances Hayter, 7 September 2011 [p19: para 43]; Submission of Queensland Resources Council [p8].
- 214 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4778: line 21].
- 215 Exhibit 936, Statement of Andrew Brier (Moranbah North), 27 September 2011 [p5: para 27]; Annexure ASB-MN-03-01.
- 216 Exhibit 936, Statement of Andrew Brier (Moranbah North), 27 September 2011 [p5: para 27]; Annexure ASB-MN-03-01; Transcript, Andrew Brier, 8 November 2011, Brisbane [p4778: line 11].
- 217 Exhibit 936, Statement of Andrew Brier (Moranbah North), 27 September 2011 [p5: para 22]; Annexure ASB-MN-03-01.
- 218 Exhibit 936, Statement of Andrew Brier (Moranbah North), 27 September 2011 [p5: para 22]; Annexure ASB-MN-03-02.
- 219 Exhibit 936, Statement of Andrew Brier (Moranbah North), 27 September 2011 [p5: para 23]; Annexure ASB-MN-03-03, ASB-MN-03-04.
- 220 Exhibit 936, Statement of Andrew Brier (Moranbah North), 27 September 2011 [p5: para 27]; Transcript, Andrew Brier, 8 November 2011, Brisbane [p4781: line 26].
- 221 Statement of Carl Grant, 1 November 2011 [p2: para 2(f)].
- 222 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4781: line 34]; Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-03-37.
- 223 Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-03-37 [p2].

- 224 Section 8(d), *Environmental Protection Act 1994*.
- 
- 225 Transcript, Michael Roche, 10 November 2011, Brisbane [p4860: line 50].
- 
- 226 Transcript, Michael Birchley, 8 November 2011, Brisbane [p4799: line 41].
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- 227 As described above, this position was not necessarily a rejection of what the Queensland Resources Council was requesting, as the details of the request were unclear.
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- 228 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4777: line 46]; Exhibit 747, Statement of Michael Birchley, 5 September 2011, Annexure MFB-03-37.
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- 229 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4777: line 43].
- 
- 230 Section 340(1), *Environmental Protection Act 1994*.
- 
- 231 Exhibit 937, Statement of Andrew Brier (Dawson), 27 September 2011 [p5: para 19].
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- 232 Exhibit 937, Statement of Andrew Brier (Dawson), 27 September 2011 [p5: para 19].
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- 233 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4776: line 39].
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- 234 Exhibit 945, Statement of Michael Roche, 26 October 2011 [p3: para 12].
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- 235 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4772: lines 1-18].
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- 236 Exhibit 922, Report of Associate Professor Laurence, Flooding and Abandoned Mines, 4 November 2011 [p3: para 11].
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- 237 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p4-5: para 23].
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- 238 Exhibit 922, Report of Associate Professor Laurence, Flooding and Abandoned Mines, 4 November 2011 [p4: para 13].
- 
- 239 Exhibit 922, Report of Associate Professor Laurence, Flooding and Abandoned Mines, 4 November 2011 [p2-3: para 10].
- 
- 240 Johnson, D. B. and K. B. Hallberg. 2005. Acid mine drainage remediation options: a review. *Science of the Total Environment*. 338(1-2):3-14 [p5].
- 
- 241 Johnson, D. B. and K. B. Hallberg. 2005. Acid mine drainage remediation options: a review. *Science of the Total Environment*. 338(1-2):3-14 [p6-12].
- 
- 242 Wolkersdorfer, C. 2008. Water management at abandoned flooded underground mines: fundamentals, tracer tests, modelling, water treatment. Berlin: Springer [p50].
- 
- 243 Exhibit 608, Statement of Oskar Kadletz, 20 September 2011 [p1: para 3-4].
- 
- 244 Exhibit 942, Statement of Rob Lawrence (Mt Oxide), 27 September 2011, Annexure RAL-MO01-01 [p3].
- 
- 245 Exhibit 608, Statement of Oskar Kadletz, 20 September 2011 [p1: para 3].
- 
- 246 Exhibit 942, Statement of Rob Lawrence (Mt Oxide), 27 September 2011, Annexure RAL-MO01-01 [p6].
- 
- 247 Transcript, Oskar Kadletz, 22 September 2011, Brisbane [p3106: line 54].
- 
- 248 Exhibit 608, Statement of Oskar Kadletz, 20 September 2011 [p6: para 26].
- 
- 249 Exhibit 942, Statement of Rob Lawrence (Mt Oxide), 27 September 2011, Annexure RAL-MO01-01 [p7].
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- 250 Exhibit 608, Statement of Oskar Kadletz, 20 September 2011 [p3: para 11]; Transcript, Oskar Kadletz, 22 September 2011, Brisbane [p3108: line 37].
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- 251 Transcript, Oskar Kadletz, 22 September 2011, Brisbane [p3108: line 37].
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- 252 Exhibit 942, Statement of Rob Lawrence (Mt Oxide), 27 September 2011 [p4: para 17].
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- 253 Exhibit 942, Statement of Rob Lawrence (Mt Oxide), 27 September 2011 [p4: para 17(a)].
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- 254 Exhibit 608, Statement of Oskar Kadletz, 20 September 2011 [p7: para 27].
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- 255 Transcript, Oskar Kadletz, 22 September 2011, Brisbane [p3110: line 10].
- 
- 256 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p2: para 11; p3: para 16].
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- 257 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p8: para 45].
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- 258 Transcript, Andrew Brier, 8 November 2011, Brisbane [p4761: line 20].
- 
- 259 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p14-15: para 80].
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- 260 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p2: para 15; p5: para 30].
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- 261 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p6: para 32]; Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4741: line 6].
- 262 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4741: lines 22-30].
- 263 Transcript, Oskar Kadletz, 22 September 2011, Brisbane [p3108: line 20].
- 264 Exhibit 608, Statement of Oskar Kadletz, 20 September 2011 [p4: para 17].
- 265 Exhibit 608, Statement of Oskar Kadletz, 20 September 2011 [p4: para 16]; Transcript, Oskar Kadletz, 22 September 2011, Brisbane [p3109: line 11].
- 266 Exhibit 608, Statement of Oskar Kadletz, 20 September 2011 [p7: para 26].
- 267 Transcript, Oskar Kadletz, 22 September 2011, Brisbane [p3109: line 38].
- 268 Transcript, Oskar Kadletz, 22 September 2011, Brisbane [p3109: line 38].
- 269 Exhibit 608, Statement of Oskar Kadletz, 20 September 2011 [p4: para 18].
- 270 Transcript, Oskar Kadletz, 22 September 2011, Brisbane [p3108: line 20].
- 271 Exhibit 930, Statement of Verdun Spreadborough, 19 September 2011 [p2].
- 272 Exhibit 942, Statement of Rob Lawrence (Mt Oxide), 27 September 2011, Annexure RAL-MO01-01 [p8].
- 273 Exhibit 608, Statement of Oskar Kadletz, Annexure OK-3 [p8].
- 274 Transcript, Oskar Kadletz, 22 September 2011, Brisbane [p3110: line 30].
- 275 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p18: para 86]; Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4743: lines 17-20].
- 276 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p18: para 86].
- 277 Exhibit 608, Statement of Oskar Kadletz, 18 September 2011 [p5: para 21].
- 278 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p16: para 82].
- 279 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4742: line 30 – p4743: line 4].
- 280 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p16: para 82].
- 281 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p16: para 83 – p17: para 84].
- 282 Transcript, Oskar Kadletz, 22 September 2011, Brisbane [p3109: line 56].
- 283 Transcript, Oskar Kadletz, 22 September 2011, Brisbane [p3111: line 21].
- 284 Service Delivery and Performance Commission, Review of the Roles and Responsibilities of the Department of Natural Resources, Mines and Water, Environmental Protection Agency and Department of Primary Industries and Fisheries (2007) available at [www.parliament.qld.gov.au/documents/tableOffice/TabledPapers/2007/5207T1077.pdf](http://parliament.qld.gov.au/documents/tableOffice/TabledPapers/2007/5207T1077.pdf) [p35].
- 285 Service Delivery and Performance Commission, Review of the Roles and Responsibilities of the Department of Natural Resources, Mines and Water, Environmental Protection Agency and Department of Primary Industries and Fisheries (2007) available at [www.parliament.qld.gov.au/documents/tableOffice/TabledPapers/2007/5207T1077.pdf](http://www.parliament.qld.gov.au/documents/tableOffice/TabledPapers/2007/5207T1077.pdf) [p36].
- 286 Exhibit 922, Report of Associate Professor David Laurence, Flooding and Abandoned Mines, 4 November 2011.
- 287 A joint publication of the Ministerial Council on Mineral and Petroleum Resources and the Minerals Council of Australia, 2010. See in particular, Figure 2.1 [p16].
- 288 Ministerial Council on Mineral and Petroleum Resources and the Minerals Council of Australia, Strategic Framework for Managing Abandoned Mines in the Mineral Industry, 2010 [p15].
- 289 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p1-2: para 7; p7: para 39-42].
- 290 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p5: para 26].
- 291 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p2: para 8].
- 292 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4748: line 11].
- 293 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4745: line 1-8].
- 294 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4748: lines 35-57].

- 295 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4744: line 1-29].
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- 296 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4744: lines 23-35].
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- 297 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4747: line 42 – p4748: line 15].
- 
- 298 Ministerial Council on Mineral and Petroleum Resources and the Minerals Council of Australia, Strategic Framework for Managing Abandoned Mines in the Mineral Industry, 2010 [p23].
- 
- 299 Transcript, David Laurence, 7 November 2011, Brisbane [p4681: line 51].
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- 300 Transcript, David Laurence, 7 November 2011, Brisbane [p4682: lines 5-12].
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- 301 Transcript, David Laurence, 7 November 2011, Brisbane [p4682: line 40].
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- 302 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4743: line 40; p4747: lines 36-52].
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- 303 Exhibit 932, Working Risks Spreadsheet, 8 November 2011.
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- 304 Exhibit 932; Transcript, 8 November 2011, Brisbane [p4743: line 40 – p4746: line 11].
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- 305 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4746: line 23].
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- 306 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4746: line 48].
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- 307 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4746: line 52].
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- 308 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4749: line 19-23].
- 
- 309 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4747: line 42 – p4748: line 15].
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- 310 Exhibit 922, Report of Associate Professor Laurence, Flooding and Abandoned Mines, 4 November 2011 [p4: para 15]; Transcript, David Laurence, 7 November 2011, Brisbane [p4680: line 56; p4682: line 16].
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- 311 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4748: line 20-22].
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- 312 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4750: line 50-56].
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- 313 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4748: line 29-31; p4751: line 2].
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- 314 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4748: line 40 – p4749: line 11; p4750: lines 1-13].
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- 315 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4750: lines 21-48].
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- 316 (7 giant, 6 very large, 77 large and 227 medium): Exhibit 932, Work Risks Spreadsheet, 8 November 2011.
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- 317 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p7: para 43(a)].
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- 318 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p7: para 43(b)].
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- 319 Exhibit 929, Second Statement of Oskar Kadletz, 3 November 2011 [p7: para 43(c)].
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- 320 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4749: line 53 – p4750: line 6].
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- 321 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4746: line 38].
- 
- 322 Transcript, Oskar Kadletz, 8 November 2011, Brisbane [p4749: lines 43-49].
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- 323 Exhibit 922, Report of Associate Professor Laurence, Flooding and Abandoned Mines, 4 November 2011 [p6: para 22 – p7: para 24]; Transcript, David Laurence, 7 November 2011, Brisbane [p4678: line 51].
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- 324 Exhibit 922, Report of Associate Professor Laurence, Flooding and Abandoned Mines, 4 November 2011 [p6: para 22 – p7: para 24]; Transcript, David Laurence, 7 November 2011, Brisbane [p4680: line 5].
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- 325 Exhibit 922, Report of Associate Professor Laurence, Flooding and Abandoned Mines, 4 November 2011 [p6: para 22 – p7: para 24]; Transcript, David Laurence, 7 November 2011, Brisbane [p4679: line 29].
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- 326 Exhibit 922, Report of Associate Professor Laurence, Flooding and Abandoned Mines, 4 November 2011 [p6: para 22 – p7: para 24]. Note also economic opportunities that may be available at abandoned mines: see Ministerial Council on Mineral and Petroleum Resources and the Minerals Council of Australia, Strategic Framework for Managing Abandoned Mines in the Mineral Industry, 2010 [p9].
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# 14

## 14 Flood-related deaths

### 14.1 The Commission's review of systemic issues

In the 2010/2011 floods, which affected more than 78 per cent of Queensland, 33 people died;<sup>1</sup> another three are still missing. While flood-related fatalities occurred throughout the state, the highest concentration of deaths occurred in the Lockyer Valley area, where 16 people died and the three people who remain missing were lost.

The Commission reviewed the information it obtained in respect of those deaths to establish whether the surrounding circumstances revealed any matter within its terms of reference on which it could usefully make recommendations. Because of the urgency attached, those recommendations, which were designed to reduce the likelihood of similar tragedies, were made in its interim report, although police investigations into some of the deaths were yet to be completed. The Commission did not, in the interim report, describe the circumstances of the deaths, with two exceptions.<sup>2</sup> It is appropriate in this report to provide a record of the deaths which occurred in the floods, with a broad indication of how they occurred and details of the recommendations made in the interim report to deal with systemic issues raised about preparation for and response to flooding.

In undertaking its review of flood-related deaths, the Commission benefited from the co-operation of the State Coroner<sup>3</sup> and the Queensland Police Service. Flood-related deaths must be investigated by a coroner under the *Coroners Act 2003*.<sup>4</sup> Given the significant loss of life in the Lockyer Valley area, the Queensland Police Service established a task force to investigate the deaths in the Southern Police Region (which includes the outskirts of Ipswich, Toowoomba, and the Lockyer Valley area) and provided a comprehensive report to the State Coroner's office.

Between 31 October 2011 and 2 November 2011 the State Coroner conducted an inquest into 21 of the flood-related deaths and the three suspected deaths (of the individuals still missing). The inquest so far as it concerned one death, that of a child, Jesse Wickman, at Minden, was adjourned to the week commencing 27 February 2012.

Police officers in the relevant police regions have investigated the other flood-related deaths that occurred throughout Queensland, forwarding their reports to the responsible coroners' offices. Some of these deaths have yet to be the subject of coronial hearings.

### 14.2 The circumstances of 2010/2011 flood-related deaths

Details of the deaths and the recommendations which have stemmed from the Commission's review of them appear in the five sections which follow.

### 14.2.1 Deaths during activities in flooded waterways

Seven of the 33 flood-related deaths occurred while the deceased were swimming or kayaking in, diving into or walking through, flooded waterways. It is a particularly tragic circumstance that four of the seven people who died were under 21 years of age. Some of the deaths were avoidable with a greater exercise of judgement; some of those who died were taken by surprise by rising floodwaters. The Commission did not make any recommendation arising out of the facts of these deaths. As section 3.5.1 of the interim report noted, the SES Natural Hazards Children's Awareness and Education Program had already launched a national education program which included information to discourage children from swimming in flooded creeks. The Commission is aware, too, that state and local governments provide warnings about the hazards of waterways in State Forests and National Parks. Details of each of those deaths follow.

Che-Nezce Perrie Shepherd, who was 17 years old, was swimming with friends on 12 December 2010 in Alligator Creek in Cape Bowling Green National Park. Her leg became trapped between rocks while she was sliding down rapids; her friends and others who tried to help could not extricate her. Heavy rainfall in the area caused the water level in Alligator Creek to rise rapidly, drowning Ms Shepherd as she remained unable to free herself. Ms Shepherd's friends had difficulty contacting emergency services because of the lack of phone reception in that part of the park, and the area was accessible only on foot.

Dale Justin Peake, 29 years of age, was kayaking at Barron Falls, Kuranda on 15 December 2010. He was an experienced kayaker who had checked his safety equipment and discussed his planned route with his friends. He kayaked down one of the falls, but was not seen to surface at the bottom. Mr Peake's body and kayak were recovered the following day; an autopsy showed that he had drowned. The area had been subject to heavy rainfall over the previous few weeks and the water levels were higher than usual.

Andrew Donald Devencorn was 20 years of age. On 20 December 2010 he jumped into the Brisbane River at Sherwood Forest Park for a swim. He was last seen being washed downstream in a strong current. Mr Devencorn's body was located three days later at Canoe Reach, Yeronga.

Nelson Simon Gutchen, a man of 50, left his niece's house after Christmas dinner, intending to visit a friend. To reach his destination he tried to cross a flooded footbridge over Granite Creek. His body was found in the creek three days later; he had drowned.

Berlene Faye Murray, a 19 year old girl, jumped from a bridge railing into Barambah Creek at Cherbourg on 8 January 2011. The creek was flooded and the current strong. Ms Murray's body was found 200 metres downstream the same day.

Navina Friedericke Villinger was a German 19 year old, holidaying in Queensland. On the late afternoon of 10 January 2011, she and some friends visited Granite Gorge Nature Park, near Mareeba. She and a friend were wading in rapidly flowing water. Her friend heard her call for help just before she disappeared beneath the water. Searches by police, SES members and a Queensland Fire and Rescue Service swift water rescue team that evening and night were unsuccessful. It was not until two days later that Ms Villinger's body was found. An autopsy showed that she had drowned.

Van Toan Giang was 25 years old when, on 13 January 2011, he drowned attempting to reach his workplace. He disappeared while trying to swim across floodwaters covering Bowhill Road, Willawong, at about 7.15 am to reach his place of employment. His body was found in the floodwaters later that morning.

### 14.2.2 Deaths of people in vehicles on flooded roads and crossings

Almost a quarter of the deaths in Queensland during the 2010/2011 floods occurred while people were trying to drive through floodwaters on roads or causeways. Two of those killed were passengers. All but one of the deaths occurred in rural Queensland. In some instances, the lack of information about road conditions ahead may have been a factor in the decision to attempt to drive through floodwaters, although in other cases, warning signs seem to have been disregarded. Section 3.5 of the Commission's interim report addresses the need for community education about the hazards for the community in floods, while section 4.1.5 of the interim report deals with information about road conditions and closures. The relevant recommendations in the Commission's interim report for community education about the dangers of driving through floodwaters (recommendations 3.15 – 3.18) and recommendations in relation to road condition information (recommendations 4.25, 4.26, 4.27 and 4.28) are set out below.

Given the experience of 2010/2011, it was distressing in early February 2012 to see another tragic death in similar circumstances in flooding in Roma. As well, during flooding in south-east Queensland in January of this year, there were a number of cases in which the Queensland Fire and Rescue Service had to retrieve people from cars in floodwaters. There seems to be a lack of understanding that water across roadways may be not only deep, but swift-flowing; it is not necessarily a simple matter of wading from a stalled car to dry land. It is to be hoped that the 'If it's flooded, forget it' campaign begun in this wet season eventually penetrates public consciousness sufficiently to make such incidents the very rare exception, rather than worryingly common.

The circumstances of individuals' deaths in vehicles submerged or swept away by floodwaters are as follows.

Kay Lorraine Joy, a 55 year old woman, left her home in the morning of 30 November 2010 to travel to Dysart. There had been a great deal of rain in the Dysart area over the previous days, and rain continued to fall heavily that day. Many roads were cut; the local council had erected 'road closed' signs on flooded roads. Mrs Joy's vehicle became stuck in floodwaters in the middle of a creek crossing where 'road closed' signs were in place. The water at the crossing was flowing rapidly, about one metre high and 15 metres wide. Police and Queensland Fire and Rescue Service officers were unable to reach Mrs Joy. Her body was recovered the following day.

Alan William Kane, 81 years of age, attempted to drive across a flooded causeway crossing Station Creek near his home at Bajool on the evening of 3 December 2010. A witness saw his car swept away into the creek. It floated for some distance before disappearing under the water, which was muddy, deep and flowing rapidly. Mr Kane was found in the vehicle, drowned, the next day. According to the police who investigated the accident, the water at the causeway was between one and two metres higher than its normal level. There were no warning signs at the causeway; according to the Rockhampton Regional Council, the creek rises and falls so quickly that there is little opportunity to erect temporary signs. Because of its low traffic volume, the local community was familiar with its propensity to flood: local people regularly used the causeway although the creek was flowing over it.

Richard Christian Baker was a 58 year old transport driver. He was carrying stock to a location near Clermont on 7 December 2010 when he drove his truck into a flooded causeway which reportedly had about two metres of water over it. The truck was swept away and was found the following day with Mr Baker's body in it, 50 to 60 metres from the causeway, in five metres of water.

Donna Marie Chong was 41 years of age. On 1 January 2011, she was travelling with her husband, her two children and nephew to Burketown in a four wheel drive vehicle, in convoy with another family, also in a four wheel drive. The second family consisted of two adults and two children; the parents and siblings of Ms Chong's nephew travelling in her vehicle. At about 7.00 pm they arrived at the Leichardt River crossing, about 71 kilometres south-east of Burketown. The crossing is a cement causeway about 200 metres wide, with guide markings. Ms Chong's husband, who was driving, saw a marker indicating the water depth was 200 millimetres and entered the crossing. Some way on he saw a second marker indicating that it was 500 millimetres, and decided to turn back. As he tried to put the vehicle in reverse, its front right wheel slipped off the causeway into deep water and it started to float away. He and Ms Chong got themselves and the children out of the vehicle. Ms Chong's husband managed to hold on to a tree with two of the children. He last saw her floating past him with the third child on her back. At 8.00 pm, police were contacted; they arrived at about 8.50 pm and saw a car in the middle of the causeway. Markings indicated the water level was 700 millimetres. Everyone involved was rescued except for Ms Chong. Her body was located approximately two kilometres downstream from where she was last seen; she had drowned.

John Charles Graham, a 61 year old man, was a rear-seat passenger in a four wheel drive vehicle travelling from Victoria to Townsville on 2 January 2011. At Aramac, the vehicle's driver decided to take the Aramac Torrens Creek Road to Townsville (a shorter route), although a sign at the edge of Aramac indicated it was closed by flooding. The vehicle was washed off a single lane bridge over which water was flowing at a depth of 600 to 700 millimetres, into Cornish Creek. Both the driver and front passenger escaped the vehicle, but Mr Graham did not. His body was found three days later, out of the vehicle and some 100 metres from the bridge.

James Cole Perry was 34 years old. On 10 January he was returning with his wife and young son from the Gold Coast to Toowoomba. At about 3.00 pm, near Helidon, on the Warrego Highway they encountered water across the road. Mr Perry initially drove their station wagon into the water, thinking it was not deep, before attempting to reverse out of it. The vehicle stalled and was washed off the highway. It floated towards Lockyer Creek. As the water rose on the vehicle, its three occupants climbed onto its roof; but they were forced to jump from it into floodwaters as it neared downed power lines. Mr Perry's wife last saw her husband holding their son and the vehicle. She was

able to catch hold of a tree and was eventually rescued. Her son was found alive, holding onto the top of a cattle feed bin well down Lockyer Creek towards Grantham. Mr Perry has not been found; it seems he was able to save his son, but not himself.

Robert Gregory Bromage was 50 years old. In the early hours of 11 January 2011, he set off in his sedan to buy food. His movements after that are not known; at about 8.30 am he used his mobile phone to call a mechanical repairs business. At just after 10.00 am that morning a police officer saw his car being washed along in floodwaters at Karrabin. An immediate search did not find him, but the following day the car was found, with Mr Bromage's body inside it.

Robert John Kelly, a man aged 30, intended to drive his station wagon from Toowoomba to Gracemere, near Rockhampton. Many of the roads he had to travel on were flooded. Shortly after 2.00 pm on 12 January 2011, he telephoned a friend and said he was about five hours away from Rockhampton. The call ended abruptly when Mr Kelly said that he had just hit water. The friend tried, unsuccessfully, to call him back. Mr Kelly was found the next day, in his submerged vehicle in Myall Creek along the Brymaroo Irvingdale Rd, Brymaroo.

### **Interim report recommendations in relation to driving through floodwaters**

- 3.15 Before the next wet season, the Queensland Government should conduct a public education campaign about the dangers of driving into floodwaters.
- 3.16 The campaign should use various media and be designed to reach as many people as possible.
- 3.17 The National Emergency Management Committee should, as part of its education initiatives, consider developing a national public education campaign about the dangers of driving into floodwaters, using various media and commencing, if possible, before the next wet season.
- 3.18 The Queensland and Commonwealth governments should liaise to ensure a consistent message is delivered to the public.

### **Interim report recommendations in relation to road conditions and closure information**

- 4.25 The Department of Transport and Main Roads, in its capacity as primary provider of information about road conditions to the public, should continue to improve the accuracy of road condition information and the timeliness of its distribution to the public and other agencies.
- 4.26 The Department of Transport and Main Roads should identify and include local road names when reporting road conditions.
- 4.27 The Queensland Government should work with the New South Wales Government to co-ordinate road condition reporting procedures to inform local councils and road users of interstate road conditions in a variety of different ways.
- 4.28 In rural and remote areas where telecommunications are not effective, measures that do not rely on internet and mobile telephone services should be implemented to inform the travelling public of road conditions ahead, for example:
  - signs with detailed information
  - providing tourist information centres and tourist radio stations with information on road conditions.

### **14.2.3 The deaths in flash flooding in Toowoomba on 10 January 2011**

Donna Maree Rice, who was 43, and her 13 year old son, Jordan, drowned on 10 January 2011 after their vehicle was inundated by floodwaters while stalled at a Toowoomba intersection. Their call, through the '000' emergency number, to the police met with no appropriate response. Evidence was called about those events in the Commission's public hearings held in Toowoomba<sup>5</sup> and Brisbane.<sup>6</sup> The circumstances are set out in more detail in section 5.4.3 of the Commission's interim report. That section dealt with the issues identified in relation to emergency call procedures. The following recommendation stemmed from the Commission's examination of the deaths of Mrs Rice and her son.

## Interim report recommendation in relation to emergency call-taker training

5.38 Queensland Police Service call-takers across the state should be trained to a uniform standard, consistent with the standard of training provided by the Brisbane Police Communications Centre.

### 14.2.4 The deaths in the Lockyer Valley region on 10 January 2011

Chapter 7 of the interim report deals with events of 10 January in Toowoomba and the Lockyer Valley. Among other aspects, the Commission investigated the issue of warnings for residents of the Lockyer Valley. The interim report's recommendations about warnings (recommendations 3.13, 4.9 – 4.12) appear below.

Four of the people who died at Grantham suffered from mobility problems; three relied on walking aids. Two recommendations made by the Commission in the interim report (recommendations 5.65 and 5.66) concerned the issue of evacuation of people suffering from lack of mobility. They are also reproduced below.

Sandra Christine Matthews, 46 years of age, and her husband, Steven Noel Matthews, 56 years of age, were at their home at Spring Bluff on 10 January 2011 with their son and daughter, aged 20 and 15 respectively. The Spring Bluff area had been subjected to heavy rainfall throughout December 2010 and early January 2011. Between 1.00 pm and 2.00 pm, the rain was extremely heavy, and Murphys Creek, which ran next to the Matthews' property, began to rise and entered the house. The Matthews children were able to get into the ceiling cavity, but their parents were swept away when the water demolished the eastern wall of the house. The bodies of Mr and Mrs Matthews were found later that day, about two kilometres downstream.

Selwyn Hector Schefe, 52 years old, his wife, and six year old daughter Katie Louise Schefe, lived at Watts Road Murphys Creek, in a house about 20 metres from the creek. On the afternoon of 10 January, the water came rapidly up from the creek and into the house. Mr and Mrs Schefe decided to evacuate. With difficulty because of the water's pressure, they managed to get their daughter out of the house. The three climbed into the rear tray of their utility, parked outside. The vehicle itself began to float away. Mrs Schefe was thrown out of the tray when it suddenly tilted. She last saw her husband still in the utility's tray, holding Katie. Both were drowned; Katie's body was found in Murphys Creek, about 3.5 kilometres downstream; Mr Schefe's body was found 50 kilometres away.

Sylvia Helen Baillie was 72 years old and lived on Murphys Creek Road at Postman's Ridge. Her house was between 10 and 20 metres from Rocky Creek. Mrs Baillie was concerned about water rising fast from the creek on the afternoon of 10 January, and was making preparations to evacuate. She was last seen at her front door at about 2.10 pm on 10 January, just before water engulfed the house, demolishing a wall, and swept it away. Mrs Baillie's body was found in Grantham, about 15.5 kilometres away.

Bruce William George Warhurst, a sixty year old man also lived at Murphys Creek Road, Postman's Ridge with his family on a property which adjoined Rocky Creek. The house itself was between 60 and 80 metres from the creek. At 2.08 pm on 10 January he spoke to his wife, who was stranded in her vehicle by landslides on the Toowoomba range. A witness saw Rocky Creek burst its banks at about 2.30 pm; Mr Warhurst was moving around the house. Shortly after, the same witness saw a wave of water from the creek wash the Warhurst house away. Mr Warhurst's body was found six kilometres away, at Helidon Spa.

Reinskje (Regina) Van der Werff suffered from a number of conditions which affected her mobility, and used a walking frame. She was 82 years old. On the afternoon of 10 January, she was at home with her daughter, grandson and three great-grandchildren at their residence on the Gatton-Helidon Road at Grantham. At about 3.00 pm, a male relative rang to advise the family that they should get onto the roof of their house because there was a lot of water coming towards Grantham. It was impossible for Mrs Van der Werff to climb a ladder; her daughter managed as best she could by helping her onto a table before getting herself and her children onto the roof, from where they were later rescued by helicopter. The water rose to within a metre of the ceiling. Mrs Van der Werff's body was found some days later, still in the house.

Bruce Allan Marshall, 66 years of age, also lived on the Gatton-Helidon Road with his wife and son, in a low-set house. He too suffered from medical conditions affecting his mobility. On 10 January, his wife and son had gone to Toowoomba. At 4.03 pm, Mr Marshall telephoned his daughter. In the course of their conversation, he told her that water had reached the top step of the house and was starting to come up through the floor boards; he was going to ring the SES for assistance. That conversation was followed by a number of calls made by Mr Marshall to the '000' emergency number, which were put through to police, the last at 4.18 pm. In those calls, Mr Marshall

gave an account of increasing desperation: the water had come up to his waist, then to his shoulders; he could not get out of the house. His body was found in the house on the following day.

Llynch-Chiann Armana Omega Clarke-Jibson, 31 years old, and her children, Jocelyn Elenor Jibson, aged five, and Garry Daniel Jibson, aged 11, died in an attempt to escape the flooding which hit Grantham on 10 January. Ms Jibson's husband, Daniel McGuire, was a member of the Grantham Rural Fire Service. He attempted to evacuate the family in a rural fire truck. Water hit the truck, washing it off the roadway. It rapidly became inundated. Mr McGuire managed to save son Zachary, aged seven, but he was unable to rescue the other members of the family, who were trapped in the truck. Queensland Fire and Rescue Service members found the truck, and the bodies of Ms Jibson, Jocelyn and Garry, in the truck, that night.

Jean Gurr was an 88 year old widow, who, like the McGuire family, lived on the Gatton-Helidon Road. Mrs Gurr walked with the aid of a walking stick. On the afternoon of 10 January she made two unanswered telephone calls to a family member, at 4.05 pm and 4.10 pm. Her house, which was on stumps about half a metre high, was completely inundated. Mrs Gurr's body was found in it that night.

Pauline Lesley Magner, 65 years old, Dawn Margaret Radke, 56 years old, and their 23 month old granddaughter Jessica Lily-Ann Keep, were lost after floodwaters rushed through the low-set house of Jessica's parents, Stacy and Matthew Keep, in Railway Street, Grantham. Mrs Keep, who had Jessica in her arms, was swept outside the house and carried by the waters to the railway line, where the pressure of the water tore the child from her mother's arms. Her body was not found until nearly two weeks later, many kilometres away on the bank of Lockyer Creek. Mrs Radke and Mrs Magner were also swept away; Mrs Magner's body was found, Mrs Radke's was not.

Brenda May Ross, 56 years old, and her partner, Christopher John Face, 63 years old, were at their house at 8 Anzac Avenue, Grantham, with Mrs Ross's 25 year old son Joshua Adam Ross, on the afternoon of 10 January. Mrs Ross's mobility was very limited: she used a walking frame and sometimes a wheelchair. At 4.27 pm, Mrs Ross made an emergency call, saying in the course of it that water was up her knees. During the call, her son told the operator that the house was giving way to the floodwaters, and that his mother was disabled and could not be moved. Minutes later, Mrs Ross' sister telephoned her. Mrs Ross told her that she was sitting on her bed, and that the water was knee deep around her. Joshua Ross told his aunt that the floodwaters had caused damage to the internal walls of the house. He could see the floodwaters inundating other rooms. The house was creaking and the walls shaking. A witness saw the house 'implode' under the pressure of the water; it was completely demolished. The bodies of Mrs Ross and her son Joshua Ross were recovered in the vicinity of Grantham; the body of her partner, Mr Face has not been recovered.

### **Interim report recommendations in relation to warnings**

- 3.13 Before the next wet season, local governments susceptible to flooding should conduct community education programs which provide local information about (at least) the following topics:
  - the measures households should take to prepare for flooding
  - the roles and functions of the SES and details of how to contact and join it
  - whom to contact if assistance is needed during a flood
  - contact details for emergency services in the area
  - the types of warnings that are used in the area, what they mean and what to do in the event of a warning
  - where and how to obtain information before, during and after a disaster
  - what is likely to happen during a disaster (for example, power outages and road closures)
  - evacuation
  - measures available for groups who require particular assistance (for example, the elderly, ill and people with a disability).
- 4.9 A siren may be appropriate in smaller towns or rural communities susceptible to flash flooding. If councils rely on sirens to warn residents, they should ensure that the community understands the meaning of the siren.
- 4.10 Councils, with the assistance of the Bureau of Meteorology, should examine the feasibility of and priorities for installing additional river height and rainfall gauges in areas of identified need.

- 4.11 Councils, with the assistance of the Bureau of Meteorology, should consider the susceptibility of their regions to flash flooding, and whether it is feasible and necessary to acquire and operate an automated local evaluation in real time system (ALERT system) for particular waterways.
- 4.12 The Queensland Government should consider assisting less well-resourced councils to fund the installation of an ALERT system where a case is made for its adoption.
- 4.29 The Bureau of Meteorology should endeavour to make clear the areas actually covered by its warnings, and specify what may be expected in particular areas, so that the relevance and significance of any warning is obvious to residents of the area at risk.
- 7.2 Lockyer Valley Regional Council should investigate the feasibility of installing alarm-activating gauges in the creeks at Spring Bluff, Murphys Creek and other communities where communications systems are poor and there is a risk of rapid and unexpected water rise.

### **Interim report recommendations concerning evacuation of people suffering from lack of mobility**

- 5.65 Councils should identify organisations (for example, Meals on Wheels and Bluecare) that provide services to people in the community who may be unable to evacuate without assistance. Councils should include the contact details of these organisations in their evacuation sub-plans.
- 5.66 Councils should work with these service providers to identify: the number of people who may require assisted evacuation; the general nature of their needs, including any necessary medical supplies and equipment; warning message formats and dissemination; increased timeframes needed for evacuation; transportation requirements; and shelter requirements. Councils should include this information in their evacuation sub-plans.

#### **14.2.5 Death of a child during a rescue attempt on 11 January 2011**

Jesse Joshua Wickman was four years old. On 11 January, his parents were trying to evacuate their family from their home at Minden in advance of expected flooding. Both Mr and Mrs Wickman were driving four wheel drive vehicles; Mr Wickman was driving ahead. Mrs Wickman had their two small children with her. Before they had left the town, Mrs Wickman's vehicle stalled in floodwater across the Warrego Highway. She and the children got out of it, but the current prevented them from making their way to higher ground, and the vehicle itself started to move. Mr Wickman was able to reach them on foot and place the children on the bonnet before he and his wife climbed up as well. Not long after, Queensland Fire and Rescue Service swift water rescue officers arrived. They made their way, with considerable difficulty, through the fast-flowing water to the family. They brought with them four adult sized personal floatation devices which they fitted to each of the two adults and the children. Mr and Mrs Wickman and one child were safely brought to dry land, but Jesse was carried away by the water. His body was found, still wearing the personal floatation device, in Minden that afternoon.

Although the precise circumstances of Jesse Wickman's death had, at the time the interim report was prepared, yet to be the subject of an inquest, having regard to the information which was then available, the Commission made a recommendation in relation to the availability of child-sized personal flotation devices. Other more general recommendations in relation to swift water rescue may also prove relevant.

### **Interim report recommendations in relation to swift water rescue safety**

- 5.13 The Queensland Fire and Rescue Service should revise the Operations Doctrine to clarify:
  - how many Level 2 swift water rescue technicians and Level 1 support personnel are required to safely perform a swift water rescue
  - the options available to an incident controller at a swift water incident with fewer than the required personnel and what considerations they should take into account in their decision-making.
- 5.19 The Queensland Fire and Rescue Service should purchase waterproof radio equipment that:
  - is appropriate for swift water and normal fire fighting environments
  - will attach securely to firefighters in a way that does not hamper their operations.
- 5.23 Every rescue appliance should carry personal floatation devices suitably sized for children or infants.

The Commission hopes that the recommendations will, as they are put into effect, result in improved individual safety in flood conditions, so that Queensland never again experiences loss of life through flooding on the scale that it did in the 2010/2011 wet season.

## (Endnotes)

- 1 The Commission's interim report referred to a figure of 35. Police investigations have led to the conclusion that two of those deaths were not, in fact, flood-related, and they are not, in consequence, discussed in this report.
- 2 The deaths of Donna Rice and her son Jordan were the subject of section 5.4.3 of the interim report.
- 3 The Commissioner had agreed with the State Coroner at the beginning of the work of the Commission that broader systemic questions of the preparation for and response to the flood events fell within the Commission's terms of reference; those issues, where directly raised by the circumstances of particular deaths, would be examined by the Commission. Matters set out under section 45 of the *Coroners Act 2003* – the event of the death; the identity of the deceased; how, when and where he or she died; and the immediate cause of death – remained for the Coroner.
- 4 Section 11, *Coroners Act 2003*.
- 5 19 April 2011.
- 6 11 May 2011.

# 15

## 15 Emergency response and other interim report issues

The Commission was required by its terms of reference to inquire into emergency preparation, planning and response to the 2010/2011 floods by federal, state and local governments, emergency services and the community.

The Commission's interim report made recommendations about those matters that were required to be implemented before the 2011/2012 wet season.

In the course of the Commission's inquiry into those matters, there were a number of issues that required more detailed attention. This chapter addresses those issues: evacuation plans for businesses; emergency communications systems; review of disaster management plans; the adequacy of the response of the Queensland Fire and Rescue Service including their risk assessment system; the adequacy of the funding arrangements and structure of the SES.

This chapter also contains a more detailed examination of some of the circumstances in Grantham on 10 January 2011: the response of the SES and whether a Grantham quarry contributed to the flooding that occurred there. The Commission's interim report (chapter 7) addressed other aspects of the warnings, and preparation, planning and emergency response to flooding in the Lockyer Valley including Grantham.

Other aspects of the preparation, planning and response to the 2010/2011 floods as they relate to essential services are addressed in chapter 10 *Essential services*.

### 15.1 Evacuation plans for commercial premises

The Commission dealt extensively with evacuation plans in section 5.5.1 of its interim report. There, the Commission recommended that Emergency Management Queensland finalise draft evacuation guidelines for use by local disaster management groups. This has since been done; the guidelines were finalised and published in August 2011.<sup>1</sup> The Commission also recommended that each council develop an evacuation sub-plan in accordance with the Emergency Management Queensland guidelines, involving local groups and people in the planning process.

Since the release of its interim report, the Commission has heard evidence about local businesses' initiatives in developing evacuation procedures before the 2010/2011 floods, enabling them to remove their stock and other items before the onset of flooding.

In response to the flooding of Gympie in 1999, the Gympie Chamber of Commerce led the development of a flood plan designed to assist businesses subject to flooding to produce their own flood evacuation plans and to promote communication between business owners and relevant authorities about flood issues.<sup>2</sup> The Chamber of Commerce drew

upon the experience of businesses that had been inundated by floodwaters to create the flood plan.<sup>3</sup> The flood plan has been developed over time, and was revised after the 2010/2011 floods.<sup>4</sup> In its current form, it contains a contact list of businesses, councils, relevant emergency services and the Bureau of Meteorology. It also contains a register of historic peak flood heights, and provides advice about:<sup>5</sup>

- where to obtain flood warning information
- what to do in times of flood
- the preparation of a flood evacuation plan
- what will occur at certain flood heights, such as when electricity will be cut and restored.

The flood plan was, and is, available on the Gympie Chamber of Commerce's website.<sup>6</sup> The plan enabled an organised evacuation and helped businesses to resume operating more quickly in the Gympie area after the 2011 flooding. Those who used it commented favourably on it.<sup>7</sup>

Over the years, the owner of a building in Maryborough's marina precinct has developed a formula to estimate, fairly accurately, from upstream river levels the time and scale of flooding of the marina.<sup>8</sup> By relying on this system, one business operator was able to remove stock and other items from his marine supply and chandlery business before the onset of flooding in late December 2010.<sup>9</sup> His view was that, on the basis of that information, a contingency plan for the businesses on the riverfront should be developed, with better communication and support from the council.<sup>10</sup> Another business owner in the marina had, since the flood, developed a formal evacuation plan, which he envisaged would ensure staff knew what to do and promote a more efficient evacuation, with business owners working together.<sup>11</sup>

The owner of a clothing boutique in a shopping precinct in Rosalie, an inner-western suburb of Brisbane, suggested that shop owners there should have a flood plan to identify which shops could flood and to establish a procedure for them to remove stock and assist each other.<sup>12</sup>



*Flooding at Jondaryan, January 2011 (photo courtesy I Burton, Jondaryan District Residents Association)*

The Commission endorses business owners' developing flood evacuation plans for their premises as a common sense measure to mitigate flood damage to property. Developing site-specific flood evacuation plans is primarily a private responsibility for business owners.

However, there is a limit to what business owners can achieve by preparing flood evacuation plans; inevitably evacuations will be undertaken alongside work being done by councils and emergency services. For example:

- The owner of the chandlery business in the Maryborough marina commented that, while the marina businesses were largely self-sufficient in flooding, they needed the council to provide advance notice of flooding (if any was available) and, in particular, to manage road closures and vehicle traffic to allow business owners efficiently to remove their stock, plant and equipment.<sup>13</sup>
- A member of the Gympie Chamber of Commerce noted a difficulty encountered in the clean-up after the flood: business owners were required to give signed consent before the rural fire brigade would hose out their properties.<sup>14</sup> This meant that when business owners had evacuated (and may have still been isolated elsewhere) their premises would have remained mud-encrusted despite the presence of fire brigade personnel able and willing to clean them.

Emergency Management Queensland's Queensland Evacuation Guidelines for Disaster Management Groups provide information and guidance to councils and local disaster management groups about planning for evacuation.<sup>15</sup> The guidelines recommend that local disaster management groups develop evacuation sub-plans that include information about areas that might be affected by hazard, safe evacuation routes, estimated evacuation timelines, transport requirements and traffic management strategies. The guidelines prompt councils and local groups to consider how to communicate the evacuation sub-plan (once developed) to businesses.<sup>16</sup> Doing so is likely to assist business owners in developing their own evacuation plans.

As each council has the primary responsibility for managing disasters within its region, and the development of flood evacuation plans for commercial premises is likely to be an individual or locality-based arrangement, it is appropriate that councils support and encourage local businesses to develop flood evacuation plans for their premises. Councils can communicate to business operators the benefits of developing evacuation plans. They are also best placed to establish lines of communication between those managing private evacuations, council staff, and emergency services. There may be benefits to councils' providing business owners with locally relevant information about suitable content for flood evacuation plans, perhaps by developing and publishing a template flood evacuation plan.

As to the issue of the hosing out of commercial premises in the post-flood clean-up at Gympie, the Queensland Fire and Rescue Service has confirmed that, because its Rural Fire Service volunteers have no power of entry to hose out properties during recovery operations, the activity can only be performed with the property owner's consent.<sup>17</sup> In the absence of evidence about similar concerns elsewhere, the Commission is not in a position to do more than observe that it would appear sensible for the responsible authorities to consider steps to streamline consent requirements in areas that are regularly subject to flooding; for example, to consider if advance consent could be given by property owners for emergency services to enter their properties for cleaning purposes following floods.

## Recommendations

- 15.1 Councils should support and encourage business owners to develop private flood evacuation plans by providing the following to business owners in areas known to be affected by flood:
  - information about the benefits of evacuation plans
  - contact details of relevant council and emergency service personnel for inclusion in evacuation plans.
- 15.2 Councils should consider making available to business owners locality specific information that would assist them to develop evacuation plans for commercial premises, for example, any evacuation sub-plan created under Emergency Management Queensland's disaster evacuation guidelines.

## 15.2 Emergency communications

In its interim report, the Commission examined the procedures used to deal with emergency calls, paying particular attention to calls made in the Toowoomba region on 10 January 2011. The interim report recommended the introduction of uniform training standards for call takers in the Queensland Police Service,<sup>18</sup> and indicated that the Commission's final report would examine proposals for extending the police service's computer aided despatch system and improving interoperability<sup>19</sup> between the police service and the Department of Community Safety.<sup>20</sup>

The issue of 'black spots' (areas which are not covered by a radio communications network and within which radio communications are consistently difficult or impossible) was also examined in the interim report, but only in the context of the Lockyer Valley.<sup>21</sup> The following sections discuss interoperability between emergency communications systems, and measures to address black spots in emergency communications across Queensland.

### 15.2.1 Interoperability

#### Emergency calls

When a member of the public calls 'triple zero', his or her call is answered by a Telstra operator, who transfers the call to the appropriate emergency service (the Queensland Fire and Rescue Service, the Queensland Ambulance Service or the police service).<sup>22</sup> The call is first transferred to the communications centre that is closest to the caller's location ('the primary call centre').<sup>23</sup> However, during peak call times the primary call centre may be unable to attend to all calls, so the Telstra operator has to forward the call to an alternative call centre under 'overflow arrangements'. The Telstra operator will only leave the call once it is transferred to another operator.<sup>24</sup>

The fire service, ambulance service and police service each have a number of communications centres throughout the state. Communications centre staff use computer aided despatch systems to allocate jobs generated by emergency calls to the officers who will respond.

The Department of Community Safety (which is responsible for the fire and ambulance services) uses the Emergency Services Computer Aided Despatch (ESCAD) system, which permits interoperability between the two services.<sup>25</sup> In particular, the system allows fire and ambulance officers to obtain access to callers' data wherever the call is taken. The police service's computer aided despatch system did not allow any information exchange between the police and other emergency service agencies.<sup>26</sup> The Commission notes that the Queensland Government has begun work to develop this interaction.<sup>27</sup>

#### Queensland Police Service

The police service uses the Emergency Services Communications and Operational Response Tasking (ESCORT) computer aided despatch system in five of its 21 communications centres.<sup>28</sup> That system allows limited interoperability among the five centres, but not between them and the remaining 16 communications centres,<sup>29</sup> each of which uses a stand alone computer system not capable of communicating with other systems.<sup>30</sup>

This lack of interoperability becomes particularly problematic when overflow arrangements are needed. Where calls exceed one police communications centre's capacity (for example, during a disaster event), there is currently no capacity for another centre to receive and respond to some of those calls.<sup>31</sup> And where responsibility for responding to an emergency call is transferred to a communications centre which is not interoperable with the centre at which the call was received, call details must be manually recorded and transferred via telephone, Ultra High Frequency (UHF) radio, email or facsimile, or printed via the police service's computer network to a printer physically located within the second communications centre.<sup>32</sup>

The police service has consistently identified the importance of improving interoperability between its communications centres and between police and other emergency services.<sup>33</sup> With that aim, the police service is currently establishing a new computer aided despatch system at seven communications centres: North Coast Region (Maroochydore), South Eastern Region (Beenleigh), Brisbane, Cairns, Townsville, Rockhampton and Toowoomba.<sup>34</sup> The new system commenced operating at the North Coast Region communications centre on 7 December 2011<sup>35</sup> and will be in place in South Eastern Region, Brisbane, Cairns and Townsville by the end of 2012<sup>36</sup> and Rockhampton and Toowoomba in 2013.<sup>37</sup>

Once in place, the new system is expected to have these benefits:

- reducing data entry time for call takers<sup>38</sup>
- reducing congestion on radio networks, because of its automated despatching capabilities<sup>39</sup>
- making more information available to front-line officers, because the system will be connected with QPRIME, the police service's information management system<sup>40</sup>
- providing improved awareness of current conditions for call takers, since the system will be linked with geographic/geospatial information system (GIS) data sets<sup>41</sup>
- providing interoperability with other emergency service organisations through the use of an Inter-CAD Electronic Messaging System (ICEMS).<sup>42</sup>

The rollout of the new system to the seven communications centres forms part of a long term transition to a unified and interoperable computer aided despatch system across all police communications centres. However, since it is envisaged that the new computer aided despatch system will, at this time, only be adopted in seven of the police communications centres, the remaining centres will still have no direct means of information exchange with police communications centres or with other emergency services.<sup>43</sup>

A recent police service draft report warned that the full benefits of the new system would only be realised once it was used on a state-wide basis in all police communications centres.<sup>44</sup> (Complementary technologies such as 'Automatic Vehicle Location'<sup>45</sup> would also improve police communications.<sup>46</sup>) Several members of the police service similarly emphasised, in their evidence, the benefits to be gained from the state-wide use of a common computer aided despatch system.<sup>47</sup>

The draft report also suggested that the number of communications centres should be reduced from the current 21 to seven in order to, amongst other things, streamline operations.<sup>48</sup> This proposed step is yet to be considered by the police service's information steering committee and contact management business strategy executive working group.<sup>49</sup> Any recommendation by that committee for such a reduction in communications centre numbers will affect decisions about further rollout of the new computer aided despatch system.

## Radio communications

The fire service, the ambulance service and the police service use stand alone radio communications networks as the basis for all communications between officers carrying out operations and communications centres. The three services do not have interoperable radio communications,<sup>50</sup> though they may connect through some radio channels.<sup>51</sup>

Radio communications encompass both narrowband (supporting voice communications) and broadband (supporting data communications including the transmission of photos, videos and maps).<sup>52</sup> The fire, ambulance and police services, alongside most other emergency service organisations in Australia, use the 400 MHz spectrum for narrowband radio communications.<sup>53</sup>

All emergency service organisations are moving towards complete interoperability using the 400 MHz spectrum for narrowband communications by the year 2020, according to the Council of Australian Governments' plan, under an agreement with the Australian Communications and Media Authority.<sup>54</sup>

The 400 MHz spectrum cannot effectively be used for data communications because the size of each spectrum allocation is too small to transmit large files.<sup>55</sup> As a result of insufficient spectrum for transmitting large files and/or during times of high demand, the network may become congested; that may slow it or cause outages.<sup>56</sup> During the 2010/2011 floods, there was, at times, congestion on the radio networks.<sup>57</sup>

Some Australian emergency service agencies have called for the dedication of a broadband data network to support the existing narrowband network.<sup>58</sup> A senior police service officer expressed his view to the Commission that the implementation of broadband data applications would improve the operational capabilities of the police, ambulance and fire services.<sup>59</sup> However, some telecommunications providers disagree with the proposition that emergency service organisations require dedicated spectrum for broadband communications on the basis that, amongst other things, it would inhibit the commercial exploitation (and, they say, associated national economic benefit) of the digital 'dividend', or spectrum.<sup>60</sup>

Several national bodies are currently considering or have recently considered the benefits of dedicating a broadband data network to Australia's emergency response agencies, including:

- the Australian Communications and Media Authority as part of its ongoing review of the 900 MHz band plan (which actually encompasses the spectrum from 820-960 MHz)<sup>61</sup>
- the Public Safety Mobile Broadband Steering Committee, which is working with the Australian Communications and Media Authority to determine whether the 800 MHz band should be dedicated to emergency response organisations.<sup>62</sup> The Committee's final report is due by 29 February 2012<sup>63</sup>
- the Senate Environment and Communications References Committee, which recently recommended that the Commonwealth Government allocate sufficient spectrum for dedicated broadband public protection and disaster relief radio communications in Australia.<sup>64</sup>

The Commission similarly regards as vital the allocation of broadband spectrum to Australia's emergency service organisations, to avoid congestion on narrowband communications and to assist Australian emergency service organisations in achieving 'interoperability', giving them the best means of communicating and co-operating.

In Queensland, the public safety communications steering committee (a joint working party comprising representatives from the police service, the Department of Community Safety, the Department of Public Works, the Department of the Premier and Cabinet and Queensland Treasury) is considering the development of a state-wide whole of government wireless network,<sup>65</sup> similar to those established in other Australian states and territories.<sup>66</sup> If established, the network (relying on digital rather than analogue technology) would allow officers using portable radios to obtain access to police communications centres from anywhere in the state, allow interoperability between emergency and other agencies, and provide both narrowband and broadband communications capability.<sup>67</sup> If approved, the project would take 10 or more years to put into place.<sup>68</sup>

The Commission supports the move towards interoperability between Queensland's public safety agencies, both in narrowband radio communications and through the establishment of a whole of government digital wireless network.

## 15.2.2 Radio communications 'black spots'

The Department of Community Safety and the police service, for the most part, use analogue radio networks,<sup>69</sup> which are less reliable than digital networks over large distances, rough terrain and during severe weather events.<sup>70</sup> In a state as large and geographically diverse as Queensland, it is impossible to achieve complete state-wide coverage using analogue networks;<sup>71</sup> consequently, the existence of black spots is inevitable. Various radio communications black spots were identified throughout the state during the 2010/2011 floods.<sup>72</sup>

Black spots in communications systems are identified and regularly addressed by the Department of Community Safety and the police service through specific programs.<sup>73</sup> Efforts are made to improve radio communications coverage in areas with limited communications by:

- using mobile telephones<sup>74</sup>
- deploying mobile repeaters or installing additional permanent repeaters to supplement radio networks<sup>75</sup>
- using alternative equipment such as high frequency single side band transceivers, satellite phones and mobile satellite terminals.<sup>76</sup>

The replacement of analogue networks with digital ones would alleviate the communications difficulties which black spots cause emergency service organisations.<sup>77</sup> In particular, the digital radio network under consideration by the public safety communications steering committee would resolve many of the problems experienced by members of the police service, who could use hand-held or vehicle radios with the assurance of consistent coverage throughout the state, and without the need to change channels.<sup>78</sup>

For this reason also, the Commission supports the establishment of a state-wide digital radio network. In the meantime, it is vital that emergency service agencies continue their efforts to identify and address black spots in their respective radio communications networks to ensure sufficient communications capabilities are maintained.

## 15.3 Review of disaster management plans

The *Disaster Management Act 2003* requires each council to prepare a disaster management plan for its area<sup>79</sup> and to review the plan's effectiveness at least once a year.<sup>80</sup> Emergency Management Queensland has overarching responsibility for reviewing and assessing the effectiveness of the state's disaster management arrangements, which includes the review of local disaster management plans.<sup>81</sup>

The Commission observed in its interim report that Emergency Management Queensland had not had a consistent approach to how it conducted the review of disaster management plans.<sup>82</sup> Accordingly, the Commission recommended that Emergency Management Queensland take steps to improve the overall review process,<sup>83</sup> and that it 'assess the effectiveness of the review system before the end of 2011, and report its results to the Commission by 31 December 2011'.<sup>84</sup>

In response to the Commission's recommendations, Emergency Management Queensland developed and implemented an amended process to review local disaster management plans. It also conducted an assessment of its amended review process and, as recommended, provided a report of those results to the Commission.

This section of the report discusses Emergency Management Queensland's review process and the results of Emergency Management Queensland's assessment of the effectiveness of the review process.



*Sheep being relocated near Roma, 2010/2011 (photo supplied)*

### 15.3.1 The review process

Emergency Management Queensland's process of reviewing disaster management plans involved:

- district disaster co-ordinators' reviewing all 74 local disaster management plans and providing the results to Emergency Management Queensland for analysis<sup>85</sup>
- Emergency Management Queensland's reviewing a sample of 22 local disaster management plans.

To assist the district disaster co-ordinators to review the plans, Emergency Management Queensland developed an Interim Review and Assessment Workbook. The workbook was distributed to councils and district disaster co-ordinators on 1 September 2011, and following comments from disaster co-ordinators, was finally released in October 2011.<sup>86</sup> The purpose of the workbook was to ensure that a standardised approach was followed by those responsible for reviewing the local plans.<sup>87</sup> The workbook was used to assess the adequacy of each plan against twelve components of disaster management:

- organisation and governance
- risk management
- planning process
- community capacity building
- response arrangements
- impact assessment
- co-ordination
- public information
- community support
- evacuation
- re-supply
- recovery.<sup>88</sup>

Senior officers of Emergency Management Queensland and the Queensland Police Service provided guidance and education to disaster co-ordinators in the review process.

The results of the review were subsequently analysed by Emergency Management Queensland to identify any shortcomings in each local plan and to develop strategies to address them. As a result of this analysis, each council was classified according to the level of support it would require in a disaster response: high, moderate or minimal.<sup>89</sup>

Emergency Management Queensland also separately reviewed the 22 local government areas it identified as having a high likelihood of being affected by flooding. The information obtained from this exercise was used to identify aspects of local disaster management that require improvement (for example, the adequacy of training and the substance of disaster sub-plans).<sup>90</sup>

The results of the review have been provided to the Commission, but at the time of writing had yet to be communicated to the councils involved. They appear to show that the process adopted has been effective.

### 15.3.2 Assessment of the review process

Emergency Management Queensland assessed the effectiveness of its disaster management plan review process with reference to five diverse local government areas: Moreton Bay Regional Council, Carpentaria Shire Council, Flinders Shire Council, Scenic Rim Regional Council and Toowoomba Regional Council. It analysed the reviews completed by the district disaster co-ordinators for these areas and developed a questionnaire to gauge the experiences of the officers involved in the review process. Based on its analysis of this information, Emergency Management Queensland has identified areas for improvement in how the review process operates.<sup>91</sup>

The assessment concluded that although there were some difficulties with the review methodology (which includes the interim workbook), reviewing officers were generally able to apply it appropriately.<sup>92</sup>

Feedback from officers involved in the review process identified the need for:

- more training and support in how to conduct the reviews and use the workbook<sup>93</sup>
- better scheduling of the reviews to allow more extensive participation in the review process<sup>94</sup>.

As a result of the assessment, Emergency Management Queensland has committed to improving the review process by:

- monitoring the annual reviews of local disaster management plans
- reporting annually to the state disaster management group about areas requiring improvement
- developing and implementing training and education for reviewing officers
- developing an overarching policy and standards for disaster management plans at all levels.<sup>95</sup>

The Commission also notes the commitment of the Queensland Police Service to instituting the review of local disaster plans as a standing activity for its officers who perform the role of district disaster co-ordinator.<sup>96</sup>

The review process developed by Emergency Management Queensland has provided a standardised format for the review of local disaster plans and has identified opportunities for improvement in some plans. Emergency Management Queensland proposes to revise the review and assessment workbook to incorporate in it the critical feedback it has received from district co-ordinators who use it. This is a prudent and necessary step.

Generally, Emergency Management Queensland appears to have developed an effective and consistent process for reviewing the progress and quality of disaster management plans. It should continue to monitor and improve that process and to provide all necessary assistance, including training and support, to district disaster co-ordinators in their role of reviewing plans.<sup>97</sup>

## 15.4 Queensland Fire and Rescue Service

### 15.4.1 Preparedness for and response to the events of 10 January 2011

The Commission's interim report considered the fire service's preparedness for and response to the events of 10 January 2011. The Commission had not, when the interim report was written, received sufficient evidence from the fire service to allow it to answer the following questions:

- Whether management staff of the fire service responded promptly to station officer requests for more staff on 10 January 2011.
- Whether management staff of the fire service took all reasonable steps to recall staff to ensure operational preparedness for the events of 10 January 2011.
- Whether management staff of the fire service communicated weather forecasts and warnings to station officers in order to give stations some forewarning of what local conditions were likely to be and ensure that stations were as prepared as possible for the events of 10 January 2011.<sup>98</sup>

Following the delivery of the interim report, the fire service provided the Commission with a written submission (unsupported by witness statements) which sought to address each of the three outstanding questions for both the south-eastern and south-western regions. It provided a more detailed spreadsheet, which assisted in determining the location of fire service personnel and vehicles at particular times. The Commission then required and received statements from a number of senior fire service officers and operational staff to address particular areas of uncertainty. From all of that material, it has been possible to piece together the following sequence of events.

### 15.4.2 Response of fire service management and deployments on 10 January

#### South-eastern region

On the morning of 10 January 2011, the Ipswich station officer telephoned a number of senior fire service officers to request additional staff, including swift water rescue technicians, for duty at Ipswich, where only one technician was rostered on.<sup>99</sup> His concern was that the Bureau of Meteorology's website was indicating wet weather in the Lockyer area; because the ground was already saturated, flash flooding was possible. Taking his account in conjunction with telephone records supplied by the fire service, it seems that at 7.24 am, the station officer spoke to the duty manager of operations, asking for six extra staff. The duty manager told him that there was going to be a meeting of senior personnel, and he would speak to him after it. (The duty manager had no recollection of the call, but did not deny its possibility.<sup>100</sup>) Such a meeting did take place at 8.30 am between the duty manager of operations, the acting assistant commissioner of the south-eastern region and two other senior officers.<sup>101</sup>

At that meeting, the duty manager advised the acting assistant commissioner of the current operational situation: the south-eastern region was experiencing generalised flooding and forecasts indicated continuing rain for the western part of the region. A call was received from the assistant commissioner of the south-western region advising that the Toowoomba fire service might have difficulty responding to incidents in the south-eastern region, because landslides had caused damage to the Toowoomba range section of the Warrego Highway. All those considerations led the acting assistant commissioner to decide to recall additional swift water rescue technicians and equipment.<sup>102</sup> Decisions were made to call in two swift water technicians to crew a spare Ipswich rescue vehicle to be positioned at Gatton, to bring the Beenleigh rescue truck to Ipswich and to move another rescue vehicle from Robina to Beenleigh. Two swift water technicians were also to be recalled to duty to crew an additional vehicle at Robina.<sup>103</sup>

There is then some confusion about precisely who communicated what to whom about those decisions. The duty manager said that he contacted station officers at the stations affected to advise them to make the arrangements to recall staff, although he could not remember to whom he spoke. It does not seem, however, that he spoke to the station officer at Ipswich. That may have been because at 8.50 am, about the time the duty manager would have been contacting the Ipswich station, the Ipswich station officer telephoned the acting assistant commissioner. The latter, on the station officer's account, gave approval for one swift water rescue technician to be called in.<sup>104</sup> (Again, the acting assistant commissioner did not recall but did not deny the possibility that he had spoken to the station officer.) It is possible that there was some misunderstanding in the conversation, because other evidence suggests that by then approval had in fact been given for two officers to be recalled.<sup>105</sup> It is fairly clear that the station officer was continuing to seek support; seven minutes later, he telephoned the regional technical rescue co-ordinator, who did recall their conversation:<sup>106</sup> the station officer raised the need for more swift water technicians. The regional co-ordinator made calls to the duty manager and the acting assistant commissioner; he was able to confirm that two technicians could be called in to duty.

The Commission considers it likely, given the sequence of events, that the Ipswich station officer's calls were the prompt for the assignment of the two swift water technicians to Ipswich, but that is not to say that senior fire service management in the south-eastern region would not in any event have made arrangements for extra personnel to be called in. It is clear that they did make arrangements as effectively as they could for the day's events, subject to the constraints dealt with in the interim report, of a fire service well below its proper strength in terms of swift water technicians and stretched by the deployments of officers to other parts of Queensland.

In fact, most of the arrangements for stationing crews and appliances<sup>107</sup> at the intended stations gave way to the emergencies of the day. Both the spare appliance from Ipswich, with the recalled swift water technicians, and the Ipswich rescue vehicle with its crew were sent (as were crews and vehicles from Helidon and Gatton) at about 1.30 pm to Postman's Ridge and Murphys Creek, where they performed a number of rescues in the course of the afternoon.<sup>108</sup> The Beenleigh appliance and its crew went, as did teams from Forest Hill, Gatton and Laidley, to assist in events on the Warrego Highway near Helidon when the water rose there after 2.00 pm. Also assisting there was a rescue vehicle from Cannon Hill, which had been directed to assist in Toowoomba, but had been unable to reach the city. Two swift water technicians from that vehicle rescued a woman who had been a passenger in a vehicle washed off the flooded highway. Her husband and child had been swept away; she was found holding onto a tree.<sup>109</sup>

Shortly after 4.00 pm, the fire service began to receive calls from people in difficulties in the floodwaters in Grantham. The first concerned three people said to be inside a semi-submerged car. A further nineteen calls for help were recorded as received between 4.50 pm and 11.00 pm, principally from people trapped in or on their houses.

The fire service experienced some difficulties in collating and providing the details of what tasks were performed and the times at which they were performed in response to the emergencies created by the Grantham flooding. No electronic record was available, because, it seems, of problems with its software systems. However, the fire service has advised the Commission that it has improved its operational procedures: in any major event, the relevant incident control centre will have among its staff a fire communications officer and operation management system operator, who will, together, ensure details of crews, vehicles, dispatch and arrival times and tasks performed are recorded in the service's Emergency Services Computer Aided Dispatch system.

The information which follows is drawn largely from the statements of fire service officers who were involved in the events of the afternoon and evening of 10 January. The crew of an appliance from Laidley was able, at about 4.30 pm, to assist a number of people on the roof of a house on the Gatton-Helidon road.<sup>110</sup> Four other fire service vehicles, crewed by auxiliary firefighters from Laidley, Rosewood and Hattonvale, tried by different routes to get into Grantham itself, but were prevented by the fast-rising, fast-flowing floodwaters from reaching it.<sup>111</sup> They set about evacuating surrounding properties.<sup>112</sup>

Unable to get access to Grantham by road, the fire service despatched two helicopters, one to make observations and the other to perform winch rescues.<sup>113</sup> Their first rescue, soon after 5.00 pm, was of the child who had been in the vehicle swept off the Warrego Highway.<sup>114</sup> He had been carried a considerable way downstream towards Grantham. After refuelling in Toowoomba, the two helicopters rescued half a dozen people stranded in or on houses in Grantham before ceasing operations at about 7.40 pm.<sup>115</sup> (As described in the Commission's interim report,<sup>116</sup> Emergency Management Queensland rescue helicopters also performed large numbers of winch rescues in Grantham that evening.)

At 6.30 pm, the fire service helicopter landed the two swift water technicians from the Cannon Hill rescue vehicle in Grantham. Using a rural fire brigade vehicle as a control point, they set about searching houses and vehicles and making contact with people stranded on roof tops. Grantham residents who had taken refuge at the town's school identified people for whom they should look.<sup>117</sup> Senior fire service officers had arrived in Gatton at 5.40 pm and commenced the process of establishing an incident control centre, which became operational at 7.15 pm.<sup>118</sup>

The crew of the appliance from Rosewood which had earlier tried to get into Grantham was sent back to the western side of Grantham that evening.<sup>119</sup> There they encountered the two swift water technicians called in for duty at Ipswich. After finishing their last rescue at Murphys Creek the two technicians had been sent back at 5.50 pm to Gatton<sup>120</sup> and by chance, not direction, attempted a detour through Grantham. Arriving there at about 7.30 pm, they found the lower part of the town still flooded; the chaos of the afternoon was evident from its state.<sup>121</sup> They joined forces with the team of the Rosewood appliance. At about the same time another swift water rescue team sent up from Beenleigh had arrived on the western side of Grantham and were joined by a swift water rescue trained firefighter from Rosewood.<sup>122</sup> The incident control centre had given the latter team a list of houses to search; they were residences from which emergency calls had been received. Both groups spent the following hours on foot and using an inflatable work platform searching house by house for survivors.<sup>123</sup> A front end loader was performing evacuations at the same time. The swift water technicians from Cannon Hill were continuing to operate on the other side of the town.<sup>124</sup> All the teams continued to work into the early hours of the following morning.<sup>125</sup>

## **South-western region**

In late December 2010, the assistant commissioner for the south-western region held a series of meetings with other senior officers to decide what to do in light of the developing wet season. Sick leave was always high in December and early January, so that it was expected there might be problems in providing full crews for fire appliances and, in turn, in maintaining the fire service's ability to respond where swift water rescue was needed in the region. The assistant commissioner gave a direction that full staff numbers were to be maintained at all permanent stations, with staff called in on overtime where necessary.<sup>126</sup> In addition, on 23 and 24 December 2010, swift water equipment and three additional support vehicles were moved to Toowoomba's Kitchener Street station to increase the service's ability to perform swift water rescues.<sup>127</sup>

On the night of 9 January 2011, four swift water rescue technicians from Toowoomba were required to attend an incident in Grantham involving an auxiliary fire truck which had got into difficulties in floodwaters. The four technicians did not arrive back in Toowoomba until the early hours of the morning. They were sent home to rest, but were directed to remain on standby. As it happened, three of the four were able to take part in the rescues of the following afternoon.<sup>128</sup>

The flooding in Grantham of the previous night and the morning's weather conditions convinced the Kitchener Street station officers that they should try to procure more swift water rescue technicians, in addition to the two already on duty, for the day's work. The senior station officer unsuccessfully attempted to contact the acting inspector for the Toowoomba command to authorise additional staff deployments. He left messages on the inspector's mobile phone but received no response.<sup>129</sup> (Fire communications centre notes record that a call from the centre to the acting inspector's phone at 8.38 am similarly went to message bank.<sup>130</sup>) By mid-morning it was raining heavily and the station officer renewed his efforts to contact the inspector, ringing both his mobile phone and the district office; calls to both went unanswered. (Fire service records confirm two calls were made at about 11.50 am from the mobile phone attached to the fire truck the station officer was crewing to the inspector's mobile phone.<sup>131</sup>) The station officer did not try to contact anyone else in fire service management, because, as he understood it, the established chain of command required that he deal with the inspector.<sup>132</sup>

The acting inspector has provided a statement in which he says that he received one call on his mobile telephone that morning but no call or message from the station officer. He suggests that the calls might have been made to a mobile phone which he had passed on to another fire service officer a year previously.<sup>133</sup> By 11.45 am he had left the district office to go to the Toowoomba Town Hall, where he attended a meeting of the local disaster management group.<sup>134</sup> At the direction of the assistant commissioner, he went from there to the fire communications centre at 1.30 pm.<sup>135</sup>

The assistant commissioner of the south-western region spent the morning of 10 January 2011 at the regional co-ordination centre, monitoring weather reports and live radar. At about 12.30 pm, he became concerned that the severe weather formation he had been monitoring had intensified and developed and would pass over Toowoomba on its way to Dalby.<sup>136</sup> In consequence, he held a briefing about the weather situation with other senior officers in

the course of which they were advised by the fire communications centre that heavy rain was falling immediately north of Toowoomba. The assistant commissioner organised the recall of off-duty staff to the fire communication centre, and directed that the auxiliary stations located in Toowoomba command east of Dalby be advised of the weather and made ready to respond.<sup>137</sup> Arrangements were made for staff from the regional operations command centre to crew an additional vehicle.<sup>138</sup>

At about 1.30 pm two vehicles and crews from the Kitchener Street station and one from the Highfields station were sent to Murphys Creek in response to the developing emergency there. One vehicle attempted to reach Murphys Creek via the New England Highway while the other used the Warrego Highway. The two swift water technicians were assigned one to each vehicle, with the hope that one of the vehicles would be able to reach its destination. The Kitchener Street station officer was in the vehicle using the New England Highway; en route he made a call to the fire communications centre requesting more swift water rescue technicians.<sup>139</sup> That call seems to have been acted on: at 1.42 pm, the fire communications centre called the regional technical rescue co-ordinator to request technical rescue assistance, which resulted in the recall of three of the swift water rescue technicians who had been off duty because of the late finish of their shift that morning.<sup>140</sup> They responded to a number of incidents from about 3.00 pm onwards.<sup>141</sup>

The vehicle which was to travel via the New England Highway encountered flooding before it left Toowoomba; as a result it turned around and instead was directed to a number of incidents in the city. Its crew was soon engaged in the rescue of a man clinging to a tree in Dent Street.<sup>142</sup> The other vehicle was prevented by flooding on the range from reaching Murphys Creek. It returned to Toowoomba and made its way to the Kitchener and James Street intersection. Its crew heard the report of a woman and child swept away (Ms Rice and her son) but was too late to do more than search for them. They were able to retrieve a woman stranded on the roof of a motor vehicle in floodwaters at the intersection and to rescue a man holding onto a street sign in fast-flowing water.<sup>143</sup>

### 15.4.3 Chain of command

The acting assistant commissioner of the south-eastern region said that there was no formal protocol for requesting assistance when station officers were not attending an incident; the expectation was that station officers should initially try to contact either the duty manager or their area commander. If both those officers were off-duty, the request should be made through the fire communications centre to an on-call senior officer.<sup>144</sup> It seems that that procedure might be better communicated, since the Ipswich station officer was unaware of it: he thought that what he had done in contacting the acting assistant commissioner was unorthodox and outside the usual chain of command.<sup>145</sup> In fact, what happened seems to have worked well enough. The Ipswich station officer was able to contact three superior officers likely to be able to provide some assistance as to the redeployment of staff, and it seems probable that had he contacted only the duty manager of operations, he would nonetheless have had an answer to his request for more staff (if not one entirely satisfactory to him) once the meeting between the duty manager, the acting assistant commissioner and others had concluded.

In the south-western region, although the assistant commissioner had clearly undertaken appropriate planning for staffing for the wet season, there remain some unsatisfactory aspects of the events of the morning of 10 January. The assistant commissioner explained the procedure for calling for more staff. If a station officer was not attending to an incident, the normal chain of command applied: contact should be made with the inspector or the nominated on-call senior officer. If that officer did not respond, contact should be made with the next level of senior officer, including the director of regional operations or the assistant commissioner. An alternative, should there be any difficulty in making direct contact, was to ask the fire communications centre to facilitate contact with a senior officer.<sup>146</sup> But it does not seem that any of the fire officers at the Kitchener Street station in Toowoomba was aware of that procedure; and it is a matter of concern that the station officer did not, apparently, have a current contact number for the inspector.

### *Recommendation*

- 15.3 The fire service should ensure that station officers are familiar with the procedure for contacting management when requesting the calling in of additional staff; and, in particular, that they have available to them the names and current telephone numbers of the officers to be contacted in the first instance, with alternative contact details in the event that those officers prove unavailable.

## 15.4.4 Weather forecasts and warnings

The fire service referred the Commission to a fire service directive, Incident Action Guide 3.5, directed to officers in charge (including station officers) who may have to respond to incidents involving swift water rescues. It advocates that officers ‘[a]nticipate potential rescues by monitoring weather situations such as prolonged heavy rain, impending storm activities [sic] or flooding’.<sup>147</sup>

The senior station officer at the Kitchener Street station in Toowoomba said that the firefighters at his station had kept themselves informed of any weather formations but had received no formal advice from fire service management of the storm system approaching Toowoomba that morning.<sup>148</sup> The other Kitchener Street station officer on duty on 10 January complained that although the regional operations control centre had been informed that the Oakey air base was to be evacuated because of anticipated flooding there, that information had not been passed on.<sup>149</sup> They first became aware of the severity of the events when they were called to the swift water rescue in Murphys Creek at 1.30 pm.<sup>150</sup> They perceived that the fire communications centre was given advance notice of the approaching storm system and had brought in extra staff some hours ahead of the rain, but that operational staff were left uninformed.<sup>151</sup>

In fact, fire communication centre recordings show that around 8.30 am fire communications centre staff spoke to an officer at the Kitchener Street station, a crew member using the mobile phone on one of the rescue appliances and the officer acting for the day in the position of regional technical rescue co-ordinator to advise of the anticipated flooding of Dalby and Oakey. In speaking to the officer at Kitchener Street, the fire communications centre operator explained that ‘the storm cell that’s over us is headed in their direction as well’.<sup>152</sup> None of the recipients of the calls was told that Oakey air base was to be evacuated, but that detail does not seem to have been crucial, and in fact the assistant commissioner of south-western was not aware of it on 10 January 2011; he only became aware of it in a post-incident review.<sup>153</sup> It may have been better had they specifically been informed of the approaching storm cell, but it seems that in compliance with Incident Action Directive 3.5, they had in fact kept themselves informed. The recordings also support the assistant commissioner’s account: it was not until 12.50 pm, when the rain had just begun to fall heavily on Toowoomba, that calls were made to off-duty staff asking them to report to the fire communication centre for duty.<sup>154</sup>

It might be useful to ensure that that directive is brought to the attention of station officers, although it seems that the station officers at Ipswich and Kitchener Street were in fact paying attention to weather conditions on the morning of 10 January. A difficulty may arise, however, when officers are attending to incidents and are in no position to monitor impending weather events. Prudence would indicate that the fire service should ensure station officers are advised of events as extraordinary as the storm cell looming over Toowoomba on 10 January 2011.

## 15.4.5 Risk assessments

The Commission’s interim report raised the inadequacy of the numbers of Level 2 trained swift water rescue technicians.<sup>155</sup> The evidence of the fire service was that the numbers of approved rescue technicians were determined ‘according to a business case based on a regional risk assessment’ performed by the assistant commissioner in each region.<sup>156</sup>

After the release of the interim report, the United Firefighters Union of Australia raised with the Commission its concern that the far northern region – and possibly other regions – did not conduct risk assessments in preparation for the wet season. The union’s request for copies of risk assessments for the far northern region, made to the assistant commissioner for that region, had produced the response that there was no risk assessment; instead the region monitored hazards and provided advice and recommendations to the deputy commissioner for any increases in staff numbers deemed necessary.<sup>157</sup>

The Commission required and received a statement from the acting commissioner of the fire service to clarify whether or not regions did in fact conduct risk assessments. The acting commissioner advised the Commission that all assistant commissioners did conduct risk assessments to determine approved rescue technician numbers for their regions, but there was no standardised or written assessment process for doing so.<sup>158</sup> Each region has a special operations functional plan, a document which guides the management of technical rescue (including swift water rescue) and the allocation of safety equipment, with the objective of achieving maximum effectiveness.<sup>159</sup> The special operations functional plan is developed and reviewed annually by each region; the process begins in May of each year and must be completed by July.<sup>160</sup> As part of the annual review, a checklist is distributed to the regions: it

sets out how to update and review the previous year's special operations functional plan.<sup>161</sup> The checklist specifically requires a risk assessment to be undertaken to update the regional technical rescue plan, and plan ahead for the required rescue technician numbers and equipment.<sup>162</sup>

The acting commissioner had sought information from the assistant commissioner of each region as to how the risk assessment process was undertaken. Each region had 'conducted its own process to review regional capability'.<sup>163</sup> In the far northern region, an inspector in the role of regional technical rescue sponsor had reviewed the numbers of personnel trained in technical rescue. In consultation with a chief superintendent for the region, he concluded that no additional Level 2 technicians were needed, having regard to the following factors: a number of technicians were due to complete training in mid-2010 (presumably four, since the number of technicians was anticipated to rise by 25 per cent to 20); local action plans had been completed for the most significant hazards in the region; incidents to date had been managed with the existing number of technicians; and there was an effective call back system in place for Level 2 technicians. No part of the review or decision-making process was, however, documented.<sup>164</sup>

It is clear from the union's letter to the Commission that it would not agree with the conclusion reached as to the absence of any need for more rescue technicians, but the focus of its correspondence was its concern as to whether any risk assessment had been done at all in the far northern region. Given the lack of documentation of the process and the response of the assistant commissioner for the region to the union's inquiry, the concern is not surprising.

## ***Recommendation***

15.4 The Queensland Fire and Rescue Service should require that each region records in writing the results of its risk assessment undertaken as part of its annual review of its special operations functional plan.

## **15.5 State Emergency Service (SES)**

The Commission's interim report discussed the training, equipment and membership of the Queensland SES.<sup>165</sup> Three recommendations were made (recommendations 5.32-5.34) in respect of the SES and Emergency Management Queensland, directed at improving the capacity of the SES to respond effectively to flooding, recruiting more volunteers and establishing new SES units where possible.<sup>166</sup> The interim report also observed that the adequacy of funding arrangements and the effectiveness of the command and control structure (the ability to direct SES members and allocate SES resources<sup>167</sup>) warranted further examination.<sup>168</sup>

In Queensland, the administration of the SES is a responsibility shared between the State Government (acting through Emergency Management Queensland) and councils.<sup>169</sup> It is inevitable that there will be tensions in such an arrangement. However, it has not been possible for the Commission to examine this relationship in such detail that it can either properly or sensibly make wholesale recommendations for change. Rather, the Commission seeks only to make recommendations designed to clarify the working of certain aspects of the established model for the operation and support of the SES in Queensland. However, investigating whether structural changes should be made to these arrangements in the longer term would be desirable.

### **15.5.1 SES command and control**

The evidence before the Commission concerning the command and control of the SES reveals there is much confusion among those with an interest in the activities of the SES.

The lack of a cohesive view is apparent:

- within the SES and Emergency Management Queensland as to the authority and responsibility for SES command and control in certain situations
- between the SES and Emergency Management Queensland, on the one hand, and local disaster managers, on the other, as to the nature and limits of their respective roles.

In any examination of the adequacy of the SES's command and control structure, it is important to grasp the distinction between disaster management and disaster operations. Appreciating the distinction helps in understanding the confusion which, in certain situations, surrounds the issue of SES command and control.

Disaster management consists of the actions of groups and individuals within the disaster management hierarchy (such as local disaster management groups and local disaster co-ordinators). It is concerned with co-ordinating the response to a disaster by calling on the services, as required, of various specialised agencies.<sup>170</sup>

Disaster operations are the activities of those agencies (such as the police and the fire and ambulance services) in that response. Each of the agencies typically has its own hierarchical structure, or system of command and control, to enable it to perform the particular disaster operations required of it.<sup>171</sup>

The SES is not concerned with disaster management. Rather, it is a response agency that conducts disaster operations of a particular type.<sup>172</sup>

## Requests for assistance and response

An SES unit may receive requests for assistance (tasks) from a number of sources, including:

- members of the public (using the 132 500 telephone number)
- the Queensland Police Service
- the Queensland Fire and Rescue Service
- the Queensland Ambulance Service
- local disaster management groups
- district disaster management groups.<sup>173</sup>

Local controllers are in charge of individual units established within local government areas. It is the local controller for the SES unit who must decide whether to respond to the request for assistance. This decision is based upon an assessment of the unit's functions and the capacity of its members to respond.<sup>174</sup>

## Command and control

'Command and control' refers to the ability to direct SES members and to use SES resources. Where requests for assistance do not exceed the capacity of an SES unit to respond, the command and control arrangements within the SES appear to be well settled. In these situations, the authority to direct SES operations vests in the local controller;<sup>175</sup> the Commission is not aware of there being any systemic difficulties with these arrangements.

However, where requests for assistance do exceed the capacity of a local unit to respond, there is uncertainty about whether, and the circumstances in which, the command and control arrangements for SES operations may be moved to a higher level. During the 2010/2011 floods, this confusion appeared to be heightened in circumstances where significant deployments of extra SES personnel took place and disaster management groups were activated.<sup>176</sup>

There are at least three possible reasons for the lack of clarity in the command and control arrangements within the SES at this level of operations.

First, the SES is essentially a community-based organisation made up of volunteers. It is not expected that it should operate under strict command and control principles (like those of a permanently staffed and uniformed emergency service agency). However, many of the activities undertaken by the SES, and the environments in which it undertakes them, are hazardous, and accordingly require some elements of the hierarchy and discipline of the permanent emergency services.<sup>177</sup>

Another reason is that responsibility for the SES is shared between the Queensland Government and local governments. This can cause tension and create doubt about who has, or should have, the ability to direct SES operations. It has been suggested that some councils see themselves as having a claim over the local SES by virtue of the funding and resources they provide.<sup>178</sup> This perceived local 'ownership' of the SES contributes to differing views about the functioning of its command and control arrangements.<sup>179</sup>

A third reason for the confusion is that an operations directive promulgated by Emergency Management Queensland allows its regional directors to exercise command and control over the SES, despite there being no clear statutory authority for it to be able to issue a directive of this nature.

Operations Directive 1.0 *Activation Guidelines* provides that where a request for assistance exceeds the capacity of an individual unit, command and control of the response will revert to Emergency Management Queensland in accordance with Operations Directive 2.0 *Hierarchy of Command and Control*.<sup>180</sup> The latter directive states that the

SES forms part of Emergency Management Queensland, with the executive director of Emergency Management Queensland standing as the operational head of the SES.<sup>181</sup> More specifically, the directive provides that when requests for assistance exceed a unit's capacity to cope, command and control of the response is to escalate through the area director to the regional director.<sup>182</sup>

The *Disaster Management Act 2003* is said to afford two bases on which Emergency Management Queensland can make directives concerning the command and control of the SES: section 83, which sets out the chief executive's responsibilities for the SES, and section 137, which deals with the making of codes of practice to guide SES members.<sup>183</sup> Section 83 has been relied upon by Emergency Management Queensland for this purpose, in preference to section 137.<sup>184</sup> However, the chief executive's responsibilities are limited to establishing management and support services for the SES, developing policies to help it perform its functions (for example, in relation to training), and ensuring that local controllers perform their functions and the SES conducts its activities properly.<sup>185</sup> The *Disaster Management Act 2003* is very much geared to the local level and to ensuring the responsiveness of the SES at that level. Despite the SES's being a 'state' service, the Act does not confer responsibility for SES operations on anyone above local controller level, even in the event of a geographically widespread disaster which requires a large and complex response from the members of many SES units.

A review of Queensland's disaster management arrangements completed in 2009 found that the chief executive's functions under section 83 of the Act amounted to 'enabling and supporting' roles.<sup>186</sup> The directional control purportedly conferred on regional directors by Operations Directive 2.0 *Hierarchy of Command and Control* went beyond the chief executive's responsibility to help and support the SES, and 'prescribe[d] more authority to Emergency Management Queensland than is provided for in the Act'.<sup>187</sup> The same review also noted that 'some stakeholders (including SES members) are confused about whether they are accountable to EMQ and are subject to EMQ direction, or have such relationships shared with their Local SES Controller, Local Council or Local Coordination Centre Controller'.<sup>188</sup>

Operations Directive 2.0 *Hierarchy of Command and Control* provides, on its face, a clear direction that command and control of SES operations will vest in Emergency Management Queensland's regional directors when requests for assistance exceed a unit's capacity to respond.<sup>189</sup> However, in practice, the situation is less clear. Emergency Management Queensland acknowledges that there is 'no direct legislative basis for EMQ staff to direct an SES member during disaster operations'; while directives<sup>190</sup> had been developed to guide the nature of the relationship between SES volunteers and Emergency Management Queensland staff, these were based on 'key principles rather than a strict command and control approach'.<sup>191</sup> Thus activities undertaken by staff from Emergency Management Queensland (whether during a small or large-scale disaster response) are 'negotiated with SES leaders' as part of a 'flexible and cooperative approach'.<sup>192</sup> However, officers of Emergency Management Queensland are also expected to ensure that SES operations are being conducted safely, while meeting reasonable community expectations about the SES's response and the overall strategic requirements set by local, district or state disaster management groups.<sup>193</sup> Where these objectives are not being met, Emergency Management Queensland staff will take a more direct operational role.<sup>194</sup> All of this implies that senior Emergency Management Queensland officers may only assume control of SES operations in limited circumstances, notwithstanding the terms of the operational directive.

Against this background, it is perhaps unsurprising that there are conflicting views amongst Emergency Management Queensland area and regional directors about the nature of their roles in significant events, particularly regarding their authority to direct SES operations.

Emergency Management Queensland's area director for the South West Region expressed the view that Emergency Management Queensland was not in command and control of the SES, as that function rested with the respective local controllers.<sup>195</sup> In contrast, another area director considered that the area's local controllers should report directly to him (rather than to their respective councils), and that his role was to then refer any issues to councils for necessary action.<sup>196</sup> This view is similar to that of another area director who believed his function was to act as the point of contact between the council and the SES.<sup>197</sup> A different area director said that during operations some local controllers reported to the local disaster co-ordinator *and* to the Emergency Management Queensland area director.<sup>198</sup>

The Emergency Management Queensland regional director for Brisbane saw his role as to provide advice to local controllers on how a particular issue may be managed and also to 'seek to influence them' on what action to take.<sup>199</sup> This did not extend to command or control over local controllers or the operational management of requests for assistance.<sup>200</sup> Another regional director said that during the 2010/2011 floods there was an assumption by some

at the state level that Emergency Management Queensland had command and control over the SES, and that this caused conflict in the Northern Region.<sup>201</sup> Consequently, he suggested that arrangements for command and control at the local, regional and state levels should be more clearly articulated.<sup>202</sup> Other area and regional directors and local controllers similarly complained that the command and control structure for the SES remained a source of confusion,<sup>203</sup> with one regional director suggesting it had been an issue within the SES for many years.<sup>204</sup>

Emergency Management Queensland's guide, *Roles and Responsibilities in Support of Disaster Management Arrangements*, sheds no light on this issue.

The absence of any clear command structure above the level of the local controller creates uncertainty about firstly, who should direct large-scale SES operations that involve multiple units and secondly, about the handling of tasks that exceed a local unit's capacity to cope.

Local controllers indicated that during the 2010/2011 floods various approaches were taken to manage the overflow of requests for assistance. These included:

- referring requests to the district disaster co-ordinator;<sup>205</sup>
- obtaining assistance from non-SES personnel for basic requests<sup>206</sup>
- referring tasks directly to:
  - other agencies<sup>207</sup>
  - the local disaster co-ordination centre<sup>208</sup>
  - the local disaster co-ordinator,<sup>209</sup> or
  - the district disaster co-ordination centre and Emergency Management Queensland.<sup>210</sup>

Where non-SES community members had to be relied upon to meet less serious requests for assistance, or where requests for assistance could not be attended to immediately, most local controllers indicated that their SES units were in constant contact with those requiring assistance to provide and receive updates.<sup>211</sup>

Other than suggesting that command and control of the SES response to excess requests for assistance should pass to the relevant regional director of Emergency Management Queensland, Operations Directive 2.0 *Hierarchy of Command and Control* says nothing about what else should be done or how the overflow of requests should be handled. Given this, the magnitude of the 2010/2011 floods, and the number of requests for assistance that were received across the state, the methods used by local controllers were reasonable in the circumstances. Moreover, there is no evidence to suggest that there were any adverse outcomes as a result of SES units devolving responsibility for some requests for assistance in the ways described above. Nevertheless, developing a more detailed protocol to be followed in these situations is desirable in the interests of clarity and efficiency.

## Deployments

The potential for confusion about SES command and control becomes most obvious in the context of inter-regional SES deployments. A deployment is the movement of volunteers from their local government area to another area within Queensland or to another state or territory,<sup>212</sup> while an inter-regional deployment is the movement of people between the administrative regions of Emergency Management Queensland.<sup>213</sup>

According to Operational Directive 8.1 *Inter-Region Deployment*,<sup>214</sup> the overarching authority for all Queensland SES deployments rests with the Assistant Director-General, Emergency Management Queensland. Where SES resources from one Emergency Management Queensland region are required in another, the requesting region must contact the State Disaster Co-ordination Centre, which acts on the request to ascertain the availability of SES members in the supporting regions.<sup>215</sup>

The Assistant Director-General must approve the inter-regional deployment, while the Emergency Management Queensland regional director of any supporting region is to approve all persons and equipment being deployed.<sup>216</sup> The final decision for deployment rests with the supporting region's regional director,<sup>217</sup> although directive 8.1 also provides that SES members must not deploy unless authorised by their local controller.<sup>218</sup> This final requirement is appropriate, as the SES is a volunteer service made up of local units intended to provide a local-level response.

It has been suggested that a deployed SES task force will be under the command of the relevant SES local controller of the requesting region (or his or her delegate).<sup>219</sup> Significantly, this is not provided for in Operational Directive 8.1, which makes no mention of the command and control arrangements for deployments. Moreover, it is an

understanding that appears to conflict with the dictates of Operations Directive 2.0, which would, presumably, apply to such deployments, given that they occur when the capacity of the receiving region's SES units to respond to requests for assistance has been exceeded. While Operational Directive 8.1 does envisage the appointment of a task force liaison officer, this role is to 'support' the deployment and to 'encourage seamless integration of the Supporting Region SES Task Force into the local area and with the local SES', rather than to command the deployed group's operations.<sup>220</sup> The directive also limits each deployed task force to a maximum of five teams 'to ensure an acceptable span of control', although it does not say for whom.<sup>221</sup>

Accordingly, the directive leaves unanswered the question of who has actual operational command in these circumstances.

## Memorandum of agreement

The 2009 review of disaster management legislation and policy found that uncertainty about the statutory underpinning of Operations Directive 2.0, *Hierarchy of Command and Control*, contributed to uncertainty about whether Emergency Management Queensland had an operational, or command, role with respect to the SES.<sup>222</sup> The language of Operations Directive 2.0 has remained unchanged since this review took place. Although the directive, which is dated 22 December 2008, is marked 'under review', its original terms remain current.<sup>223</sup>

The apparent lack of progress in developing this directive may be explained, in part, by a recommendation made about the SES in the 2009 review. Given that the SES is effectively a partnership between local and Queensland governments, the review recommended the development of a memorandum of understanding between Emergency Management Queensland and councils about the SES.<sup>224</sup> It was hoped, amongst other things, that such a memorandum would set out the correct 'chain of tasking and control' to be used in the management of disasters.<sup>225</sup>

A draft memorandum of agreement, entitled *A Partnership for the Management and Support of the State Emergency Service*, was subsequently developed by Emergency Management Queensland in consultation with the Local Government Association of Queensland.<sup>226</sup> However, the execution of a memorandum by a council is voluntary.<sup>227</sup> As at 9 November 2011, only nine agreements had been executed with councils; 64 were outstanding.<sup>228</sup>

While the memorandum seeks to aid 'the effective integration of operational demands under the *Disaster Management Act*', it provides only 'a strategic outline and does not address operational detail'.<sup>229</sup> The memorandum does, however, provide that command of the SES is to be undertaken by the local controller, and that 'support, management and coordination of the SES may be carried out by EMQ when necessary'.<sup>230</sup> The nature of these functions, and the circumstances in which they might arise, are not developed further, but none of them could be thought to imply the authority to assume command of SES operations.

Under the heading 'Activations, Tasking and Deployments', the memorandum sets out four escalating activation scenarios and outlines what is to occur:<sup>231</sup>

1. For activations that do not require the Local Disaster Management Group to be Stood Up, the SES Unit/Group will be commanded by the Local Controller.
2. When Stood Up the Local Disaster Management group will set priorities for the local SES Unit and provide taskings.
3. When a number of Local Disaster Management Groups are Stood Up the EMQ Regional Office may co-ordinate the provision of extra SES members from within the region.
4. When multiple Local Disaster Management Groups are Stood Up the co-ordination of deployed SES members will be carried out by the State Operations Co-ordination Centre.

Only the first paragraph provides a clear (and standard) direction about SES command arrangements in the situation contemplated. The next three, while outlining increasingly serious levels of activation, do not address the command and control arrangements for SES disaster operations in those circumstances. Rather, they are mostly concerned with the functions of disaster managers.

Even if the memorandum made explicit provision for the command of SES disaster operations in all the scenarios, its prospective effect would be diminished because most councils have not subscribed to the memorandum, and in the event of any inconsistency with established SES directives, the operational directives are to prevail.<sup>232</sup> This underlines the need for clear directives governing responsibility for SES command and control where circumstances overwhelm the ability of a unit to manage the response by itself.

## Relationship with disaster managers

The various ways in which the numerous requests for assistance were handled during the 2010/2011 floods have been described already, as has the lack of any explicit direction about this in Operations Directive 2.0.<sup>233</sup>

The confusion surrounding this issue points to the absence of both an established and accepted SES command structure above the level of the local controller, and raises questions about whether a formal structure should exist (at least for major disasters) or whether disaster managers (from local, district and, ultimately, state levels) should be asked to resolve these problems.

Escalating the response through Emergency Management Queensland to its regional level may allow additional SES personnel and resources to be called upon more quickly, but it risks overlooking the collaborative nature of state and local responsibility for the SES. This is a very real concern to many councils and local disaster managers, who would prefer to see the allocation of extra resources, and particularly any SES deployments, addressed through the disaster management system, rather than by Emergency Management Queensland's regional staff.<sup>234</sup>

In practice, it seems that both Emergency Management Queensland and local disaster managers were called upon by SES local controllers,<sup>235</sup> but such variability could, conceivably, affect the efficiency of response operations.

Interestingly, Emergency Management Queensland suggests that the 'preferred information path' for a request for additional resources or support from the SES 'on the ground' is by way of the local disaster management group, which will consult with Emergency Management Queensland about the request. It was also acknowledged that sometimes these requests come directly to Emergency Management Queensland rather than through the local disaster management group.<sup>236</sup>

The 'preferred path' for seeking assistance for the SES seems to be at odds with what appears in the operational literature. The draft memorandum of agreement merely says that when a number of local disaster management groups are activated, the regional office of Emergency Management Queensland may co-ordinate the provision of extra SES members from within the region,<sup>237</sup> while Operational Directive 8.1 *Inter-Region Deployment* suggests that state-level disaster managers should be approached once regional resources have been exhausted.<sup>238</sup> Neither of these courses contemplates support requests starting with local-level disaster managers.

Another area where there appears to be tension between the functions of disaster management and the conduct of SES operations is in relation to the issuing of tasks. The 2009 review of disaster management legislation and policy recommended that memoranda of understanding be developed between the Queensland Government and councils (to reflect the partnership that exists in present arrangements) that would include an emphasis on the use of agreed state disaster arrangements to issue tasks to, and deploy, SES units.<sup>239</sup> This suggestion is reflected in the current draft memorandum's expectation that when the local disaster management group is operating, it will set priorities for the local SES unit and provide tasks.<sup>240</sup>

The authority of a local disaster management group to issue tasks to the local SES unit is uniformly accepted.<sup>241</sup> However, the SES receives tasks from a variety of sources apart from the local group, including other response agencies and the 132 500 service. Perhaps it is for this reason that Emergency Management Queensland's Operations Directive 4.0 *Incident Control Function* makes the SES incident controller responsible for prioritising tasks.<sup>242</sup>

Emergency Management Queensland recognises that there may be circumstances where the local disaster management group prioritises SES tasks, which may change the thrust of the SES's operations in the affected area.<sup>243</sup> Where these circumstances arise, the SES liaison officer plays an important role in managing the mutual flow of information and the prioritisation of tasks.<sup>244</sup> However, in the absence of specific direction from disaster managers, the SES can be expected to work through its tasks (the bulk of which come from 132 500) in an orderly way.<sup>245</sup>

That the SES may receive tasks from a variety of sources reinforces the need for SES liaison with local disaster managers.<sup>246</sup> It is crucial, for example, that the SES informs disaster managers of completed tasks and of any need for further resources or support. Communication deficiencies in these areas have been identified and acknowledged by Emergency Management Queensland.<sup>247</sup>

Under current arrangements, SES liaison officers provide the link and are central to the interactions between disaster managers and the SES's operations during a disaster. Unfortunately, the role of an SES liaison officer is not described in any of the SES operational literature available to the Commission. Emergency Management Queensland should clearly define this role in its advisory material.

## Incident control

Operations Directive 4.0 *Incident Control Function* provides that in localised disasters the local controller is to appoint an incident controller.<sup>248</sup> In larger events, involving more than one SES unit, the relevant regional director of Emergency Management Queensland is to make the appointment.<sup>249</sup>

The incident controller ‘controls the management of the SES response to an event’.<sup>250</sup> His or her responsibilities include assuming control, assessing the incident, planning the response and allocating tasks.<sup>251</sup> These functions sound very much like command and control activities. However, that is apparently not the case; rather, the incident controller has a ‘functional support role’ subordinate to the head of the response,<sup>252</sup> which, in the case of localised events, must be the local controller. Precisely who this would be in the case of a major response is not clear.

Fundamentally, though, the directive does not make explicit the relationship between an incident controller and the person charged with operational responsibility for the response.

## Local structure

Sections 84A and 85 of the *Disaster Management Act 2003* make it tolerably clear that there should be one SES unit in each council area with a local controller in charge of the unit. However, according to Emergency Management Queensland’s records and to the responses received from many SES local controllers, there is frequently more than one SES unit operating within a single council area.<sup>253</sup>

This situation arises following the local government amalgamations of 2008. While many councils were joined, their constituent SES units were not. They continue to operate as before.<sup>254</sup>

Most local controllers indicated that this did not cause organisational problems during the 2010/2011 floods.<sup>255</sup> Indeed, many have suggested that it afforded them extra support,<sup>256</sup> while others noted that each local controller benefited from having specific knowledge about his or her local area.<sup>257</sup> However, it was suggested that having a single local controller for each council area, with overall responsibility for the unit/s in the area, would ensure better operational control by minimising the possibility of personality clashes.<sup>258</sup>

An area director of Emergency Management Queensland considered that having only one SES local controller in each council area would make local-level consultation easier and more efficient,<sup>259</sup> while another suggested that such a structure, where it existed, worked well for the SES.<sup>260</sup>

The Commission notes that Toowoomba Regional Council and Central Highlands Regional Council are rationalising their local structures, or have recently done so, in order to have a single local controller supported by multiple deputies and group leaders.<sup>261</sup> These arrangements are intended to meet the intention of the Act, while also preserving important local knowledge and ensuring the unit’s leaders can maintain control of its members. These initiatives have been driven by the councils involved, rather than Emergency Management Queensland.<sup>262</sup>

The Commission sees these reforms as being desirable on the whole, but appreciates they may be unsettling to some volunteer office-holders.<sup>263</sup>

## A clearer command and control structure

The preceding discussion suggests that in large-scale disasters, the SES needs better command and control arrangements above the level of the local controller. This is likely to become necessary when the local capacity to respond effectively has been overwhelmed, and the mobilisation of a major (or state-level) SES response is called for. When large numbers of additional personnel and equipment are deployed to a disaster area it cannot be assumed that the resident local controller (who in most cases will be a volunteer) will have the necessary skills to command such an operation. But this is the situation under current arrangements.

It is also apparent that Emergency Management Queensland’s role in these situations is often confused and misunderstood by both local controllers and Emergency Management Queensland staff themselves. This is so for a number of reasons, including the perceived lack of authority for Operations Directive 2.0 and the lack of clarity and any helpful practical detail in the directive itself.

The operational directives provided to the Commission collectively fail to make clear many other matters including:

- the process for dealing with requests for assistance that exceed a unit’s capacity to respond

- the interaction and communication that should take place between the SES and disaster managers, including in relation to task allocation, once disaster management groups have been activated
- the process for seeking extra support for an SES unit that has been overwhelmed by a disaster (whether by way of Emergency Management Queensland or the disaster management arrangements or both)
- the role of SES liaison officers in relation to disaster management functions and disaster operations
- the role of incident controllers, and their teams, relative to those SES personnel charged with operational command.

The Commission understands that a command role above that of local controller, in the context of Queensland's SES arrangements, may discomfit some councils which cherish the ability of the local SES unit to respond locally. However, this role should be an extraordinary one, for use in circumstances where the deployment of additional SES personnel to a region is called for because an emergency is beyond the capacity of its local units to respond. The Queensland floods of 2010/2011 demonstrate that such circumstances can indeed arise.

The recommendations which follow are directed to the deficiencies in the SES's command and control arrangements identified in the preceding discussion.

## Recommendations

- 15.5 The *Disaster Management Act 2003* should be amended to give the chief executive of the department administering the Act (or his or her delegate) the authority to appoint an officer of Emergency Management Queensland to direct SES operations in extraordinary circumstances.
- 15.6 Emergency Management Queensland, in consultation with councils, should develop a directive that makes clear the authority of an officer of that agency to command a major SES operation. This could be expected to occur when a deployment of additional SES members is made to a region because the response needed is beyond the capacity of its local units. The directive should make clear the powers of the officer and his or her reporting responsibilities to disaster managers in these circumstances. Emergency Management Queensland must also ensure that any officer who assumes such a role has adequate training and skills in the conduct of disaster operations.
- 15.7 Emergency Management Queensland should ensure its staff, SES members and disaster managers are familiar with the directive when it is developed.
- 15.8 Emergency Management Queensland, in consultation with councils, should develop clear directives about:
  - the communication and reporting that should take place between the SES and disaster managers, including in relation to task allocation and completion, once disaster management groups have been activated
  - the communication and reporting that should take place between the SES and disaster managers, including in relation to task allocation and completion, once disaster management groups have been activated
  - the process for dealing with requests for assistance that exceed an SES unit's capacity to respond them
  - the process for seeking extra support for an SES unit that has been overwhelmed by a disaster (whether by way of Emergency Management Queensland or the disaster management arrangements or both)
  - the role of SES liaison officers in communications with disaster managers about SES disaster operations
  - the role of incident controllers, and their teams, relative to those SES (or Emergency Management Queensland) personnel charged with the command of SES operations.
- 15.9 Emergency Management Queensland should ensure its staff, SES members and disaster managers are familiar with the directives it develops in relation to these matters.

## 15.5.2 Funding

The funding of the SES in Queensland is not the subject of legislation. Instead, broadly accepted mechanisms for financing the service have developed over time between the Queensland Government and councils who share this responsibility. Their financial support is supplemented by corporate sponsorship, donations and the fundraising efforts of SES members.<sup>264</sup>

### Queensland Government funding

The Queensland Government's financial contribution to the SES is administered by Emergency Management Queensland, which regularly provides volunteer uniforms, training and communications equipment. Additionally, the agency manages a range of funding programs including the recurrent and non-recurrent subsidy schemes.<sup>265</sup>

Under the recurrent scheme, the Department of Community Safety (through Emergency Management Queensland) administers the local government subsidy program, which entails a yearly payment of \$3000 (base amount) to each SES unit, \$100 for each additional active SES group, a further \$500 for local governments with a population in excess of 45 000 where only one SES group exists, and an additional \$300 for each active emergency service cadet group in the local government area.<sup>266</sup> The total budget available for this program is \$480 000 per annum.<sup>267</sup> The grants paid in 2009/2010 and 2010/2011 amounted to \$482 500 (excluding GST) and \$480 350 respectively.<sup>268</sup>

Emergency Management Queensland provided to the Commission a spreadsheet entitled *SES Annual Payments to Local Government* for the financial year 2009/2010.<sup>269</sup> The document reveals that each SES unit received an individual subsidy payment (directed to the relevant council) in accordance with the program's guidelines. However, many of the councils that were amalgamated in 2008 have more than one SES unit. This is because SES units that existed prior to the council amalgamation continue to operate. On the strength of this, some councils receive multiple subsidy payments while others receive only one.<sup>270</sup> Emergency Management Queensland acknowledged that these arrangements continue, and that they are anomalous, being inconsistent with the current structure of local government.<sup>271</sup> A better way to distribute these subsidies may be to develop a formula that takes into account a unit's size and the council's population, area and exposure to natural hazards.<sup>272</sup>

The non-recurrent subsidy scheme is an annual competitive grants program open to all councils.<sup>273</sup> Applications are invited every September, and are then determined by a state assessment committee.<sup>274</sup> The subsidies support:

- the provision of accommodation for SES units (to a maximum of either 75 per cent of the project cost or \$50 000 whichever is the lesser of the two)<sup>275</sup>
- the purchase of motor vehicles and accessories (matched on a 'dollar for dollar' basis up to \$15 000 for motor vehicles and a maximum of \$3 800 for accessories)<sup>276</sup>
- the provision of office equipment (with 50 per cent of the items' cost reimbursed up to a maximum of \$500 for televisions, DVD players, photocopiers, facsimiles, general office equipment and satellite telephones, and a maximum of \$750 for computers and printers).<sup>277</sup>

The total budget available for this program each year is \$317 000, with \$132 000 allocated for accommodation, \$175 000 for vehicles and accessories, and \$10 000 for office equipment.<sup>278</sup>

According to Emergency Management Queensland, requests for funding from the program consistently exceed its capacity.<sup>279</sup> Consequently, unexpended funds from other programs are used to supplement the non-recurrent SES subsidy scheme when the opportunity arises. In 2008-2009, an additional \$188 000 became available for this purpose, while in 2010-2011 the amount was \$734 480.92, bringing the total funding approved for the scheme in that financial year to \$1 038 324.54.<sup>280</sup> Even so, requests for grants still slightly exceeded the funds available.<sup>281</sup>

### Local government funding

While councils are not obliged to support their SES units, they are required to have a disaster response capability (the ability to provide people and equipment to deal with a disaster or emergency);<sup>282</sup> providing funding to the local SES is an obvious way of meeting that commitment.<sup>283</sup>

Under the current arrangements, councils are responsible for meeting the operating costs of their SES units, and pay for day-to-day expenses such as electricity, telephones, fuel and vehicle maintenance costs. In addition, councils provide a range of other resources to the SES units in their areas. During the 2009/2010 and 2010/2011

financial years, this included items such as buildings, vehicles, trailers, flood boats, chainsaws, and office and communications equipment.<sup>284</sup> Unsurprisingly, the level of support provided by councils to the SES varies greatly throughout Queensland. While it is impossible to make any meaningful direct spending comparisons, the evidence before the Commission shows that the amounts actually spent by individual councils on the SES averaged across the last two financial years ranged from as little as \$13 320 to as much as \$3.4 million. However, when these particular sums are considered on a per capita basis by reference to the populations of the local government areas concerned, the amounts equate to \$24.04 and \$3.20 per head of population respectively. While this might be a fairer measure of the proportionate spending involved, it does not take into account the flood (or storm) risk of each area or the manner in which these funds were disbursed relative to the needs of each SES unit. Consequently, it provides little insight into the reasonableness of these commitments for the units involved.

One matter that is clear from the information available to the Commission is that those councils which have experienced flooding in recent years typically offer greater financial support to the SES on a per capita basis than is the case in those areas where flooding is infrequent.

Emergency Management Queensland does not monitor the amount of money each council spends on the SES in its area; neither does it actively assess the relative financial needs of SES units.<sup>285</sup> Presumably these things are not done because the Queensland Government's subsidy programs can be administered without detailed information of this type. Consequently, it seems unlikely that Emergency Management Queensland has a complete picture of the funding health of the SES across the state.

## Fundraising

Under section 82(e) of the *Disaster Management Act*, fundraising is identified as an official function of the SES. Accordingly, many SES units and groups undertake local fundraising activities<sup>286</sup> which, according to local controllers, range from traffic management,<sup>287</sup> sausage sizzles<sup>288</sup> and selling firewood<sup>289</sup> to marketing an SES branded golf umbrella.<sup>290</sup> The local controllers of those SES units which undertake fundraising gave estimates of funds raised varying between 2 and 40 per cent of their annual operating budgets.<sup>291</sup>

Local controllers reported a range of concerns about undertaking fundraising activities. Principal among them was that it absorbed volunteers' time when they already had other SES responsibilities.<sup>292</sup> Controllers made a number of points: the service's continuing training obligations were sufficiently demanding of members' time without adding to them the burden of fundraising;<sup>293</sup> some members became 'burnt out' since most fundraising opportunities fell around Christmas time, coinciding with the storm season; and people who joined the SES did so to serve the community, not to fundraise.<sup>294</sup> Worryingly, it was suggested that some members may forego training opportunities so as to ensure that fundraising continues.<sup>295</sup>

Emergency Management Queensland echoed those concerns. The Sunshine Coast's area director stated that local controllers would like to see an improvement in the funding arrangements so that they did not have to raise funds at all,<sup>296</sup> while the regional director for the North Coast said that many SES volunteers do not believe that they should have to fundraise to function effectively.<sup>297</sup>

These are valid concerns. Any measures that could relieve volunteers of the burden of undertaking fundraising activities are to be encouraged.

## Memorandum of agreement

Another matter of interest to the Commission is the role of the draft memorandum of agreement in addressing the respective funding obligations of the state and local government for the SES. While the draft agreement is largely concerned with the allocation of these responsibilities, the working details of the agreement are to be set out in an attachment to the memorandum referred to as the 'Local Arrangements'. Although nine memoranda have been executed between Emergency Management Queensland and councils to date, none have yet had their 'Local Arrangements' finalised.<sup>298</sup> It is desirable that this occur as soon as possible, although the Commission appreciates the difficulties involved.

One challenge, by way of example, is how to deal with the registration of motor vehicles. It has been suggested that there is considerable confusion about the actual ownership of SES vehicles partly funded by the Queensland Government.<sup>299</sup> The vehicle inventory template contained in the local arrangements allows for the owner and registrant of each vehicle to be identified.<sup>300</sup> This presents no difficulty when the council supplies a vehicle to a

unit. However, where the state partly funds the purchase of a vehicle under the non-recurrent subsidy scheme, the potential for disagreement becomes apparent. Consistently with the scheme's guidelines, the draft local arrangements suggest that such vehicles should be fitted with 'QG' number plates and registered and insured by Emergency Management Queensland,<sup>301</sup> implying that the Department of Community Safety owns the vehicle, despite having contributed to its acquisition on a 'dollar for dollar' basis and only up to a maximum of \$15 000. It is understandable that councils may see this as being inequitable, particularly as they are also expected to assume responsibility for the vehicle's operating and maintenance costs.

Despite the difficulties created by this issue, and others like it, the Commission considers the negotiation and execution of the local arrangements to be an important next step that all parties should take without delay.

## *Recommendations*

- 15.10 Emergency Management Queensland should develop and implement a new formula for the distribution of its recurrent SES subsidy, which takes into account relevant factors including the size of a local SES contingent and the population, area and natural hazard risk profile of the local government area concerned.
- 15.11 Emergency Management Queensland should pursue the execution of the 'Local Arrangements' with councils where a Memorandum of Agreement is in place. The contents of the arrangements should be reviewed and updated regularly.

### 15.5.3 RFA Online

The SES receives requests for assistance from various groups and agencies, as well as the general public, particularly through the 132 500 service. RFA Online has been developed by Emergency Management Queensland as a task management tool for use by the SES. It is expected to convey requests for assistance received by way of 132 500 calls to the SES unit best placed to respond. It is also designed to provide SES units which have RFA Online with a means of managing their list of tasks.<sup>302</sup>

According to Emergency Management Queensland, as at 7 November 2011, 72 out of 300 SES units across the state were using RFA Online. However, an amount of recurrent funding has become available to improve the online connectivity of SES units so that RFA Online can be implemented more broadly.<sup>303</sup>

Some councils have been reluctant to use RFA Online, apparently because they use other disaster management software.<sup>304</sup> However, RFA Online is not a competing piece of disaster management software, but a task management tool designed especially for use by the SES. Consequently, it can be used by the SES independently of a local disaster management group (for example, in situations where the local disaster co-ordination centre has not been activated). Furthermore, Emergency Management Queensland is funding the development of a means to share data from RFA Online with at least one disaster management software program, so that RFA Online can be integrated with a local group's disaster management system if required. This capability is expected to become available by the 2012/2013 wet season.<sup>305</sup>

The Commission encourages Emergency Management Queensland to continue to implement RFA Online within the SES as quickly as possible. Councils should facilitate this process.

### 15.5.4 Training

The information provided to the Commission by SES local controllers suggested that they considered that their units had adequate training to prepare them for the 2010/2011 floods; but equally prevalent was the sentiment that there was no room for complacency about training.

One training-related concern was the recognition that SES members could receive for the knowledge and skills gained from other training courses and previous life or work experience. There was a reasonably consistent view that the recognition accorded to members for prior learning was insufficient.<sup>306</sup> One local controller said that volunteers

with relevant trade qualifications were frustrated at the need for retraining, while another suggested that the issue was causing members to leave the SES.<sup>307</sup>

While a formal process for the accreditation of prior learning exists within the SES,<sup>308</sup> Emergency Management Queensland acknowledged it is complex and convoluted, and tends to discourage volunteers from pursuing it.<sup>309</sup> The Commission understands that Emergency Management Queensland intends to conduct an independent review of its training processes from March 2012. One aspect of this will be to develop ways to simplify the recognition of prior learning.<sup>310</sup>

## **Recommendation**

15.12 Emergency Management Queensland should simplify the process by which SES members gain recognition for prior qualifications so that unnecessary duplication of training can be avoided.

### **15.5.5 Shared responsibility**

The SES in Queensland is principally meant to provide a local-level response to storms and floods. The approach taken by the *Disaster Management Act* in establishing the SES makes this clear. In most cases, the SES operates at this level. However, from time to time, a state-level response is required, as occurred in the 2010/2011 floods. It is at these times that the tensions in the model of shared responsibility are exposed:

- the lack of a command and control structure above the level of local controllers
- the confusion surrounding Emergency Management Queensland's ability to direct, as opposed to merely supporting, major SES operations
- the need to consult and negotiate with local government in order to deploy SES personnel and equipment around the state
- the concerns of councils over what may be seen as the Queensland Government's use of local assets for such purposes.

While shared responsibility remains the model for the SES in Queensland, these tensions will persist. They cannot be resolved, but only managed. This is a real challenge in a large and diverse state such as Queensland.

The notion of shared responsibility for the SES really comes down to shared financial responsibility. While two levels of government contribute to the SES in this way there will be times when interests collide and competing claims are made over the use of its services. At present, such difficulties must be resolved collaboratively, but it stands to reason that this is not ideal. Time is of the essence when mounting disaster response operations.

In the time available to it, the Commission has not been able to examine these matters in more detail; they may in any event be beyond its terms of reference (which concern only one of the circumstances in which the SES operates). Hence, the foregoing recommendations about the SES are made within the context of the established arrangements. However, the Commission considers that if the difficulties that have been highlighted are to be resolved, a fundamental re-working of the SES model may be required. Any review of this nature would need to address the purpose for which the SES has been raised in Queensland: as a series of local units providing a disaster response capability at that level (in combination with local disaster managers) or as a state service capable of mounting state-wide operations. It would be useful for it also to investigate SES arrangements (including in relation to funding) in other states.

## **15.6 State Emergency Service in Grantham**

The Commission's interim report, in dealing with the Lockyer Valley Regional Council's response to the flash flooding in the valley on 10 January 2011, noted that at 2.30 pm an SES controller had directed the Gatton SES group to undertake doorknocking at Grantham, that they had left Gatton for that purpose at 2.50 pm, and that they had been unable to get into Grantham because of the rising floodwaters.<sup>311</sup> The Commission received a submission from three members of the Grantham community which questioned those findings and the evidence on which they were based, because one of them had been able to travel the road from Gatton to Grantham between

2.40 pm and shortly after 3.00 pm and did not see water over the road or see any SES vehicle. Their submission also suggested that the Gatton SES controller had (in a way not identified) subsequently altered his account to suggest that the events he described actually took place an hour later.<sup>312</sup>

The Commission has made some further inquiries in consequence of those assertions. While it accepts the submitters' contention that the road from Gatton to Grantham was clear shortly after 3.00 pm (a conclusion consistent with the Commission's finding in its interim report that the Grantham flooding occurred between 3.20 pm and 4.00 pm),<sup>313</sup> it does not consider that there is any basis to reject the SES controller's account as given in his statement referred to in the interim report.<sup>314</sup> It is supported by statements from the group leader of the Gatton SES unit and members of the SES group which set out to perform the doorknocking task, as well as by the contemporary record in the form of the Gatton SES attendance log.<sup>315</sup>

The group leader confirms that she received the instruction from the controller to warn Grantham residents of expected flooding. Two group members were already on duty; a third SES member, who was at home, was called in to join the team.<sup>316</sup> The SES attendance log records that she arrived at 2.50 pm. Alongside her signature in the log, under the heading 'Activity Details', is noted 'phone call to warn Grantham at 2.30'.<sup>317</sup> On her arrival, the team set out in their truck for Grantham.<sup>318</sup> They took with them the text of the warning they were to give, which the group leader had written. It advised residents that Sandy Creek was expected to rise again rapidly that evening, with higher levels than those experienced the preceding night, and suggested immediate evacuation.<sup>319</sup>

The SES team stopped to warn residents at two farm properties on the outskirts of Grantham, on the Gatton-Helidon road. As they arrived at the town, they saw flooding in the paddocks and across the road: in particular, they saw a shipping container floating across the Gatton-Helidon road to Anzac Avenue. The water looked about two feet deep, and their vehicle was not a four wheel drive. They radioed their headquarters for instructions and were told to return to Gatton. On their return journey, they warned a group of sightseers and residents at four properties along the Gatton-Helidon road of the approaching floodwaters.<sup>320</sup> They arrived back at Gatton at about 4.00 pm.<sup>321</sup>

On that evidence, the Commission sees no reason to depart from the findings of the interim report. Before leaving the topic, however, it is appropriate to provide some further context for the activities of the five Gatton SES volunteers concerned in this discussion: the controller and the four group members, including the group leader. The previous night, the group had assisted in sandbagging and evacuations at Grantham, finally coming off duty at 4.30 am on 10 January.<sup>322</sup> The controller, who remained in the Gatton control room, performed a similar shift. He was back on duty at 9.00 am that morning. Three of the group members were back performing SES tasks at 11.30 am; the fifth, as noted above, rejoined the group at 2.50 pm for the abortive trip to Grantham. They continued to work late into the night of 10 January, the controller co-ordinating activities, the group leader answering calls for assistance, and the group members filling sandbags, warning residents to evacuate, and helping at the evacuation centre set up at the Gatton Shire Hall.<sup>323</sup> The Commission commends the efforts which they (like many other SES volunteers throughout the state) made to assist their community; not for any reward, but out of simple public-spiritedness.

## 15.7 The Grantham quarry

In section 7.3.3 of the Commission's interim report, the Commission noted that some Grantham residents had raised the question of whether stockpiles, earthen banks and buildings at Wagners' quarry, west of Grantham, contributed to or caused the flooding of the town on 10 January 2011.

On 10 January 2011, the Lockyer Creek broke its banks both south and north of the quarry. An earthen embankment about 380 metres long and three to five and a half metres high between the quarry pit and Lockyer Creek was also breached, causing a stream of faster flowing water to travel directly into the pit.<sup>324</sup> The breach was approximately 55 metres wide and eight metres deep.<sup>325</sup>

At the time the interim report was delivered, Dr Phillip Jordan, an expert hydrologist consulted by the Commission, had formed the preliminary opinion that the quarry and its features might have had some very local influence, causing a marginal increase in flood levels immediately upstream from Grantham, but was unlikely to have had a significant influence on the downstream flow of water into Grantham.<sup>326</sup>

Recognising the interest of Grantham residents in the issue, the Commission engaged Dr Jordan to undertake further modelling and provide his opinion about the question of the contribution, if any, of Wagners' quarry to the flooding of Grantham on 10 January 2011.

For this purpose, Dr Jordan modelled three scenarios using a modified version of a hydraulic model of Lockyer Creek and its floodplain, developed by Sinclair Knight Merz for the Lockyer Valley Regional Council's Floodplain Management Study.<sup>327</sup>

The first scenario sought to reconstruct the actual event that occurred on 10 January 2011. The data used reflected the terrain immediately before the 2010/2011 wet season and took into account the 55 metre wide breach in the quarry wall that occurred on 10 January 2011.<sup>328</sup>

The second scenario sought to simulate the hypothetical event that would have occurred on 10 January if the quarry had never been constructed. The terrain data used represented the condition of the relevant portion of the Lockyer Creek floodplain before the quarrying works began.

The third scenario sought to simulate the hypothetical event that would have occurred on 10 January if the quarry's wall had not been breached. The data used reflected the terrain immediately before the 2010/2011 wet season, with the quarry wall intact.<sup>329</sup>

In each scenario, the flow data comprised Lockyer Creek flows, as recorded by the Helidon gauge, and flows from Flagstone Creek, Sandy Creek, Monkey Waterholes Creek and Ma Ma Creek, estimated from recorded rainfall intensities in the respective catchments.<sup>330</sup>

For each of the three scenarios, the model generated maximum water depths and velocities.

By comparing the results generated for the three scenarios by the model, Dr Jordan's second report to the Commission concluded that the quarry mitigated the impact of flooding through the town area of Grantham. The effect of the quarry was to reduce peak flood levels in Grantham by between 0.04 metres and 0.1 metres. Peak flood velocities in Grantham were not affected; the maximum simulated velocities differed by less than 0.01 metres per second across the Grantham town area between the pre-quarry scenario and the 10 January event as simulated.<sup>331</sup> The quarry attenuated the flows, causing a five minute delay in the water rise.<sup>332</sup>

At some other locations the existence of the quarry did elevate flood levels slightly, for example, by 0.3 metres just upstream of where the breach occurred in the quarry wall and by 0.04 metres near Dorrs Road.<sup>333</sup>

As for the effect of the breach in the quarry embankment, the modelling showed the pattern of changes in flood levels through the town of Grantham to be very similar whether the embankment was breached or not.<sup>334</sup>

The accuracy of the model was assessed by comparing the model results for the first scenario (the simulation of the actual event) against debris marks and sediment deposits remaining after the actual event. The maximum water levels and depths estimated by the model for the first scenario were within 0.3 metres of the debris marks on buildings in Grantham after the January 2011 flood event.<sup>335</sup> The extent of the flooding estimated by the model for the first scenario was also consistent with the sediment deposits visible in aerial photography taken after the January 2011 flood event.<sup>336</sup>

The Commission concludes, on the basis of Dr Jordan's evidence, that none of the earthworks associated with the quarry caused or contributed to the flooding of Grantham on 10 January 2011.

## (Endnotes)

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- 1 Emergency Management Queensland, Queensland Evacuation Guidelines for Disaster Management Groups, Version 1, August 2011.
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- 2 Transcript, Gary Davison, 13 October 2011, Gympie [p4044: line 37]; Exhibit 816, Statement of Gary Davison, 29 August 2011, Attachment 'Gympie Chamber of Commerce Flood Plan correct as of February 2011' [p1].
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- 3 Transcript, Gary Davison, 13 October 2011, Gympie [p4044: line 47].
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- 4 Transcript, Gary Davison, 13 October 2011, Gympie [p4045: line 6]; Exhibit 816, Statement of Gary Davison, 29 August 2011 [p2: para 2, 3, 7].
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- 5 Exhibit 816, Statement of Gary Davison, 29 August 2011 [p2: para 4].
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- 6 Exhibit 816, Statement of Gary Davison, 29 August 2011 [p2: para 5].
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- 7 Exhibit 816, Statement of Gary Davison, 29 August 2011 [p3: para 8].
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- 8 Transcript, William Brown, 12 October 2011, Maryborough [p3959: line 10].

- 9 Exhibit 784, Statement of William Brown, 28 September 2011 [p3: para 5].
- 10 Transcript, William Brown, 12 October 2011, Maryborough [p3962: line 49].
- 11 Transcript, Michael Cox, 12 October 2011, Maryborough [p3994: line 54].
- 12 Transcript, Victoria Ashworth, 20 September 2011, Brisbane [p2872: lines 30-38].
- 13 Transcript, William Brown, 12 October 2011, Maryborough [p3962: line 49].
- 14 Transcript, Gary Davison, 13 October 2011, Gympie [p4049: line 28].
- 15 Emergency Management Queensland, Queensland Evacuation Guidelines for Disaster Management Groups, Version 1, August 2011 [p6: para 1.1].
- 16 Emergency Management Queensland, Queensland Evacuation Guidelines for Disaster Management Groups, Version 1, August 2011 [p14: para 3.8].
- 17 Correspondence from Crown Law, 5 December 2011, ‘Queensland Floods Commission of Inquiry – State Representation – Post-flood clean up of commercial buildings in Gympie’.
- 18 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p187].
- 19 The capacity for persons in different organisations or different parts of the same organisation to exchange information (Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p91]).
- 20 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p184].
- 21 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p244].
- 22 Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p26]; Exhibit 343, Statement of Glenn Walker, 18 April 2011 [p4: para 13]; Exhibit 346, Statement of Robert Waugh, 15 April 2011 [p12].
- 23 Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p26]; Exhibit 343, Statement of Glenn Walker, 18 April 2011 [p4: para 13]; Exhibit 346, Statement of Robert Waugh, 15 April 2011 [p12].
- 24 Exhibit 388, Third submission of Telstra Corporation Limited, 15 April 2011 [p4: para 14].
- 25 Exhibit 493, Statement of Gary Taylor, 24 March 2011 [p3: para 16]; Exhibit 343, Statement of Glenn Walker, 18 April 2011 [p5: para 16 and p8: para 30]; Exhibit 341, Statement of Kelli Louita Docherty-Tanaskovic, 18 April 2011 [p2: para 15]; Exhibit 345, Statement of Edward Middleton, 18 April 2011 [p2: para 8].
- 26 Exhibit 347, Statement of Grant Pitman, 15 April 2011 [p9]; Transcript, Grant Pitman, 12 May 2011, Brisbane [p1822: line 1]; Exhibit 343, Statement of Glenn Walker, 18 April 2011 [p8: para 31]; Exhibit 346, Statement of Robert Waugh, 15 April 2011 [p2].
- 27 Response from State of Queensland, 11 January 2012 [p2: para 7].
- 28 Exhibit 347, Statement of Grant Pitman, 15 April 2011 [p9]; Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p10, p12].
- 29 Statement of Grant Pitman, 15 November 2011 [p3].
- 30 Exhibit 347, Statement of Grant Pitman, 15 April 2011 [p9].
- 31 Exhibit 347, Statement of Grant Pitman, 15 April 2011 [p10].
- 32 Exhibit 347, Statement of Grant Pitman, 15 April 2011 [p9]; Statement of Grant Pitman, 15 November 2011 [p3].
- 33 Queensland Police Service, Operational Plan 2010-2011, 2010 [p12]; Queensland Police Service, Annual Report 2009-2010, 2010 [p84]; Exhibit 347, Statement of Grant Pitman, 15 April 2011 [p17]; Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p i].
- 34 Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p10]; Statement of Grant

- Pitman, 15 November 2011 [p2]; Response from State of Queensland, 11 January 2012 [p2: para 5-6].
- 35 Statement of Grant Pitman, 15 November 2011 [p2]; Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p12].
- 36 Statement of Grant Pitman, 15 November 2011 [p2].
- 37 Response from State of Queensland, 11 January 2012 [p2: para 5-6].
- 38 Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p12].
- 39 Transcript, Grant Pitman, 12 May 2011, Brisbane [p1833: line 27].
- 40 Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p12].
- 41 Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p13].
- 42 The Queensland Police Service is currently working with the Department of Community Safety to establish interoperability between the computer aided despatch systems. The target date for completion of this exercise is 30 June 2012. (Statement of Grant Pitman, 15 November 2011 [p4]; Queensland Police Service, Annual Report 2008-2009, 2009 [p94]).
- 43 Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p13].
- 44 Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p13].
- 45 Automatic vehicle location technology would allow communications centre staff to automatically determine the locations of all operational vehicles, and the staff within those vehicles, at all times (Transcript, Grant Pitman, 12 May 2011, Brisbane [p1831: line 31]).
- 46 Jenkins, S and Davidson, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p13].
- 47 Exhibit 347, Statement of Grant Pitman, 15 April 2011 [p16]; Exhibit 204, Statement of James McDonald, 14 March 2011 [p7]; Exhibit 339, Statement of Julie Cooling, 14 March 2011 [p8: para 9]; Exhibit 308, Statement of Jason Renwick, 13 April 2011 [p6: para 20]; Exhibit 346, Statement of Robert Waugh, 15 April 2011 [p15 -17].
- 48 Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p13, p75].
- 49 Jenkins, S and Davidson, G, Queensland Police Communications Centres Operational and Strategic Review – Assessment and Options Analysis, Volume 1: Project Final Report, Draft version 2.1, 2011 [p i].
- 50 Transcript, Grant Pitman, 12 May 2011, Brisbane [p1821: line 51]; Transcript, Glenn Walker, 11 May 2011, Brisbane [p1789: line 49]; Exhibit 343, Statement of Glenn Walker, 18 April 2011 [p9: para 36].
- 51 Transcript, Grant Pitman, 12 May 2011, Brisbane [p1821: line 59].
- 52 Environment and Communications References Committee, The capacity of communication networks and emergency warning systems to deal with emergencies and natural disasters, 2011 [p11: para 2.2-2.3].
- 53 Environment and Communications References Committee, The capacity of communication networks and emergency warning systems to deal with emergencies and natural disasters, 2011 [p11: para 2.5].
- 54 Environment and Communications References Committee, The capacity of communication networks and emergency warning systems to deal with emergencies and natural disasters, 2011

- [p14: para 2.9]; Australian Communications and Media Authority, The 400 MHz plan, 2011 [p23].
- 
- 55 Environment and Communications References Committee, The capacity of communication networks and emergency warning systems to deal with emergencies and natural disasters, 2011 [p13: para 2.6].
- 
- 56 Environment and Communications References Committee, The capacity of communication networks and emergency warning systems to deal with emergencies and natural disasters, 2011 [p13: para 2.6].
- 
- 57 Exhibit 343, Statement of Glenn Walker, 18 April 2011 [p9: para 39]; Transcript, Grant Pitman, 12 May 2011, Brisbane [p1828: line 52]; Exhibit 493, Statement of Gary Taylor, 24 March 2011 [p2: para 6].
- 
- 58 Environment and Communications References Committee, The capacity of communication networks and emergency warning systems to deal with emergencies and natural disasters, 2011 [p19: para 2.26]; Statement of Grant Pitman, 15 November 2011 [p10].
- 
- 59 Statement of Grant Pitman, 15 November 2011 [p10].
- 
- 60 Environment and Communications References Committee, The capacity of communication networks and emergency warning systems to deal with emergencies and natural disasters, 2011 [p20-21: para 2.29-2.32].
- 
- 61 Australian Communications and Media Authority, The 900 MHz band – Exploring new opportunities, 2011 [p1].
- 
- 62 Attorney-General's Department, Steering Committee on national broadband capability for police and emergency services, 2011.
- 
- 63 Attorney-General's Department, Public Safety Mobile Broadband Steering Committee Terms of Reference, 2011.
- 
- 64 Environment and Communications References Committee, The capacity of communication networks and emergency warning systems to deal with emergencies and natural disasters, 2011 [p27: para 2.50-2.51].
- 
- 65 Statement of Grant Pitman, 15 November 2011 [p8].
- 
- 66 Transcript, Grant Pitman, 12 May 2011, Brisbane [p1833: line 42].
- 
- 67 Statement of Grant Pitman, 15 November 2011 [p8-9].
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- 68 Transcript, Glenn Walker, 11 May 2011, Brisbane [p1790: line 13].
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- 69 Exhibit 493, Statement of Gary Taylor, 24 March 2011 [p1: para 4]; Exhibit 347, Statement of Grant Pitman, 15 April 2011 [p10]; Exhibit 343, Statement of Glenn Walker, 18 April 2011 [p9: para 37].
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- 70 Exhibit 343, Statement of Glenn Walker, 18 April 2011 [p9: para 37]; Statement of Grant Pitman, 15 November 2011 [p5].
- 
- 71 Statement of Grant Pitman, 15 November 2011 [p5].
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- 72 Transcript, Darren Rumbelow, 9 May 2011, Brisbane [p1564: line 23]; Exhibit 317, Statement of Darren Rumbelow, 13 April 2011 [p3: para 12]; Exhibit 493, Statement of Gary Taylor, 24 March 2011 [p2: para 6]; Statement of Grant Pitman, 15 November 2011 [p7].
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- 73 Exhibit 343, Statement of Glenn Walker, 18 April 2011 [p9: para 40-41]; Transcript, Glenn Walker, 11 May 2011, Brisbane [p1791: line 1]; Statement of Grant Pitman, 15 November 2011 [p5-6].
- 
- 74 Exhibit 343, Statement of Glenn Walker, 18 April 2011 [p9: para 38].
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- 75 Exhibit 493, Statement of Gary Taylor, 24 March 2011 [p2: para 6]; Statement of Grant Pitman, 15 November 2011 [p7].
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- 76 Statement of Grant Pitman, 15 November 2011 [p5].
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- 77 Statement of Grant Pitman, 15 November 2011 [p9]; Transcript, Glenn Walker, 11 May 2011, Brisbane [p1790: line 47].
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- 78 Statement of Grant Pitman, 15 November 2011 [p9].
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- 79 Section 57, *Disaster Management Act 2003*.
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- 80 Section 59, *Disaster Management Act 2003*.
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- 81 Section 16A, *Disaster Management Act 2003*. This function is performed by Emergency Management Queensland under delegation from the chief executive of the Department of Community Safety.
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- 82 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p119].
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- 83 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, Recommendations 3.7 – 3.9 [p119].
- 84 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, Recommendation 3.10 [p119].
- 85 District disaster co-ordinators are senior officers of the Queensland Police Service.
- 86 Correspondence from Queensland Government, 30 December 2011, Review of Disaster Management Plans: Report to Queensland Floods Commission of Inquiry [p4].
- 87 Correspondence from Queensland Government, 26 October 2011, Attachment 1: Noting Brief, State Disaster Management Group, 13 September 2011 [p1]. The Commission's interim report (Recommendation 3.9) had previously recommended that Emergency Management Queensland should develop a standardised approach.
- 88 Correspondence from Queensland Government, 30 December 2011, Attachment B: Interim Review and Assessment Workbook (Version 2, October 2011) [p5].
- 89 Correspondence from Queensland Government, 30 December 2011, Review of Disaster Management Plans: Report to Queensland Floods Commission of Inquiry [p1-2; and Attachment A].
- 90 The local government areas were Hinchinbrook, Carpentaria, Doomadgee, Flinders, Moreton Bay, Toowoomba; Maranoa; Somerset; Scenic Rim; Ipswich; South Burnett; Sunshine Coast; Bundaberg; Mackay, Rockhampton, Isaac, Barcoo, Banana, Cassowary Coast, Cairns, Tablelands and Cook: Correspondence from Queensland Government, 30 December 2011, Review of Disaster Management Plans: Report to Queensland Floods Commission of Inquiry [p2-3].
- 91 Correspondence from Queensland Government, 30 December 2011, Review of Disaster Management Plans: Report to Queensland Floods Commission of Inquiry [p5].
- 92 Correspondence from Queensland Government, 30 December 2011, Review of Disaster Management Plans: Report to Queensland Floods Commission of Inquiry [p5].
- 93 Correspondence from Queensland Government, 30 December 2011, Review of Disaster Management Plans: Report to Queensland Floods Commission of Inquiry [p4].
- 94 Correspondence from Queensland Government, 30 December 2011, Review of Disaster Management Plans: Report to Queensland Floods Commission of Inquiry [p3].
- 95 Correspondence from Queensland Government, 30 December 2011, Review of Disaster Management Plans: Report to Queensland Floods Commission of Inquiry [p5].
- 96 Correspondence from Queensland Government, 30 December 2011, Attachment C, Memo from QPS Deputy Commissioner (Regional Operations) [p2].
- 97 The Commission notes that it is the intention of Emergency Management Queensland to consult with Queensland Police Service to develop an appropriate training package for district disaster co-ordinators: Correspondence from Queensland Government, 30 December 2011, Review of Disaster Management Plans: Report to Queensland Floods Commission of Inquiry [p4].
- 98 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p174].
- 99 Exhibit 333, Addendum statement of Mark Stephenson, 29 April 2011 [p2-4]; Transcript, Mark Stephenson, 10 May 2011, Brisbane [p1692: line 14].
- 100 Statement of Gordon Hemphrey, 28 November 2011 [p2-3].
- 101 Statement of Gordon Hemphrey, 28 November 2011 [p5]; Statement of John Gresty, 28 November 2011 [p11].
- 102 Statement of John Gresty, 28 November 2011 [p5].
- 103 Statement of John Gresty, 28 November 2011 [p6]; Statement of Gordon Hemphrey, 28 November 2011 [p5].
- 104 Exhibit 333, Addendum statement of Mark Stephenson, 29 April 2011 [p3-4]; Transcript, Mark Stephenson, 10 May 2011, Brisbane [p1692: line 14].
- 105 Statement of Philip Paff, 25 November 2011 [p2].
- 106 Statement of Scott Beasley, 9 June 2011 [p3].
- 107 The term 'appliance' as used to describe fire service equipment is described in the glossary.

- 108 Queensland Fire and Rescue Service Response to Interim Report, Attachment 1; Statement of Mark Stephenson, 3 March 2011 [p2-5]; Statement of Philip Paff, 25 November 2011 [p3-7]; Statement Nathan Chadwick, 25 November 2011 [p3-6].
- 109 Statement of Lee Johnson, 12 December 2011, Attachment LAJ-5.
- 110 Statement of Lee Johnson, 12 December 2011, Attachment LAJ-1.
- 111 Letter from Iain Mackenzie to Commission, 22 December 2011, Attachments 1A, 1B; Statement of Mark Meier, 10 March 2011 [p1].
- 112 Statement of Mark Meier, 10 March 2011 [p1-2].
- 113 Statement of Lee Johnson, 12 December 2011 [p5]; Attachments LAJ-7, LAJ-8.
- 114 Statement of Lee Johnson, 12 December 2011, Attachments LAJ-5, LAJ-6.
- 115 Statement of Lee Johnson, 12 December 2011, Attachment LAJ-9.
- 116 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p237].
- 117 Statement of Bradley Mills, 21 March 2011 [p6-7]; Statement of Andrew Neil, 21 March 2011 [p3].
- 118 Statement of Lee Johnson, 12 December 2011 [p6].
- 119 Statement of Mark Meier, 10 March 2011 [p3]; Statement of Lee Johnson, 12 December 2011, Attachment LAJ-1.
- 120 Statement of Nathan Chadwick, 25 November 2011 [p6].
- 121 Statement of Nathan Chadwick, 25 November 2011 [p6]; Statement of Philip Paff, 25 November 2011 [p8].
- 122 Statement of Nathan Chadwick, 25 November 2011 [p6]; Statement of Lee Johnson, 12 December 2011, Attachment LAJ-1.
- 123 Statement of Mark Meier, 10 March 2011 [p3-4]; Statement of Nathan Chadwick, 9 March 2011 [p3]; Statement of Nathan Chadwick, 25 November 2011 [p6]; Statement of Philip Paff, 25 November 2011 [p8-9]; Statement of Shane Bretz, 22 March 2011 [p1]; Statement of Russell von Nida, 22 March 2011 [p1].
- 124 Statement of Bradley Mills, 21 March 2011 [p7]; Statement of Andrew Neil, 21 March 2011 [p3].
- 125 Statement of Mark Meier, 10 March 2011 [p4]; Statement of Philip Paff, 25 November 2011 [p9]; Statement of Bradley Mills, 21 March 2011 [p7]; Statement of Andrew Neil, 21 March 2011 [p3]; Statement of Russell von Nida, 22 March 2011 [p1].
- 126 Statement of Thomas Dawson, 29 November 2011 [p2-3].
- 127 Queensland Fire and Rescue Service Response to Interim Report, 13 September 2011 [p7].
- 128 Statement of Thomas Dawson, 29 November 2011 [p4]; Queensland Fire and Rescue Service, 13 September 2011 [p8]; Attachments 3 and 4.
- 129 Exhibit 328, Statement of William Dundas, 6 May 2011 [p6]; Statement of Mark Haddow, 2 June 2011 [p1].
- 130 Statement of Thomas Dawson, 29 November 2011, Attachment 6B [p1].
- 131 Queensland Fire and Rescue Service Response to Interim Report, 13 September 2011 [p6].
- 132 Exhibit 328, Statement of William Dundas, 6 May 2011 [p6]; Statement of Mark Haddow, 2 June 2011 [p1].
- 133 Affidavit of Walter Rye, 25 November 2011 [p1].
- 134 Affidavit of Walter Rye, 25 November 2011 [p2].
- 135 Affidavit of Walter Rye, 25 November 2011 [p3].
- 136 Statement of Thomas Dawson, 29 November 2011 [p8].
- 137 Statement of Thomas Dawson, 29 November 2011 [p9-10], Attachment TCD-6A FireComm recording of communications, 10 January 2011.
- 138 Statement of Thomas Dawson, 29 November 2011 [p10].
- 139 Exhibit 328, Statement of William Dundas, 6 May 2011 [para 29].
- 140 Statement of Thomas Dawson, 29 November 2011 [p11]; Exhibit 210, Statement of David Crighton, 28 January 2011 [p1].
- 141 Queensland Fire and Rescue Service Response to Interim Report, 13 September 2011, Attachment 3.
- 142 Transcript of interview with William Dundas, 24 February 2011 [p3-5].
- 143 Transcript of interview with Mark Haddow, 24 February 2011 [p1-3].
- 144 Statement of John Gresty, 28 November 2011 [p3].

- 145 Exhibit 333, Addendum statement of Mark Stephenson, 29 April 2011 [p3-4].
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- 146 Statement of Thomas Dawson, 29 November 2011 [p6].
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- 147 Queensland Fire and Rescue Service Operations Doctrine Incident Action Guide 3.5 [para 3(c)].
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- 148 Transcript of interview with William Dundas, 24 February 2011 [p1].
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- 149 Statement of Mark Haddow, 2 June 2011 [p1].
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- 150 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p173]; Exhibit 328, Statement of William Dundas, 6 May 2011 [p11-12].
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- 151 Exhibit 328, Statement of William Dundas, 6 May 2011 [p11]; Transcript, William Dundas, 10 May 2011, Brisbane [p1637: line 50 – p1638: line 15].
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- 152 Statement of Thomas Dawson, 29 November 2011, Attachment TCD-6A, FireComm recording of communications, 10 January 2011.
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- 153 Statement of Thomas Dawson, 26 November 2011 [p11].
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- 154 Statement of Thomas Dawson, 29 November 2011, Attachment TCD-6A, FireComm recording of communications, 10 January 2011.
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- 155 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p169].
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- 156 Exhibit 348, Statement of Stephen Smith, 5 May 2011 [p7: para 36]; Transcript, Stephen Smith, 12 May 2011, Brisbane [p1854-1855].
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- 157 Letter, United Firefighters Union of Australia to Queensland Floods Commission of Inquiry, undated.
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- 158 Statement of Iain Mackenzie, 15 December 2011 [para 4, 13].
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- 159 Statement of Iain Mackenzie, 15 December 2011, Attachment ISM-8.
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- 160 Statement of Iain Mackenzie, 15 December 2011 [para 14].
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- 161 Statement of Iain Mackenzie, 15 December 2011 [para 7-11].
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- 162 Statement of Iain Mackenzie, 15 December 2011, Attachment ISM-9.
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- 163 Statement of Iain Mackenzie, 15 December 2011 [para 13-14].
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- 164 Statement of Iain Mackenzie, 15 December 2011, Attachment ISM-10.
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- 165 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p179-180].
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- 166 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p180].
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- 167 Emergency Management Queensland, ODI 2.0, *Hierarchy of Command and Control*, Section 4.1 [p1].
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- 168 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p180].
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- 169 *Disaster Management Act 2003*.
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- 170 Transcript of interview with Bruce Grady, 9 November 2011 [p8: line 36].
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- 171 Transcript of interview with Bruce Grady, 9 November 2011 [p8: line 44].
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- 172 Transcript of interview with Bruce Grady, 9 November 2011 [p8: line 36].
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- 173 Emergency Management Queensland, State Emergency Service, ODO 1.0, *Activation Guidelines*, Section 5.1 [p1]; Statement of Bruce Grady, 30 September 2011 [p12: para 75].
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- 174 Emergency Management Queensland, State Emergency Service, ODO 1.0, *Activation Guidelines*, Section 5.2 [p1]; Emergency Management Queensland, State Emergency Service, ODI 2.0, *Hierarchy of Command and Control*, Section 5 [p2].
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- 175 Emergency Management Queensland, State Emergency Service, ODI 2.0, *Hierarchy of Command and Control*, Section 5 [p2].
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- 176 Statement of Christopher Artiemiew, 17 October 2011 [p8: para 52-53]; Statement of Robert Bundy, 14 October 2011 [p7: para 32]; Statement of David Hatton, 19 October 2011 [p5: para 28]; Statement of Edward Bennet, 19 October 2011 [p8-9: para 33, 35 and 37]; Statement of Andrew Wyatt, 19 October 2011 [p10: para 51-52]; Statement of David Mazzaferrri, 19 October 2011 [p5: para 27]; Statement of Robert Medlin, 19 October 2011 [p8: para 48]; Statement of Patrick Downing, 11 October 2011 [p8: para 38]; Statement of Michael Shapland, 14 October 2011 [p5-6: para 5e; p11: para 13a]; Statement of Carl Peterson, 13 October 2011 [p7: para 13c].
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- 177 Statement of Bruce Grady, 30 September 2011 [p3: para 13].
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- 178 Transcript, Robert Bundy, 29 April 2011, Toowoomba [p1023: line 21].
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- 179 Statement of David Hatton, 19 October 2011 [p5: para 28]; Statement of Robert Bundy, 14 October 2011 [p7: para 32]; Statement of David Mazzaferrri, 19 October 2011 [p5: para 27]; Transcript, Robert Bundy, 29 April 2011, Toowoomba [p1023: line 21]; Gold Coast City Council SES Local Controller response to questionnaire, Gold Coast [p13].
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- 180 Emergency Management Queensland, State Emergency Service, ODO 1.0, *Activation Guidelines*, Section 5.1 [p1].
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- 181 Emergency Management Queensland, State Emergency Service, ODI 2.0, *Hierarchy of Command and Control*, Section 4.3 [p2]. The executive director of Emergency Management Queensland is now known as the Assistant Director-General for Emergency Management Queensland. This authority arises under delegation made by the chief executive (or Director-General) of the Department of Community Safety (formerly the Department of Emergency Services).
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- 182 Emergency Management Queensland, State Emergency Service, ODI 2.0, *Hierarchy of Command and Control*, Section 5.1 [p2-3]. Furthermore, the executive director may appoint any Emergency Management Queensland officer (or SES member) to assume control of an incident in any part of Queensland for which the Executive Director is responsible: ODI 2.0, *Hierarchy of Command and Control*, Section 5.2 [p4].
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- 183 Transcript of interview with Bruce Grady, 9 November 2011 [p39: line 37].
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- 184 Transcript of interview with Bruce Grady, 9 November 2011 [p39].
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- 185 Section 16A, *Disaster Management Act 2003*.
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- 186 Jim O'Sullivan AC, APM and the Consultancy Bureau Pty Ltd, 2009, *Report on a Review of Disaster Management Legislation and Policy in Queensland* [p113].
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- 187 Jim O'Sullivan AC, APM and the Consultancy Bureau Pty Ltd, 2009, *Report on a Review of Disaster Management Legislation and Policy in Queensland* [p113, 115].
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- 188 Jim O'Sullivan AC, APM and the Consultancy Bureau Pty Ltd, 2009, *Report on a Review of*
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- Disaster Management Legislation and Policy in Queensland [p115].
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- 189 Emergency Management Queensland, State Emergency Service, ODI 2.0, *Hierarchy of Command and Control*, Section 5 [p2-3].
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- 190 SES operational directives, taken together, comprise the SES doctrine.
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- 191 Statement of Bruce Grady, 30 September 2011 [p15: para 97, 99].
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- 192 Statement of Bruce Grady, 30 September 2011 [p15: para 89-90].
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- 193 Statement of Bruce Grady, 30 September 2011 [p14: para 89-90].
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- 194 Statement of Bruce Grady, 30 September 2011 [p15: para 100].
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- 195 Transcript, Christopher Artiemiew, 20 April 2011, Toowoomba [p776: line 21]; Statement of Christopher Artiemiew, 7 April 2011 [p4: para 10-11].
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- 196 Statement of Andrew Wyatt, 19 October 2011 [p6: para 27].
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- 197 Statement of Mark Kelly, 12 October 2011 [p3: para 8].
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- 198 Statement of Scott Walsh, 17 October 2011 [p4: para 7.3].
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- 199 Statement of Michael Shapland, 14 October 2011 [p5: para 4(d)].
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- 200 Statement of Michael Shapland, 14 October 2011 [p5: para 4(d)].
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- 201 Statement of Robert Medlin, 19 October 2011 [p8: para 48].
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- 202 Statement of Robert Medlin, 19 October 2011 [p8: para 48].
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- 203 Statement of David Hatton, 19 October 2011 [p5: para 28]; Statement of Robert Bundy, 14 October 2011 [p7: para 32]; Statement of David Mazzaferrri, 19 October 2011 [p5: para 28]; Statement of Deryck Taylor, 17 October 2011 [p3: para 7]; Statement of Andrew Wyatt, 19 October 2011 [p10: para 51]; Toowoomba Regional Council SES Local Controller response to questionnaire, Cambooya [p10]; Moreton Bay Regional Council SES Local Controller response to questionnaire, Caboolture [p9]; Mackay Regional Council SES Local Controller response to questionnaire, Mackay [p10]; Statement of Christopher Artiemiew, 17 October 2011 [p8: para 48].

- para 52]; Statement of Carl Peterson, 13 October 2011 [p7: para 13c].
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- 204 Transcript, Robert Bundy, 29 April 2011, Toowoomba [p1023: line 6].
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- 205 Southern Downs Regional Council SES Local Controller response to questionnaire, Warwick [p3].
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- 206 Bundaberg SES Local Controller response to questionnaire, Isis [p3]; Barcaldine Regional Council SES Local Controller response to questionnaire, Barcaldine [p9].
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- 207 Bundaberg Regional Council SES Local Controller response to questionnaire, Bundaberg [p4]; Fraser Coast Regional Council SES Local Controller response to questionnaire, Hervey Bay [p7].
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- 208 Gympie Regional Council SES Local Controller response to questionnaire, Cooloola [p7]; Rockhampton Regional Council SES Local Controller response to questionnaire, Rockhampton [p6]; Western Downs Regional Council SES Local Controller response to questionnaire, Taroom [p3].
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- 209 Western Downs Regional Council SES Local Controller response to questionnaire, Chinchilla [p7].
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- 210 Western Downs Regional Council SES Local Controller response to questionnaire, Tara [p7].
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- 211 South Burnett Regional Council SES Local Controller response to questionnaire, Nanango [p6]; Moreton Bay Regional Council SES Local Controller response to questionnaire, Caboolture [p4]; Sunshine Coast Regional Council SES Local Controller response to questionnaire, Noosa [p6].
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- 212 Statement of Bruce Grady, 30 September 2011 [p13: para 84].
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- 213 Emergency Management Queensland has seven regions within Queensland: Brisbane, Central, Far Northern, North Coast, Northern, South Eastern and South Western.
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- 214 Operational Directive 8.1 is in 'draft' form but remains in current use.
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- 215 Emergency Management Queensland, State Emergency Service, ODI 8.1, *Inter-Region Deployment*, Section 5.1 [p2].
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- 216 Emergency Management Queensland, State Emergency Service, ODI 8.1, *Inter-Region Deployment*, Section 5.2.2.2 [p4].
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- 217 Emergency Management Queensland, State Emergency Service, ODI 8.1, *Inter-Region Deployment*, Section 4.1 [p1-2].
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- 218 Emergency Management Queensland, State Emergency Service, ODI 8.1, *Inter-Region Deployment*, Section 5.2.1 [p3].
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- 219 Statement of Bruce Grady, 30 September 2011 [p13: para 87].
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- 220 Emergency Management Queensland, State Emergency Service, ODI 8.1, *Inter-Region Deployment*, Section 5.3 [p5].
- 
- 221 Emergency Management Queensland, State Emergency Service, ODI 8.1, *Inter-Region Deployment*, Section 5.4 [p5]. 'Span of control' refers to the number of teams, individuals and resources that can be effectively managed by one person.
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- 222 Jim O'Sullivan AC, APM and the Consultancy Bureau Pty Ltd, 2009, *Report on a Review of Disaster Management Legislation and Policy in Queensland* [p115].
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- 223 Statement of Bruce Grady, 30 September 2011 [p17: para 107].
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- 224 Jim O'Sullivan AC, APM and the Consultancy Bureau Pty Ltd, 2009, *Report on a Review of Disaster Management Legislation and Policy in Queensland* [p124].
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- 225 Jim O'Sullivan AC, APM and the Consultancy Bureau Pty Ltd, 2009, *Report on a Review of Disaster Management Legislation and Policy in Queensland* [p122-123].
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- 226 Section 88A, *Disaster Management Act 2003*.
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- 227 Transcript of interview with Bruce Grady, 9 November 2011 [p56: line 55].
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- 228 Transcript of interview with Bruce Grady, 9 November 2011 [p57: line 13].
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- 229 Attachment BTG-02 to statement of Bruce Grady, 30 September 2011, Draft Memorandum of Agreement, Section 4 [p5].
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- 230 Attachment BTG-02 to statement of Bruce Grady, 30 September 2011, Draft Memorandum of Agreement, Section 5.1 [p10].
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- 231 Attachment BTG-02 to statement of Bruce Grady, 30 September 2011, Draft Memorandum of Agreement, Section 5.2 [p10-11].
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- 232 Attachment BTG-02 to statement of Bruce Grady, 30 September 2011, Draft Memorandum of Agreement, Section 6 [p12].
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- 233 The draft Memorandum of Agreement merely says that Emergency Management Queensland will 'provide assistance to Local Controllers to manage SES responses when the volume of taskings exceeds the local capacity for events': Section 5.1 [p6].
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- 234 Jim O'Sullivan AC, APM and the Consultancy Bureau Pty Ltd, 2009, *Report on a Review of Disaster Management Legislation and Policy in Queensland* [p119]; Transcript, Anthony Trace, 20 May 2011, Ipswich [p2380: line 31].
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- 235 Gympie Regional Council SES Local Controller response to questionnaire, Cooloola [p7]; Rockhampton Regional Council SES Local Controller response to questionnaire, Rockhampton [p6]; Western Downs Regional Council SES Local Controller response to questionnaire, Chinchilla [p7]; Western Downs Regional Council SES Local Controller response to questionnaire, Tara [p7]; Western Downs Regional Council SES Local Controller response to questionnaire, Taroom [p3].
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- 236 Statement of Bruce Grady, 30 September 2011 [p12-13: para 79-83] and Annexure BG-9; Transcript, Bruce Grady, 26 May 2011, Brisbane [p2669: line 31].
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- 237 Attachment BTG-02 to statement of Bruce Grady, 30 September 2011, Draft Memorandum of Agreement, Section 5.2 [p10].
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- 238 Emergency Management Queensland, State Emergency Service, ODI 8.1 *Inter-Region Deployment*, Section 5.1 [p2] and Annexure E; Transcript of interview with Bruce Grady, 9 November 2011, [p55: line 32].
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- 239 Jim O'Sullivan AC, APM and the Consultancy Bureau Pty Ltd, 2009, *Report on a Review of Disaster Management Legislation and Policy in Queensland* [p124].
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- 240 Attachment BTG-02 to statement of Bruce Grady, 30 September 2011, Draft Memorandum of Agreement, Section 5.2 [p10].
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- 241 Emergency Management Queensland, State Emergency Service, ODO 1.0, *Activation Guidelines*, Section 5.1 [p1].
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- 242 Emergency Management Queensland, State Emergency Service, ODI 4.0, *Incident Control Function*, Section 5.1 [p1]; Statement of Bruce Grady, 30 September 2011 [p12: para 77].
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- 243 Transcript of interview with Bruce Grady, 9 November 2011 [p44: line 40].
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- 244 Transcript of interview with Bruce Grady, 9 November 2011 [p44: line 31].
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- 245 Transcript of interview with Bruce Grady, 9 November 2011 [p45: line 36].
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- 246 Transcript of interview with Bruce Grady, 9 November 2011 [p44].
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- 247 Statement of Bruce Grady, 30 September 2011 [p12-13: para 79-83] and Annexure BTG-9.
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- 248 Emergency Management Queensland, State Emergency Service, ODI 4.0, *Incident Control Function*, Section 5.3 [p2].
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- 249 Emergency Management Queensland, State Emergency Service, ODI 4.0, *Incident Control Function*, Section 5.3 [p2].
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- 250 Emergency Management Queensland, State Emergency Service, ODI 4.0, *Incident Control Function*, Section 5.1 [p1].
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- 251 Emergency Management Queensland, State Emergency Service, ODI 4.0, *Incident Control Function*, Section 5.2 [p2].
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- 252 Transcript of interview with Bruce Grady, 9 November 2011 [p53: line 14].
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- 253 Response to requirement of State of Queensland, 21 September 2011 [p7-8]; Southern Downs Regional Council SES Local Controller response to questionnaire, Warwick [p1]; Southern Downs Regional Council SES Local Controller response to questionnaire, Stanthorpe [p3]; Bundaberg Regional Council SES Local Controller response to questionnaire, Isis [p1]; Bundaberg Regional Council SES Local Controller response to questionnaire, Bundaberg [p1-2]; Sunshine Coast Regional Council SES Local Controller response to questionnaire, Maroochy [p3]; Sunshine Coast Regional Council SES Local Controller response to questionnaire, Noosa [p3]; North Burnett Regional SES Local Controller response to questionnaire, Monto [p3]; North Burnett Regional SES Local Controller response to questionnaire, Mundubbera [p3]; North Burnett Regional SES Local Controller response to questionnaire, Perry [p3]; Western Downs Regional Council SES Local Controller response to questionnaire, Tara [p3]; Western Downs Regional Council SES Local Controller response

to questionnaire, Chinchilla [p3]; Fraser Coast Regional Council SES Local Controller response to questionnaire, Maryborough [p3]; Fraser Coast Regional Council SES Local Controller response to questionnaire, Hervey Bay [p3]; Barcaldine Regional Council SES Local Controller response to questionnaire, Aramac [p1]; Barcaldine Regional Council SES Local Controller response to questionnaire, Barcaldine [p3]; Maranoa Regional council SES Local Controller response to questionnaire, Booringa [p2]; Maranoa Regional Council SES Local Controller response to questionnaire, Roma [p3]; South Burnett Regional Council SES Local Controller response to questionnaire, Nanango [p6]; Goondiwindi Regional Council SES Local Controller response to questionnaire, Goondiwindi [p3]; Goondiwindi Regional Council SES Local Controller response to questionnaire, Inglewood [p1].

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- 254 Statement of Peter Twomey, 17 October 2011 [p4: para 19-20].
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- 255 Southern Downs Regional Council SES Local Controller response to questionnaire, Warwick [p1]; Southern Downs Regional Council SES Local Controller response to questionnaire, Stanthorpe [p3]; Bundaberg Regional Council SES Local Controller response to questionnaire, Isis [p1]; Bundaberg Regional Council SES Local Controller response to questionnaire, Bundaberg [p1-2]; Sunshine Coast Regional Council SES Local Controller response to questionnaire, Noosa [p3]; North Burnett Shire Council SES Local Controller response to questionnaire, Mundubbera [p3]; Western Downs Regional Council SES Local Controller response to questionnaire, Tara [p3]; Western Downs Regional Council SES Local Controller response to questionnaire, Taroom [p1]; Western Downs Regional Council SES Local Controller response to questionnaire, Chinchilla [p3]; Fraser Coast Regional Council SES Local Controller response to questionnaire, Maryborough [p3]; Fraser Coast Regional Council SES Local Controller response to questionnaire, Hervey Bay [p3]; Barcaldine Regional Council SES Local Controller response to questionnaire, Aramac [p1]; Barcaldine Regional Council SES Local Controller response to questionnaire, Barcaldine [p3]; Maranoa Regional Council SES Local Controller response to questionnaire, Booringa [p2]; Maranoa Regional Council SES Local Controller response to questionnaire,

Roma [p3]; South Burnett Regional Council SES Local Controller response to questionnaire, Nanango [p6]; Goondiwindi Regional Council SES Local Controller response to questionnaire, Goondiwindi [p3]; Goondiwindi Regional Council SES Local Controller response to questionnaire, Inglewood [p1].

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- 256 Southern Downs SES Local Controller response to questionnaire, Warwick [p1]; Southern Downs Regional Council SES Local Controller response to questionnaire, Stanthorpe [p3]; Bundaberg Regional Council SES Local Controller response to questionnaire, Isis [p1]; Western Downs Regional Council SES Local Controller response to questionnaire, Tara [p3]; Western Downs Regional Council SES Local Controller response to questionnaire, Taroom [p1]; Western Downs Regional Council SES Local Controller response to questionnaire, Chinchilla [p3]; Maranoa Regional Council SES Local Controller response to questionnaire, Booringa [p2]; South Burnett Regional Council SES Local Controller response to questionnaire, Nanango [p2]; Goondiwindi Regional Council SES Local Controller response to questionnaire, Inglewood [p1].
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- 257 Bundaberg Regional Council SES Local Controller response to questionnaire, Isis [p1]; Barcaldine Regional Council SES Local Controller response to questionnaire, Aramac [p1]; Maranoa Regional Council SES Local Controller response to questionnaire, Booringa [p2].
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- 258 Toowoomba Regional Council SES Local Controller response to questionnaire, Cambooya [p2].
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- 259 Statement of Jennifer Millers, 17 October 2011 [p9: para 59].
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- 260 Statement of Anthony Lee, 13 October 2011 [p5: para 22].
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- 261 Transcript of interview with Bruce Grady, 9 November 2011 [p6: line 19]; Transcript, William Wilkinson, 25 May 2011, Emerald [p2617: line 53].
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- 262 Transcript of interview with Bruce Grady, 9 November 2011 [p7: line 8].
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- 263 Transcript of interview with Bruce Grady, 9 November 2011 [p6: line 22].
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- 264 Statement of Bruce Grady, 30 September 2011 [p5-8: para 30-57].
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- 265 Exhibit 494, Statement of Bruce Grady, 23 March 2011 [p2: para 5; p3: para 14; Annexure BG-4]; Statement of Bruce Grady, 30 September 2011 [p5: para 28; p9: para 58; Annexure BTG-8]; Transcript, Bruce Grady, 26 May 2011, Brisbane [p2663: line 11].
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- 266 Statement of Bruce Grady, 30 September 2011 [p5: para 31].
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- 267 Statement of Bruce Grady, 30 September 2011 [p5: para 33]. All amounts quoted are exclusive of GST.
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- 268 Statement of Bruce Grady, 30 September 2011 [p5: para 34-35].
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- 269 Statement of Bruce Grady, 30 September 2011 [p5: para 36]; Annexure BTG-5.
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- 270 Transcript of interview with Bruce Grady, 9 November 2011 [p70: line 7].
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- 271 Transcript of interview with Bruce Grady, 9 November 2011 [p68: line 10-p70: line 17].
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- 272 Transcript of interview with Bruce Grady, 9 November 2011 [p68-70].
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- 273 Statement of Bruce Grady, 30 September 2011 [p6: para 44; p9: para 57].
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- 274 Department of Community Safety, SES Non-Recurrent Subsidy Funding Guidelines [p1].
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- 275 Statement of Bruce Grady, 30 September 2011 [p7: para 45]; Department of Community Safety, SES Non-Recurrent Subsidy Funding Guidelines [p6].
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- 276 Statement of Bruce Grady, 30 September 2011 [p7: para 46]; Department of Community Safety, SES Non-Recurrent Subsidy Funding Guidelines [p7].
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- 277 Statement of Bruce Grady, 30 September 2011 [p7: para 47]; Department of Community Safety, SES Non-Recurrent Subsidy Funding Guidelines [p8].
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- 278 Statement of Bruce Grady, 30 September 2011 [p7: para 49].
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- 279 Transcript of interview with Bruce Grady, 9 November 2011 [p65: line 45].
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- 280 Statement of Bruce Grady, 30 September 2011 [p8: para 50-51].
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- 281 Transcript of interview with Bruce Grady, 9 November 2011 [p66: line 34].
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- 282 Section 80(1)(a), *Disaster Management Act 2003*.
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- 283 Transcript, Robert Bundy, 28 April 2011, Toowoomba [p1004: line 50].
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- 284 Response to requirement of Gladstone Regional Council, 1 September 2011 [p2]; Response to requirement of Murweh Shire Council, 24 August 2011 [p1]; Response to requirement of Western Downs Regional Council, 22 August 2011 [p3]; Response to requirement of Goondiwindi Regional Council, 12 September 2011 [p1-2]; Response to requirement of Lockyer Valley Regional Council, 20 September 2011 [p8-10]; Response to requirement of Moreton Bay Regional Council, 9 September 2011 [p1, 2-3]; Response to requirement of Rockhampton Regional Council, 20 September 2011 [p1]; Response to requirement of Fraser Coast Regional Council, 21 September 2011 [p1-2]; Attachment LMD-2; Response to requirement of Maranoa Regional Council, 21 September 2011 [p2-3]; Response to requirement of Bundaberg Regional Council, 22 September 2011 [p1]; Appendix 2; Response to requirement of Brisbane City Council, 23 September 2011 [p2-3]; Response to requirement of North Burnett Regional Council, 19 September 2011 [p1, 4-5]; Response to requirement of Balonne Shire Council, 22 September 2011 [p1]; Response to requirement of Central Highlands Regional Council, 22 September 2011 [p1, 2-3]; Response to requirement of Ipswich City Council, 14 October 2011 [p-2]; Response to requirement of Gympie Regional Council, 11 October 2011 [p2-3]; Response to requirement of Mackay Regional Council, 23 September 2011 [p3-4]; Response to requirement of Somerset Regional Council, 9 September 2011 [p1-4]; Response to requirement of Woorabinda Aboriginal Shire, 23 August 2011 [p1]; Response to requirement of Banana Shire Council, 14 September 2011 [p1]; Response to requirement of Gold Coast City Council, 24 August 2011 [p2]; Annexure 1; Response to requirement of Toowoomba Regional Council, 28 September 2011 [p2-3]; Response to requirement of Carpentaria Shire Council, 14 October 2011 [p2]; Response to requirement of Burke Shire Council, 18 October 2011 [p1-2].
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- 285 Transcript of interview with Bruce Grady, 9 November 2011 [p76: line 29]; Transcript, Bruce Grady, 26 May 2011, Brisbane [p2663: line 10].
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- 286 Statement of Bruce Grady, 30 September 2011 [p8: para 53(iii)].
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- 287 Bundaberg Regional Council SES Local Controller response to questionnaire, Isis [p5]; Bundaberg Regional Council SES Local Controller response to questionnaire, Bundaberg [p6]; Sunshine Coast Regional Council SES Local Controller response to questionnaire, Maroochy [p12]; Brisbane City Council SES Local Controller response to questionnaire, Brisbane [p9]; Scenic Rim Regional Council SES Local Controller response to questionnaire, Beaudesert [p4]; Central Highlands Regional Council SES Local Controller response to questionnaire, Bauhinia [p12]; Lockyer Valley Regional Council SES Local Controller response to questionnaire, Gatton [p12].
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- 288 Sunshine Coast Regional Council SES Local Controller response to questionnaire, Maroochy [p12]; Gold Coast City Council SES Local Controller response to questionnaire, Gold Coast [p11]; Brisbane City Council SES Local Controller response to questionnaire, Brisbane [p9].
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- 289 Gympie Regional Council SES Local Controller response to questionnaire, Cooloola [p12].
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- 290 Somerset Regional Council SES Local Controller response to questionnaire, Esk [p9].
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- 291 Bundaberg Regional Council SES Local Controller response to questionnaire, Isis [p5]; Sunshine Coast Regional Council SES Local Controller response to questionnaire, Maroochy [p12]; North Burnett Regional Council SES Local Controller response to questionnaire, Monto [p12]; North Burnett Regional Council SES Local Controller response to questionnaire, Eidsvold [p12]; Gympie Regional Council SES Local Controller response to questionnaire, Cooloola [p12]; Fraser Coast Regional Council SES Local Controller response to questionnaire, Maryborough [p12]; Fraser Coast Regional Council SES Local Controller response to questionnaire, Hervey Bay [p12]; Rockhampton Regional Council SES Local Controller response to questionnaire, Rockhampton [p9]; Mackay Regional Council SES Local Controller response to questionnaire, Mackay [p9]; South Burnett Regional Council SES Local Controller response to questionnaire, Nanango [p23]; Gladstone Regional Council SES Local Controller response to questionnaire, Calliope [p12]; Gold Coast City Council SES Local Controller response to questionnaire, Gold Coast [p10]; Ipswich City Council SES Local Controller response to questionnaire, Ipswich [p8]; Somerset Regional Council SES Local Controller response to questionnaire, Esk [p10]; Goondiwindi Regional Council SES Local Controller response to questionnaire, Goondiwindi [p12]; Goondiwindi Regional Council SES Local Controller response to questionnaire, Inglewood [p4]; Lockyer Valley Regional Council SES Local Controller response to questionnaire, Gatton [p12].
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- 292 Sunshine Coast Regional Council SES Local Controller response to questionnaire, Maroochy [p12]; Fraser Coast Regional Council SES Local Controller response to questionnaire, Maryborough [p12]; Mackay Regional Council SES Local Controller response to questionnaire, Mackay [p9]; Maranoa Regional Council SES Local Controller response to questionnaire, Booringa [p11]; Scenic Rim Regional Council SES Local Controller response to questionnaire, Beaudesert [p4]; Gold Coast City Council SES Local Controller response to questionnaire, Gold Coast [p11]; Goondiwindi Regional Council SES Local Controller response to questionnaire, Goondiwindi [p12]; Murweh Shire Council SES Local Controller response to questionnaire, Murweh [p9]; South Burnett Regional Council SES Local Controller response to questionnaire, Nanango [p23].
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- 293 Sunshine Coast Regional Council SES Local Controller response to questionnaire, Noosa [p10].
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- 294 Fraser Coast Regional Council SES Local Controller response to questionnaire, Hervey Bay [p12].
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- 295 Rockhampton Regional Council SES Local Controller response to questionnaire, Rockhampton [p10].
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- 296 Statement of Andrew Wyatt, 19 October 2011 [p8: para 41].
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- 297 Statement of Peter Twomey, 17 October 2011 [p6: para 35].
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- 298 Transcript of interview with Bruce Grady, 9 November 2011 [p57].
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- 299 Submission of Local Government Association of Queensland, 4 November 2011 [p3].
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- 300 Statement of Bruce Grady, 30 September 2011, Annexure BTG-2: Memorandum of Agreement – Local Arrangements [p5].
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- 301 Department of Community Safety, SES Non-Recurrent Subsidy Funding Guidelines [p7]; Statement of Bruce Grady, 30 September 2011,

- Annexure BTG-2: Memorandum of Agreement – Local Arrangements [p6].
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- 302 Transcript of interview with Bruce Grady, 9 November 2011 [p11-12].
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- 303 Transcript of interview with Bruce Grady, 9 November 2011 [p15].
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- 304 Statement of Anthony Lee, 13 October 2011 [p8: para 36]; Statement of Patrick Downing, 11 October 2011 [p4: para 17].
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- 305 Transcript of interview with Bruce Grady, 9 November 2011 [p16-17].
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- 306 Southern Downs Regional Council Local Controller response to questionnaire, Warwick [p6]; Barcaldine Regional Council Local Controller response to questionnaire, Barcaldine [p17]; Bundaberg Regional Council Local Controller response to questionnaire, Isis [p5].
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- 307 Ipswich City Council Local Controller response to questionnaire, Ipswich [p8]; Barcaldine Regional Council Local Controller response to questionnaire, Barcaldine [p17].
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- 308 EMQ School of Emergency Management, Recognition of Prior Learning – Applicant Guide.
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- 309 Transcript of interview with Bruce Grady, 9 November 2011 [p25].
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- 310 Transcript of interview with Bruce Grady, 9 November 2011 [p24, 26].
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- 311 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p239].
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- 312 Submission of Lisa Spierling, Elizabeth Fraser and M. Warburton, undated.
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- 313 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p236].
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- 314 Statement of Gary Dorr, 8 July 2011.
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- 315 Statement of Kathleen Dawn Carrillo, 2 December 2011; Statement of Annette Flower Fifoot, 2 December 2011; Statement of Shane William Engel, 2 December 2011; Statement of Gary Dorr, 2 December 2011, Annexure GJD-3.
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- 316 Statement of Kathleen Dawn Carrillo, 2 December 2011 [p3].
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- 317 Statement of Annette Flower Fifoot, 2 December 2011, Annexure AFF-1 [p1].
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- 318 Statement of Kathleen Dawn Carrillo, 2 December 2011 [p3].
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- 319 Statement of Kathleen Dawn Carrillo, 2 December 2011, Annexure KDC-2 [p3].
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- 320 Statement of Shane William Engel, 2 December 2011 [p3]; Statement of Annette Flower Fifoot, 2 December 2011 [p2].
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- 321 Statement of Kathleen Dawn Carrillo, 2 December 2011 [p3]; Statement of Annette Flower Fifoot, 2 December 2011 [p2]; Statement of Shane William Engel, 2 December 2011 [p3].
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- 322 Statement of Kathleen Dawn Carrillo, 2 December 2011 [p1]; Statement of Shane William Engel, 2 December 2011 [p1-2]; Statement of Gary Dorr, 6 July 2011 [p4]; Statement of Gary Dorr, 2 December 2011, Annexure GJD-3.
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- 323 Statement of Kathleen Dawn Carrillo, 2 December 2011 [p5]; Statement of Annette Flower Fifoot, 2 December 2011 [p2]; Statement of Shane William Engel, 2 December 2011 [p3-4]; Statement of Gary Dorr 2 December 2011, Annexure GJD-3.
- 
- 324 Transcript, Phillip Jordan, 22 September 2011, Brisbane [p3047: line 25]; Exhibit 600, Dr Phillip Jordan, SKM, *Provision of Hydrological Advice to Queensland Floods Commission of Inquiry: Assessment of Impact of Quarrying Operations on Flash Flooding in Grantham on 10 January 2011*, 16 September 2011 [p26].
- 
- 325 Transcript, Phillip Jordan, 22 September 2011, Brisbane [p3046: line 11]; Exhibit 600, Dr Phillip Jordan, SKM, *Provision of Hydrological Advice to Queensland Floods Commission of Inquiry: Assessment of Impact of Quarrying Operations on Flash Flooding in Grantham on 10 January 2011*, 16 September 2011 [p6].
- 
- 326 Exhibit 67, Dr Phillip Jordan, SKM, *Hydrological advice to Queensland Floods Commission of Inquiry*, 12 April 2011 [p27-28]; Transcript, Philip Jordan, 18 April 2011, Toowoomba [p504: line 1].
- 
- 327 Transcript, Phillip Jordan, 22 September 2011, Brisbane [p3045: line 58]; Exhibit 600, Dr Phillip Jordan, SKM, *Provision of Hydrological Advice to Queensland Floods Commission of Inquiry: Assessment of Impact of Quarrying Operations on Flash Flooding in Grantham on 10 January 2011*, 16 September 2011 [p5].
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- 328 Transcript, Phillip Jordan, 22 September 2011, Brisbane [p3046: line 11]; Exhibit 600, Dr Phillip Jordan, SKM, *Provision of Hydrological Advice to Queensland Floods Commission of Inquiry*:

- Assessment of Impact of Quarrying Operations on Flash Flooding in Grantham on 10 January 2011*, 16 September 2011 [p5-6].
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- 329 Exhibit 600, Dr Phillip Jordan, SKM, *Provision of Hydrological Advice to Queensland Floods Commission of Inquiry: Assessment of Impact of Quarrying Operations on Flash Flooding in Grantham on 10 January 2011*, 16 September 2011 [p5].
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- 330 Exhibit 600, Dr Phillip Jordan, SKM, *Provision of Hydrological Advice to Queensland Floods Commission of Inquiry: Assessment of Impact of Quarrying Operations on Flash Flooding in Grantham on 10 January 2011*, 16 September 2011 [p14-15].
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- 331 Transcript, Phillip Jordan, 22 September 2011, Brisbane [p3049: line 45]; Exhibit 600, Dr Phillip Jordan, SKM, *Provision of Hydrological Advice to Queensland Floods Commission of Inquiry: Assessment of Impact of Quarrying Operations on Flash Flooding in Grantham on 10 January 2011*, 16 September 2011 [p36].
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- 332 Transcript, Phillip Jordan, 22 September 2011, Brisbane [p3051: line 50]; Exhibit 600, Dr Phillip Jordan, SKM, *Provision of Hydrological Advice to Queensland Floods Commission of Inquiry: Assessment of Impact of Quarrying Operations on Flash Flooding in Grantham on 10 January 2011*, 16 September 2011 [p36].
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- 333 Exhibit 600, Dr Phillip Jordan, SKM, *Provision of Hydrological Advice to Queensland Floods Commission of Inquiry: Assessment of Impact of Quarrying Operations on Flash Flooding in Grantham on 10 January 2011*, 16 September 2011 [p32].
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- 334 Exhibit 600, Dr Phillip Jordan, SKM, *Provision of Hydrological Advice to Queensland Floods Commission of Inquiry: Assessment of Impact of Quarrying Operations on Flash Flooding in Grantham on 10 January 2011*, 16 September 2011 [p37].
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# 16

## 16 Operation of Wivenhoe and Somerset dams

Prior to January 2011, it is unlikely that many in south-east Queensland had a clear understanding of the capabilities of Wivenhoe Dam. The January 2011 flood was the first large flood to test the dam since it was built in 1984. Images of Wivenhoe Dam during the flood, such as that depicted below, will long remain etched in the memories of Queenslanders.



*Wivenhoe Dam, January 2011 (Dean Saffron, Fairfax Syndication)*

The Commission considered the operation of Wivenhoe, Somerset and North Pine dams in chapter 2 of its interim report. Those three are the only dams in Queensland specifically charged with mitigating floods.

The focus of the Commission in its investigation of the operation of dams for the interim report was on issues that could be resolved before the start of the 2011/2012 wet season as well as those matters of such importance



that they should be commenced, even if they could not be completed, before the next wet season. For example, a principal recommendation for the 2011/2012 wet season was that, should the Bureau of Meteorology predict a wet season of greater or equal severity, the level of Wivenhoe Dam should be lowered to 75 per cent of its full supply level for the duration of the wet season. The Commission also recommended an interim review of the flood mitigation manual by the beginning of the 2011/2012 wet season to resolve uncertainty about the operational procedures contained in it and the basis on which flood engineers should make decisions under the manual.

In January 2012 questions emerged about the evidence that had been given on the operation of Wivenhoe and Somerset dams in January 2011, on which the Commission had based its findings. In particular, questions were asked about whether the operational strategies set out in the flood mitigation manual for Wivenhoe and Somerset dams had been engaged at the correct times. In order to resolve these questions the Commission held an additional 10 days of hearings in February 2012. The Commission's findings arising from these hearings are set out in this chapter.

The interim report also left open two matters relating to dams: the consequences for flooding in Brisbane of the operation of Wivenhoe and Somerset dams in January 2011 and the longer term review of the flood mitigation manuals relevant to Wivenhoe, Somerset and North Pine dams. The Commission obtained modelling in respect of the first question and further evidence was received as part of the additional hearings. The results are dealt with in this chapter. A different aspect of the topic, the effect of dam releases on the riverbanks upstream and downstream of the dams, is dealt with in chapter 17. The longer term review of the flood mitigation manuals and a number of other issues concerning the operation and effect of dams around Queensland are also dealt with in chapter 17.

Before continuing, it should be noted that the Commission was required by its terms of reference to examine the 'implementation of the systems operation plans for dams across the state and in particular the Wivenhoe and Somerset release strategy and [make] an assessment of compliance with, and the suitability of, the operational procedures relating to flood mitigation and dam safety'.<sup>1</sup>

These terms did not allow a consideration of all aspects of dams in Queensland. They confined the Commission's attention to the *operation* of dams across Queensland and the suitability of their operational procedures. Specifically, they did not permit examination of topics such as changes to infrastructure, whether by way of new dams or upgrades to existing ones. In particular, the benefit of raising the wall of Wivenhoe Dam, a topic that was, amongst others, the subject of an expert rapid assessment commissioned by the Queensland Government during 2011,<sup>2</sup> is not an operational matter, and so falls outside the term of reference. No investigation has been conducted by the Commission into that matter. The cracking in Somerset Dam was examined only because its possible effect on the dam's operation was raised in the context of the January 2011 flood event. Those matters did not prompt, nor did the terms of reference otherwise provide for, a general review of dam safety in Queensland.

Consideration of the dam-related topics which are within the Commission's terms of reference should proceed only after certain basic propositions are made clear. First, no dam can guarantee the prevention of flooding in areas downstream of it. All dams have limits to the amount of water they can hold without their structural integrity's being at risk. All have spillways (gated or ungated) to let water out so that their levels do not get too high. Dams of every size will let out water in large floods. Exceptional circumstances aside, all dams do mitigate floods to some extent.

Second, all floods are different. The amount of mitigation provided by a dam will depend on the amount of rain that falls, where it falls and over what period. Wivenhoe Dam, for example, receives water from only half of the Brisbane River catchment; if rain falls downstream of the dam, it can do nothing to mitigate any resulting flood.

Third, dam operators do not have the gift of foresight. A large flood is indistinguishable from a small flood when the first rain falls. Operators' ability to respond to flooding is hindered by the inaccuracy of rainfall forecasts and gauges, river level gauges and modelling. All that can be asked is that they act competently on the best information available to them and report faithfully what they have done.

## 16.1 Overview

### The Interim Report

In its interim report the Commission made a number of findings relating to the operation of Wivenhoe Dam. Section 2.3 dealt with Seqwater's preparedness for floods leading up to the 2010/2011 wet season. Section 2.4 set out a chronology of the consideration by government, in October to December 2010, of lowering the level of Wivenhoe Dam to 75 per cent of its full supply level. Section 2.5 addressed the manual of operational procedures for flood mitigation at Wivenhoe Dam and Somerset Dam (the manual). The manual sets out four strategies for the operation of the dam during a flood. These are known as strategies W1, W2, W3 and W4. The manual and these strategies are discussed further in sections 16.2 and 16.3 below.

Section 2.7 of the interim report contained a chronology of the flood event that occurred at Wivenhoe and Somerset dams in January 2011, including rainfall in the dam catchment, inflow into the dams and the decisions made by the flood engineers. As part of the chronology, the times at which each operational strategy was engaged during the January 2011 flood event were given as follows:

- W1 from the start of the flood event on 6 January to 8.00 am on 8 January
- W3 from 8.00 am on 8 January to 8.00 am on 11 January
- W4 from 8.00 am to 9.00 pm on 11 January
- the draw down of the lake from 9.00 pm on 11 January to 19 January.

In making the findings in respect of when each strategy was used, the Commission relied on the official report of the January 2011 flood event that was published by Seqwater on 2 March 2011 (the March flood event report),<sup>3</sup> and the statements and testimony of the flood engineers who managed Wivenhoe Dam during the flood event. Those engineers gave sworn evidence to the inquiry that the official report was accurate,<sup>4</sup> and gave accounts of their involvement in the flood event consistent with that report. The March flood event report and the flood engineers' testimony gave an account of the flood event that signalled compliance with the manual in respect of the choice of strategy.

Compliance with the manual is not limited to the choice of operational strategies; it encompasses choices as to release rates, use of weather forecasts and streamflow information and drain down times. The Commission identified two areas in which the manual had been breached: the use of rainfall forecasts and the registration of flood engineers with their professional body.

The Commission also relied on the views of a number of experts in hydrology and dam operations that the manual had been complied with.

Seqwater commissioned peer reviews of the operational decisions made during the flood event<sup>5</sup> and provided the Commission with the reports prepared by Emeritus Professor Colin Apelt, Mr Greg Roads and Mr Leonard McDonald.<sup>6</sup> Seqwater provided a report by Mr Brian Shannon with a supplementary submission to the Commission on 4 April 2011. All of these experts concluded that, but for possible minor deviations turning on the manual's interpretation, Wivenhoe Dam was operated in accordance with the manual. None of them raised any concerns about the account of events given in Seqwater's March flood event report.

The Commission asked its independent expert, Mr Mark Babister, to review Seqwater's March flood event report and the reports of the peer reviewers, other than Mr Shannon's report, and to consider whether the releases from the Somerset and Wivenhoe dams were in accordance with the manual.<sup>7</sup> In answering that question, Mr Babister said:

Three independent reviews found that the dam releases were in accordance with The Manual. Minor deviations were observed that were attributed to ambiguity within The Manual.<sup>8</sup>

Mr Babister did not depart from, or take issue with, the opinions expressed in the three reports he had reviewed.

## Reporting by *The Australian* and the reopening of hearings

On 23 January 2012 *The Australian* newspaper published a story about the results of an investigation it had conducted into the strategies used at Wivenhoe Dam in the January 2011 flood.<sup>9</sup> That article pointed to documents produced by the flood engineers and others in January 2011 that suggested that the transition to strategy W3 had not occurred at 8.00 am on 8 January 2011, as recorded in Seqwater's March flood event report and the Commission's interim report.

The Commission conducted an initial review of the material identified by *The Australian* and other contemporaneous records of strategy choices. The Commission required Seqwater, the dam operator, and SunWater, which was contracted to run the flood operations centre at the time of the January 2011 flood event, to produce any documents they had in their possession that proved that W3 had been engaged at 8.00 am on 8 January. Neither possessed any such documents beyond those already provided to the Commission prior to its interim report.

The Commission received and reviewed a large number of additional documents received from parties in response to requirements to provide information. Among other materials, the Commission received copies of the flood engineers' personal emails, backups of electronic records held on the flood operations centre's server and the hard copy materials sent to the expert peer reviewers.

The results of the Commission's review of materials, and the lack of any definitive contemporaneous record of strategy choice, suggested that there was sufficient cause to reopen public hearings in order to obtain sworn evidence from those who were involved in the operation of Wivenhoe Dam in January 2011 and in the preparation of records of those decisions. In order to allow time for these additional hearings, the deadline for the delivery of the Commission's final report was extended from 24 February 2012 to 16 March 2012.<sup>10</sup> The Commission held ten days of additional public hearings from 2 to 11 February 2012. As with all other parts of the Commission's investigations, work to gather relevant evidence was also conducted outside the public hearings.

## The issues and their resolution

The Commission's focus in this final phase of hearings was narrow compared to the wide range of topics considered previously. In general terms, it sought to resolve six questions:

- Which operational strategies were engaged at Wivenhoe Dam during the January 2011 floods and when were these strategies engaged?
- Did the engagement of operational strategies at Wivenhoe Dam during the January 2011 floods comply with the manual?
- Was the account given in Seqwater's March flood event report of the choice and timing of operational strategies used at Wivenhoe Dam during the January 2011 floods accurate?
- If the account given in the March flood event report was not accurate:
  - why was it not accurate?
  - who was responsible for it being inaccurate?
  - who in Seqwater knew, or should have known, of the inaccuracy?
  - who in government knew, or should have known, of the inaccuracy?
- If the engagement of operational strategies at Wivenhoe Dam during the January 2011 floods did not comply with the manual, and/or if the March flood event report was not accurate, why was this not identified by the expert peer reviewers?
- If the engagement of operational strategies at Wivenhoe Dam during the January 2011 floods did not comply with the manual, was that non-compliance consequential?

In the public hearings the Commission heard oral evidence from 27 witnesses:

- the four flood engineers and eight flood officers who had been on duty during the January 2011 flood event
- four other Seqwater employees, including senior managers with responsibility for the operation of Wivenhoe Dam and the preparation of the March flood event report
- three state government officials, including the then responsible Minister and the Director, Dam Safety, who holds responsibility for reviewing the March flood event report
- two senior managers from the South East Queensland Water Grid Manager
- the four expert peer reviewers engaged by Seqwater and another expert who prepared a report on Wivenhoe Dam operations during the flood event
- the Commission's independent expert Mr Babister.

This chapter sets out the results of the Commission's investigation in this final part of its work. These issues have now been comprehensively ventilated, albeit in a short period of time. Generally, unless otherwise stated, the Commission has made findings of fact on the balance of probabilities. It has made its ultimate adverse findings only where satisfied that the evidence, taken as a whole, does not reasonably allow of any other conclusion.

The Commission's interim report contained, in section 2.6, comment which reflected favourably on the flood engineers, and in section 2.7, a summary of dam operations at Wivenhoe and Somerset dams in January 2011 which included a chronology of the strategies used during the flood event. (This chronology was derived from the March flood event report.) Any opinion expressed in section 2.6 of the interim report must now be qualified by reference to the conclusions contained in this chapter and the result of any further investigations. It also follows, from conclusions drawn in this report, that regard can no longer be had to section 2.7 of the interim report as a source of information about the deployment of strategies.

Consideration was given to written submissions made by some of the parties<sup>11</sup> that any adverse findings about the conduct of the flood engineers, and recommendations in that regard, should be delivered in a confidential annexure. It was contended that to do otherwise would affect their reputations, and possibly the safety of them and their families, and that adverse publicity could prejudice any subsequent criminal proceedings.<sup>12</sup>

There is force to the submission so far as the effect on reputation is concerned, but, on balance, and in a context in which the allegations have been ventilated in a public hearing, the Commission considers that the concern for protection of reputation is outweighed by the public interest in open resolution of issues concerning the operation of the dam. There is also the consideration that the Commission has not made the same findings against Mr Ruffini. Fairness to him dictates that that fact should be made public; but to do so must inevitably produce by inference the conclusion that findings have been made adverse to the remaining engineers, so that there is little point in suppression of them.

There is no evidence of a risk to the safety of the engineers or their families. The risk of prejudice in subsequent criminal proceedings, should they in fact occur, is no greater than that likely from committal proceedings in any high profile case; that argument is not a compelling one.

It is important to note that this Commission was never intended as a means of conducting forensic investigations into whether all those connected with the response to the December 2010/January 2011 flood were telling the truth and had given consistent accounts of their actions. This chapter of the report, which sets out the results of such a forensic exercise, is exceptional. Issues aside from those listed above have not, generally, been examined with the same scrutiny. To do so would have made it impossible for the Commission to adequately address all aspects of its terms of reference given the resources and time available to it. However, once raised, the issue of whether those connected with the operation of the dam were telling the truth had to be resolved; it was fundamental to how the response to the January 2011 flood was managed.

## Individuals named in this chapter

This chapter records the Commission's findings about the decision-making, knowledge and interactions of a number of individuals. The individuals named in this chapter are listed below, with descriptions of their roles at the time of the floods.

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### Flood Engineers

Robert (Rob) Ayre	Senior Flood Operations Engineer
Terrence (Terry) Malone	Flood Operations Engineer
John Ruffini	Senior Flood Operations Engineer
John Tibaldi	Flood Operations Engineer

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### Flood Officers

Neville Ablitt	Data Collector / Flood Officer
Kim Hang	Data Collector / Flood Officer
Albert Navruk	Data Collector / Flood Officer
David Pokarier	Data Collector / Flood Officer
Richard (Bill) Stephens	Data Collector / Flood Officer
Mark Tan	Data Collector / Flood Officer
Petrus Gerhardus Louw Van Blerk	Data Collector / Flood Officer
John West	Data Collector / Flood Officer

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### South East Queensland Water Grid Manager

Barry Dennien	Chief Executive Officer
Daniel Spiller	Director of Operations; Acting Chief Executive Officer 25 December 2010 to 8 January 2011

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**Dam experts**

Colin Apelt	Emeritus Professor and Honorary Research Consultant, Department of Civil Engineering, University of Queensland, appointed by Seqwater to peer review the March flood event report
Mark Babister	Flood hydrologist; Director, WMA Water; independent expert appointed by the Commission
Brian Cooper	Dam engineer, appointed by the South East Queensland Water Grid Manager to prepare a report on the operation of Wivenhoe Dam
Leonard McDonald	Dam safety and risk consultant; appointed by Seqwater to peer review the March flood event report
Gregory (Greg) Roads	Director/Principal Engineer, WRM Water & Environment; appointed by Seqwater to peer review the March flood event report
Brian Shannon	Retired civil engineer, former chairman Australian National Committee on Large Dams; appointed by Seqwater to peer review the March flood event report

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**The Premier, the Minister and their Directors-General**

The Hon. Anna Bligh MP	Premier of Queensland
Kenneth (Ken) Smith	Director-General, Department of the Premier and Cabinet
The Hon. Stephen Robertson MP	Minister for Natural Resources, Mines and Energy
John Bradley	Director-General, DERM
James (Jim) Reeves	Director-General, DERM (from 29 August 2011 only)
Debra-Lee (Debbie) Best	Deputy Director-General, DERM; Acting Director-General, DERM, 25 December 2010 to 10 January 2011
Terrence (Terry) Wall	Associate Director-General, DERM; Acting Director-General, DERM, 10 to 11 January 2011

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**DERM**

Peter Allen	Director, Dam Safety
Robert (Bob) Reilly	General Manager, Office of the Water Supply Regulator

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**Other Seqwater personnel**

Peter Borrows	Chief Executive Officer
Robert (Rob) Drury	Dam Operations Manager
Chloe De Marchi (nee Cross)	Dam Safety and Emergency Response Support Officer
James (Jim) Pruss	Executive General Manager of Water Delivery

## 16.2 The flood mitigation manual for Wivenhoe Dam and Somerset Dam

The operation of Wivenhoe and Somerset dams during floods (that is, when the level of either dam rises above its full supply level) is governed by a flood mitigation manual.

At the time of the January 2011 flood event, the relevant manual was Revision 7 of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam.<sup>13</sup> It was a ‘flood mitigation manual’ pursuant to Chapter 4 Part 2 of the *Water Supply (Safety and Reliability) Act 2008*, requiring approval by the chief executive of the Department of Environment and Resource Management.<sup>14</sup> Revision 7 was approved in November 2009; since the January 2011 floods it has been superseded by Revision 8 and Revision 9.<sup>15</sup>

The manual's purpose is to prescribe procedures for the operation of the dams, to reduce, so far as practicable, the effects of flooding associated with the dams.<sup>16</sup> This purpose is to be achieved 'by the proper control and regulation in time of the flood release infrastructure at the dams, with due regard to the safety of the dam structures'.<sup>17</sup> The manual explains that the prime purpose of incorporating flood mitigation measures into the dams is to reduce flooding in the urban areas of the floodplains below Wivenhoe Dam.<sup>18</sup>

To achieve that purpose, the manual sets out 'strategies' for use during flood events at the dam. A flood event occurs when the level of either Wivenhoe Dam or Somerset Dam is expected to rise above the dam's full supply level. The manual contains four strategies for use at Wivenhoe Dam (W1, W2, W3 and W4) and three strategies for use at Somerset Dam (S1, S2 and S3). The manual provides for flood engineers in a flood operations centre to operate the dams in accordance with the manual during flood events. It sets out how the flood engineers should decide which strategy they should operate the dams in at any time, and how much water to release. The manual includes details of what gate openings should be made if communications between the dam and the flood operations centre are cut. For a more detailed description of the manual, see section 2.5.1 *Structure of the Wivenhoe manual* in the Commission's interim report.

The manual states that it must be used for the operation of the dam, but there is no legislative requirement to that effect.<sup>19</sup> However, section 374 of the *Water Supply (Safety and Reliability) Act* confers on Wivenhoe Dam's operators protection from civil liability for acts and omissions done or made honestly and without negligence in observing the operational procedures in the manual. Given its significant legal effect, the manual cannot be regarded simply as a set of technical instructions.

## 16.3 The manual requires a choice of strategy

Counsel for Mr Ayre and SunWater,<sup>20</sup> Seqwater<sup>21</sup> and Mr Tibaldi<sup>22</sup> advanced an argument that as a matter of legal interpretation, the flood mitigation manual did not require a conscious choice of strategy in the operation of the dam in the January 2011 event at any stage between the application of strategy of W1 through to the point at which W3 became applicable by virtue of the lake level. The only circumstances in which choice was required were where there was a decision to invoke a strategy on a predicted lake level, or where the lake level was at 68.5 metres and the releases from Wivenhoe Dam were less than the natural peak flow rates at Moggill and Lowood, in which case the flood engineer could choose to move to W3 and out of W2 by increasing releases from Wivenhoe above the peak rate. The move to W3 at 8.00 am on 8 January was automatic by reason of the lake height having reached 68.5 metres and the flows from the dam exceeding the natural peaks at Moggill and Lowood. No decision was required. On that view, it was, then, proper to look later at what had occurred and apply the appropriate strategy label to it; as Mr Tibaldi had done in his preparation of the March flood event report.

Counsel for Mr Malone<sup>23</sup> did not make a similar contention, instead submitting that there had in fact been a conscious engagement of strategy W3 at 8.00 am on 8 January. Counsel for the State<sup>24</sup> said that the determination of strategy as between W2 and W3 occurred 'almost automatically'. That submission went on, however, after noting considerations Mr Ruffini had detailed in his evidence, to observe that the decision as between strategies 'required some thought', and indeed more, a decision not to drastically reduce discharges as W2 required, thus extending the drain down time.

An analysis of the manual leads to two conclusions: firstly, that the flood engineers must consciously choose or adopt the strategies (W1, W2, W3 or W4) under which Wivenhoe Dam operates; and, secondly, that the engineer on duty at any point during the flood event must recognise the strategy under which he is acting in the operation of the dam.

### 16.3.1 Objectives and procedures

The preface of the manual explains the significance of the procedures it contains:

Given their potential significant impact on downstream populations, it is imperative that Wivenhoe and Somerset Dams be operated during flood events in accordance with clearly defined procedures to minimise impacts to life and property.<sup>25</sup>

Section 1.7 describes the manual as containing the operational procedures for Wivenhoe and Somerset dams and requires that it be used for the operation of the dams during flood events.<sup>26</sup>

The preface also makes clear the primary objectives of the procedures. They are, in order of importance, to:

- Ensure the structural safety of the dams
- Provide optimum protection of urbanised areas from inundation
- Minimise disruption to rural life in the valleys of the Brisbane and Stanley Rivers
- Retain the storage at Full Supply Level at the conclusion of the Flood Event
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.<sup>27</sup>

These objectives are repeated later in the manual, under the heading General.<sup>28</sup>

Merely having regard to the ‘objectives’ when operating the dam will not amount to compliance: the manual contemplates that the ‘objectives’ and ‘procedures’ are different things. So, for example, section 5.2 Operation provides:

The Senior Flood Operations and Flood Operations Engineers use the RTFM [Real Time Flood Model] for flood monitoring and forecasting during flood events to operate the dams in accordance with this Manual. This is done by optimising releases of water from the dams to minimise the impacts of flooding in accordance with the *objectives and procedures* contained in this Manual.<sup>29</sup>

(emphasis added)

### 16.3.2 The role of the flood engineers

Section 2.2 of the manual requires the designation of a Senior Flood Operations Engineer to be in charge of Flood Operations at all times during a Flood Event. Release of water at the dams during Flood Events is, according to section 2.2, ‘carried out under the direction of the Duty Flood Operations Engineer’.

Section 2.3 provides that the responsibilities of the Senior Flood Operations Engineer when rostered on duty during a Flood Event are to:

- Set the overall strategy for management of the Flood Event in accordance with the objectives of this Manual.
- Provide instructions to site staff to make releases of water from the Dams during Flood Events that are in accordance with this Manual.
- Apply reasonable discretion in managing a Flood Event as described in Section 2.8.<sup>30</sup>

Mr Ayre was the Senior Flood Operations Engineer during the January 2011 flood event.

Section 2.4 requires that flood operations engineers:

- Direct the operation of the dams during a flood event in accordance with the general strategy determined by the Senior Flood Operations Engineer.
- Follow any direction from the Senior Flood Operations Engineer in relation to applying reasonable discretion in managing a Flood Event as described in Section 2.8. Unless otherwise directed, a Flood Operations Engineer is to follow this Manual in managing Flood Events and is not to apply reasonable discretion unless directed by the Senior Flood Operations Engineer or the Chief Executive.
- Provide instructions to site staff to make releases of water from the Dams during Flood Events that are in accordance with this Manual.<sup>31</sup>

To understand what is meant by the capacity of the Senior Flood Operations Engineer to ‘apply reasonable discretion’ and the requirement that Flood Operations Engineers follow the manual unless otherwise directed by the Senior Flood Operations Engineer, it is necessary to turn to section 2.8 of the manual. It vests a discretion in the senior flood engineer to depart from the manual, but a precondition is that he hold the opinion that it is necessary to depart from the procedures. This implies a requirement for the senior flood engineer to have turned his mind to the procedures in the manual: that is, to have consciously considered the strategies provided for in the manual and to have rejected them as being appropriate to meet the flood mitigation objectives in the circumstances. Meanwhile, the flood engineers must follow the manual (that is to say, apply its procedures) unless otherwise directed.

### 16.3.3 Selection of flood operations strategies

Section 8.4 Flood Operations Strategies says:

There are four strategies (W1 to W4) **used when operating Wivenhoe Dam during a flood event as outlined below. These strategies are based on the Flood Objectives of this manual.**

(emphasis added)

The language of ‘use’ is, self-evidently, inconsistent with the notion that the strategies are merely a form of labelling which can take place after the event. And it is difficult to see how something which was no more than a characterisation of actions and conditions after they have taken place could seriously be called a ‘strategy’. The word itself implies the adoption and use of a set of tactics.

Section 8.4 then repeats the objectives set out above. The section goes on to state:

**Within any strategy**, consideration is always given to these objectives in this order, when making decisions on dam releases.

(emphasis added)

To give consideration to the objectives ‘within a strategy’ clearly requires a conscious recognition that the strategy has been invoked.

The concept of making decisions ‘within’ a strategy recurs later in 8.4:

When determining dam outflows **within all strategies**, peak outflow should generally not exceed peak inflow.  
(emphasis added)

Section 8.4 explicitly uses the language of choice:

The strategy **chosen** at any point in time will depend on the actual levels in the dams and the following predictions, which are to be made using the best forecast rainfall and stream flow information available at the time:

Maximum storage levels in Wivenhoe and Somerset Dams.

Peak flow rate at the Lowood Gauge (excluding Wivenhoe Dam releases).

Peak flow rate at the Moggill Gauge (excluding Wivenhoe Dam releases).

(emphasis added)

It is plain that that process of choice must admit of more than one possible result. As the flood engineers were at pains to point out when they gave evidence in April 2011,<sup>32</sup> the weight to be given to any rainfall forecast was a matter for their determination and, it follows, could produce varying outcomes. The allowance for prediction in the choice of strategy inevitably introduces an element of subjective judgment.

The section goes on to consider when strategies must be altered:

Strategies are likely to change during a flood event as forecasts change and rain is received in the catchments. It is not possible to predict the range of strategies that will be used during the course of a flood event at the commencement of the event. **Strategies are changed in response** to changing rainfall forecasts and stream flow conditions to maximise the flood mitigation benefits of the dams.

(emphasis added)

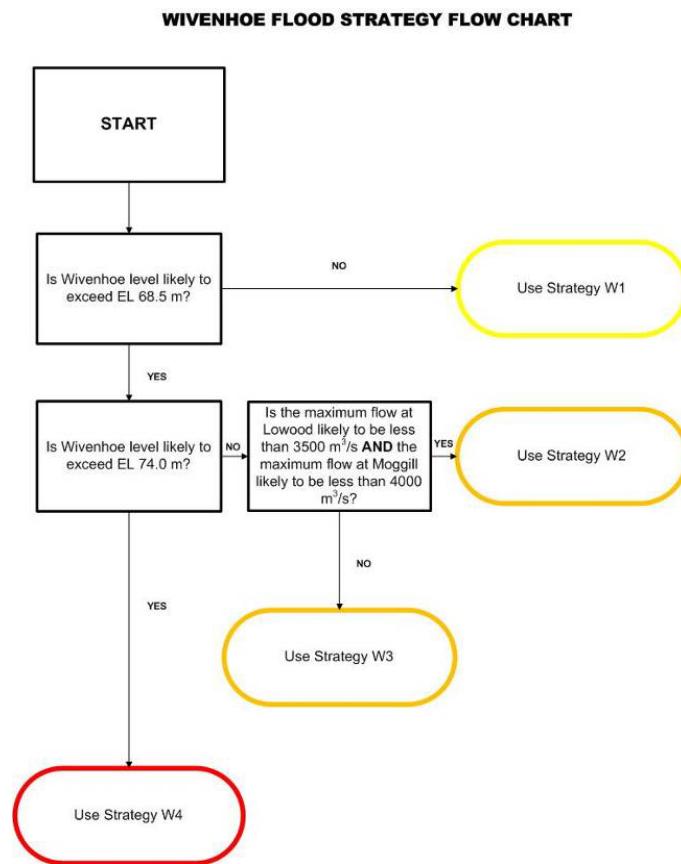
Again, the terms used are those of active choice: strategies do not simply change by reference to events, they are to be changed. This is the language of conscious decision making. Choice (and change to that choice) is to be made by taking into account rainfall forecasts, flow conditions and the aim of maximising the dams’ flood mitigation capacities.

Section 8.4 demonstrates how contemporaneous selection of a strategy is to be undertaken. It sets out a flow chart ‘showing how best to select the appropriate strategy to use at any point in time’.<sup>33</sup>

The flow chart is a ‘decision tree’, again requiring actual selection of strategy depending on the circumstances which are operating at any point in time. For example, if Wivenhoe Dam is not likely to exceed 68.5 metres, it requires ‘use’ of strategy 1; if it is likely to exceed 68.5, it requires further decision making down the tree.

The flow chart appears below.<sup>34</sup>

Figure 16(a)



Mr Tibaldi's evidence on 15 April 2011 was helpful in explaining just how the flowchart (which he designed) is to be used:

The flowchart is on page 23 and the sentence prior to the flowchart says: 'A flowchart showing how best to select the appropriate strategy', so previously we have got all our information together, now we're coming to the stage where we're going to select the appropriate strategy – 'a flowchart showing how to best select the appropriate strategy to use at any point in time is shown below.' So once you've got all your information together, now you have got to select your strategy, now you go to the flowchart. You will notice in the flowchart that forecast is not mentioned at all, but the engineer that has to choose the strategy has to make an engineering judgment or a judgment about what is likely. He is asked essentially two questions about what is likely. The first question is about the likely level in Wivenhoe Dam. Again, he has got to make a judgment on what is likely. He can assign whatever weight his judgment feels worthy in terms of the forecasts. Now, as I said, generally given the great uncertainties in the QPF [quantitative precipitation forecasts] as provided by BOM, no weight is provided to those forecasts. However, as I said, there are three circumstances under which you may provide – assign some weight to those forecasts.<sup>35</sup>

(Mr Tibaldi went on to explain the circumstances under which forecasts could be given weight. He did not return to the second question of likelihood about which the engineer had to make a judgement, but it seems probable in context that he was referring to the maximum flow at Moggill and Lowood; the flow chart requires an assessment of likely flows at both points.)

Even without the benefit of Mr Tibaldi's explanation, the language of the flow chart is clear in directing the user to actually turn his or her mind to which is the appropriate strategy. It is not designed for after-the-event labelling.

The manual continues by identifying the strategies and the conditions for their use, which include the 'primary consideration' for each. The primary considerations coincide with the objectives set out earlier. Strategy W1 applies

when the lake level is predicted to be below 68.5 metres AHD, the maximum release is predicted to be less than 1900 m<sup>3</sup>/s, and the primary consideration is minimising disruption to downstream rural life.<sup>36</sup> As with other strategies, it can be seen that there are elements of prediction requiring the exercise of judgment.

The manual goes on to deal with the sub-strategies (W1A – W1E) and sets out what the flood engineer operating the dam must do under each. Generally, it says, those ‘strategies require a great deal of control over releases and knowledge of discharges from Lockyer Creek’. It seems obvious that an engineer who does not know in which of those strategies he is operating the dam cannot know what is required of him.

The manual requires that if the level of Wivenhoe Dam reaches EL 68.5 metres, the engineer must ‘switch’ to W2 or W3 as appropriate.<sup>37</sup> The word ‘switch’ is active, connoting contemporaneous thought, decision and action.

W2 is a ‘transition strategy’ in which ‘the primary consideration changes from Minimising Impact to Downstream Rural Life to Protecting Urban Areas from Inundation’.<sup>38</sup> Again, the conditions under which W2 can be invoked involve elements of prediction: that the lake level is predicted to be between 68.5 and 74 metres, and that the maximum release is predicted to be less than 3500 m<sup>3</sup>/s. The manual elaborates: ‘The intent of Strategy W2 is to limit the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill, while remaining within the upper limit of non-damaging floods at Lowood (3500 m<sup>3</sup>/s); the combined peak river flows should not exceed those shown in a table. The table sets out the ‘target maximum flow in the Brisbane River’: at Lowood, it is to be the lesser of the natural peak flow without the dam releases and 3500 m<sup>3</sup>/s, while at Moggill it is to be the lesser of the natural peak flow without the dam releases and 4000 m<sup>3</sup>/s.

The manual sets out the conditions in which W3 is engaged: as for W2, the lake level is predicted to be between 68.5 and 74 metres; but in this instance, the maximum release should not exceed 4000 m<sup>3</sup>/s. The primary consideration is protecting urban areas from inundation.<sup>39</sup> Again, the manual explains the intent of the strategy, which is: ‘to limit the flow in the Brisbane River at Moggill to less than 4000 m<sup>3</sup>/s, noting that 4000 m<sup>3</sup>/s at Moggill is the upper limit of non-damaging floods downstream’.

### 16.3.4 Move to strategy W3 mandated by the manual

As previously indicated, it was contended by some, but not all, counsel for the parties, that strategy W2 became inapplicable immediately and automatically when releases from Wivenhoe Dam exceeded the projected natural peak flow at Lowood or Moggill; as was the case at 8.00 am on 8 January. Counsel for Seqwater<sup>40</sup> pointed out that that was the effect of the evidence of the flood engineers, three of the four experts engaged for peer review of the March flood event report, and Mr Babister, the hydrologist engaged to perform modelling for the Commission.

Mr Tibaldi explained that the rationale for strategies W2 and W3 was to accommodate where the rain fell; if it was in the Lockyer and Bremer catchments, the W2 strategy would prevail, because the flows from those waterways would be setting most of the peak flow, and would potentially dictate the highest peak in the river ‘so that’s what you want to try and get under’.<sup>41</sup> There were ‘targets about what you’re trying to set as the flow in the river’.<sup>42</sup> The aim then would be to hold back water in the dam. If on the other hand, the rain was falling above the dam, the tributary flow would be less important.<sup>43</sup> If, as he had originally thought, the flowchart required a move to W2 before W3, it would have been necessary on 8 January to drop releases from Wivenhoe Dam back to something in the order of 100 m<sup>3</sup>/s; that had plainly not occurred.<sup>44</sup> It was not appropriate to switch to W2, because the conditions of the strategy set out in the manual could not be met. The flow in the river already exceeded the estimated peak flows downstream at Lowood and Moggill.<sup>45</sup>

Mr Ayre described the choice between W2 and W3 in his seventh statement:

The selection of the release rate is what will determine whether you’re in Strategy W2 or W3. If you pick a release rate which is less than the naturally occurring flow at Lowood, then you’re adopting a W2 strategy. If you pick a release rate that is higher than that, then you are choosing W3.<sup>46</sup>

This was consistent with a more general statement he made in the course of his evidence that while on duty during the flood event, the flood engineers used release rates to choose strategy (rather than vice versa).<sup>47</sup>

On Mr Ayre’s account, the conscious decision to move to W3 had been made at 5.00 am on the morning of 8 January, when Mr Ruffini issued a gate directive which would produce the second of those results.<sup>48</sup> That meant that when the lake reached 68.5 metres he, Mr Ayre, had no choice as between W2 and W3, because the releases already exceeded the expected downstream peaks.<sup>49</sup>

More generally, Mr Ayre said that the selection of one of those strategies rather than the other depended on the ‘overall objective of the event’: if it were to optimise protection against downstream flooding, W3 would be considered; but if the engineer wanted to minimise disruption to rural life, strategy W2 or W1 would be selected, depending on the lake level.<sup>50</sup>

Mr Malone adopted the suggestion put to him that no conscious decision is made by a flood engineer to go to W2 at all; whether W2 applied was dictated by the lake level and the fact that the release rates from Wivenhoe Dam were greater than the anticipated natural peak flow rates at Lowood and Moggill.<sup>51</sup>

Mr Ruffini agreed with the proposition that on an examination of the figures for downstream flows and Wivenhoe Dam releases it would have been obvious without further calculation that strategy W2 was ‘unavailable’ when the lake level reached 68.5 metres.<sup>52</sup> He elaborated, however: the ramping down of flows which a move to W2 would entail would make a seven day drawdown impossible, so the strategy was not viable; although if rain upstream of Wivenhoe Dam stopped, a longer drawdown might be worthwhile. It was undesirable to reduce the rate at which Wivenhoe Dam was releasing once some of the bridges were already affected, because bringing them in and out of operation had safety implications, and it was also undesirable to move release rates up and down because of the effect on riverbanks. There were other practical reasons for not wanting to ‘jump into that space’. Importantly, he recognised that it was necessary to think about the situation and the attendant problems.<sup>53</sup> He would make the assessment as to whether to move into W2 or W3 by reference to his operational spreadsheet; it would not take very long.<sup>54</sup>

Professor Apelt’s view was that the W2 strategy was ‘simply unavailable’ because the releases at Wivenhoe Dam exceeded the predicted naturally occurring peaks at Moggill; the choice as between W2 and W3 was made for the engineers by the prevailing circumstances, and the manual required them to use W3 from the time when the lake level crossed 68.5 metres for the conditions they were dealing with.<sup>55</sup>

Mr Roads found the application of W2 confusing; its application was ‘clarified’ for him by a discussion with Mr Tibaldi in which the latter had told him that because the dam was already ‘discharging at a rate that was higher than the naturally-occurring flow... at Lowood excluding Wivenhoe... W2 was somewhat redundant’.<sup>56</sup> There was, however, scope to reduce releases to below the projected naturally occurring peak.<sup>57</sup> The lake level indicated that the engineers were ‘in W2 or W3 by going into that water level’; what release strategy they then had depended on the situation.<sup>58</sup> Mr Roads agreed with the proposition that W2 was ‘just not available’ because the releases from Wivenhoe Dam were greater than the predicted naturally occurring peaks at Lowood and Moggill<sup>59</sup> but also agreed that it was not automatic that W2 could not be contemplated simply because the flows from Wivenhoe Dam currently exceeded those peaks; those flows could be adjusted to accord with W2. The decision could be made almost immediately to reduce flows to get back into W2; but he accepted that in the interim the dam would be operated in W3.<sup>60</sup>

Mr Shannon did not seem consistently to subscribe to the view that W2 was automatically inapplicable when Wivenhoe Dam releases exceeded the Moggill and Lowood peaks, although he made it clear that he regarded it as practically not relevant in the circumstances of the day. It was applicable in circumstances where the major flows were coming from Lockyer Creek and the Bremer River, as opposed to the Wivenhoe Dam catchment.<sup>61</sup> It was suggested to him that it was understandable that where the major rainfall was in the Wivenhoe Dam catchment that a flood engineer would naturally think of W3 and would not have regard to W2. He responded:

Oh well, the manual dictates that he must, sort of thing, but as I say in the report it is entirely predictable on average that W2 won’t be relevant. So it’s not that he wouldn’t be mindful of W2 but it is predictable that W2 won’t be relevant in the circumstances, there will be a direct move from W1 to W3.<sup>62</sup>

Mr Shannon did not adopt the questioner’s suggestion that an experienced engineer would, given where the rainfall was occurring and the modest flows from the Lockyer and Bremer, appreciate that it was a W3 event without needing to go through the mental process of considering the application of W2. His answer suggested he thought there was more to it than that:

It might suggest to him, but, I mean, in these circumstances I was - given the disasters that had happened around the Scenic Rim and over the Rim, I suppose, in Toowoomba, it was only when I went back and looked at the detailed data that I realised that the flows coming down Lockyer weren’t as big as I might have anticipated, and so while in the generality I might accept what you are saying, based on general reports that

I had picked up I might have thought that there was a bigger flow coming down Lockyer, in which case the flood engineers would have had to have been aware of that and --<sup>63</sup>

On further questioning, Mr Shannon agreed that it could be concluded that W2 was ‘simply physically unavailable’ once the lake level crossed 68.5 metres because the anticipated naturally occurring peaks at Lowood and Moggill were significantly lower than the releases from Wivenhoe Dam. A flood engineer with the relevant model results could see that immediately, and would know from a comparison of the Wivenhoe Dam releases with the downstream flows that the major rainfall event was happening in the Wivenhoe Dam catchment, making references to W2 ‘fanciful’.<sup>64</sup>

Mr Babister accepted the proposition put to him that if the releases from Wivenhoe Dam were above the maximum permissible releases available under W2, W2 would not be an option.<sup>65</sup> Mr McDonald (to whom that proposition was not put) took rather a different view. He regarded the flow chart as saying that the engineers should go to W2, but they had bypassed it for the reason given in the March flood event report. He thought W2 would have been an appropriate strategy in the conditions.<sup>66</sup>

As the answers of Mr Ruffini and Mr Shannon illustrate, the witnesses may not have appreciated the distinction between the W2 strategy’s being ‘unavailable’ (with its connotation of an automatic result) and its not being ‘appropriate’ (the manual’s word) in the circumstances of the day.

The premise underlying the questioning and the submissions, that the use of W2 was precluded once the flows from Wivenhoe Dam exceeded the projected naturally occurring peaks at Lowood and Moggill, is doubtful. Section 8.4 of the manual prescribes the limiting of the Brisbane River flow to less than naturally occurring peaks as a ‘target’ or ‘intent’. It does not render W2 ‘unavailable’ if the flows from Wivenhoe Dam are already above that point.

It would be odd if the manual did have that effect, because it would mean that the adoption of a strategy which might be entirely appropriate given the outlook for conditions in the Lockyer and Bremer catchments would be excluded by the circumstance that the existing dam flows exceeded, however marginally, the conjectured peaks downstream. On Seqwater’s argument,<sup>67</sup> though, the flood engineer in that instance could scale down releases until he reached the point at which W2 was said to be available, and would in the interval be operating the dam in strategy W3. The construction argued for, that an engineer in those circumstances would be operating the dam in strategy W3, although all his actions were taken according to the objectives of W2, is, to say the least, artificial.

In effect what was argued was Mr Ayre’s proposition: that release rates determine the strategy as opposed to the strategy determining the release rates. It is untenable. Section 8.4 of the manual makes it clear that decisions as to release rates are made within the governing strategy, not the other way round.<sup>68</sup> A high release rate from Wivenhoe Dam may be an indication that strategy W2 has not been in fact adopted; it may be a factor in deciding that it should not be; but the mere fact that at the time when the lake level reaches 68.5 metres it exceeds the projected natural downstream peaks does not preclude the strategy’s adoption. That feature does not absolve the engineer of choice, when the lake level reaches 68.5 metres or as conditions change, whether to proceed by limiting dam releases in accordance with the intent of W2 or to proceed with releases under W3. The manual does not, as was contended, dictate the result; what is needed is an assessment of conditions – the catchments in which rainfall is expected, the likely inflows into Wivenhoe Dam, current release rates, and expected downstream peaks – against the manual to decide which strategy should be adopted.

Even if that view of the manual be wrong, and W2 was, as was contended, ‘unavailable’ purely by reason of the Wivenhoe Dam releases exceeding the anticipated downstream peaks, it remains the case that the engineer on duty had to reach that conclusion. The manual requires that the operator ‘switch’ to whichever of W2 or W3 is appropriate. The decision as to appropriateness might have been one which could be readily and swiftly made on the information available at 8.00 am on 8 January, but it was a decision nonetheless. It cannot be accepted that the manual dictated, and that there was, an automatic move from W1 to W3, requiring no conscious adoption of the latter strategy.

It is worth mentioning the approach of Seqwater as reflected in its 4 April 2011 supplementary submission to the Commission, when it sought to deal with a criticism made by Mr McDonald of its failure to implement strategy W2. This was said:

As explained in the Wivenhoe Flood Report, Strategy W2 was bypassed early in the event because it was not possible to limit the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and

Moggill.... There was no failure to comply with the Wivenhoe Manual because the requirements of Strategy W2 could not be fulfilled at the relevant time, so the appropriate course was to invoke Strategy W3, which is what Seqwater did.

That language of bypassing W2 and invoking strategy W3 seems to contemplate an active approach and choice between the strategies.

The combined effect of:

- a. the language of the manual, which is that of choice and use of a strategy, not of retrospective labelling and
- b. the prescription in section 8.4 that the strategy chosen is to depend on:
  - i. the actual levels in the dams and
  - ii. predictions of their maximum storage levels and peak flow rates at Lowood and Moggill (excluding dam releases), which are to be made using the best forecast rainfall and stream flow information available at the time
- and
- c. the flowchart, which directs choice of strategy
- and
- d. the conditions for application of each of the strategies, which in each case involve prediction of the lake level, and for W1 and W2 of the likely maximum release rate
- and
- e. the need for a decision as to which of W2 and W3 is the appropriate strategy to which to ‘switch’

is to make it clear that what is needed is the flood engineer’s application of contemporary judgment to both the existing conditions (so far as the dam level and inflows and outflows are concerned) and their likely evolution (including the results of likely rainfall). A flood engineer cannot sit back and let the strategy be dictated by the lake level. For each strategy there is a point at which the actual lake level requires its application; but waiting for that point to be reached before the relevant strategy is brought into play in itself entails a decision not to act earlier, on the predicted lake level. And when the lake level reaches 68.5 metres, the flood engineer must consider which of strategies W2 and W3 is appropriate and take action accordingly to meet the intent of the strategy chosen. A failure to do so constitutes a breach of the manual.

### 16.3.5 Does the manual require that an engineer be conscious of the strategy in which he is operating?

It is not merely a question of how the transition takes place; there is the further question of whether the manual requires that an engineer recognise which strategy is in place at any given time during the period for which he is responsible for operating the dam.

Advancing the contrary view, Seqwater<sup>69</sup> placed reliance on evidence from three of the peer reviewers; oddly, perhaps, given its counsels’ acceptance in their closing submissions that construction of the manual was a matter of legal interpretation.<sup>70</sup>

Professor Apelt said that in his review of the March flood event report, he had been concerned with the substance of what the flood engineers did in determining whether it was consistent with a strategy. He considered it sufficient for the flood engineers to have a clear understanding of what they were required to do; it was not for him ‘the essence’, he said, that the strategy be identified by the engineer’s thinking “‘This is W3’ or whatever...”<sup>71</sup>

Mr Roads said both that it was necessary for a flood engineer to be aware of the strategy in which he was operating the dam<sup>72</sup> and that what mattered was ‘not what label they give it, it is what they actually released and whether those releases were in compliance with the manual’.<sup>73</sup> In regard to the latter, he said, he ‘took the manual quite literally in that sense, and in the question that [he] was asked to do’.<sup>74</sup>

Mr Shannon accepted that a reading of the manual would require that a flood engineer appreciated what strategy he was operating the dam under,<sup>75</sup> but also said that so long as the engineer knew what the requirements were in

the circumstances, he ‘wouldn’t be too concerned’ whether it was ‘in the front of his mind to put the label of the strategy on it’.<sup>76</sup> He would, however, ‘expect them to know exactly when they needed to consider varying their operating strategy according to the lake levels which is the primary requirement of the manual’; the heading of the requirement could be looked up to ascertain which strategy it fell under.<sup>77</sup> Asked whether his opinion was that the key thing for the engineers to have in mind was the criteria to be achieved under W3, rather than consciously putting a label on the strategy they were applying, he said that he ‘didn’t mean to imply that they would disregard it’. Rather, he expected that it would be inculcated in the engineers ‘what the conditions were that accorded with the different strategies’.<sup>78</sup>

The fourth of the reviewers, Mr McDonald, expressed his view more succinctly: ‘If you want to comply with the manual, you need to be conscious of what strategy you are in’ at all times during the dam’s operation.<sup>79</sup> To learn that the March flood event report was a reconstruction of how the dam was operated would likely have changed his opinion as to compliance; the objectives varied according to the strategy, and the engineer needed the requisite mindset in operating the dam. It might not change the releases actually made, but regard had to be had to the objectives for the strategy.<sup>80</sup>

It can be seen that the views of those experts were far from cohesive. Their evidence, it should be recognised, was given in the context of each having, a year previously and at some speed, reviewed a version of the March flood event report and found it accorded with the requirements of the manual. Nothing suggested that any had recently studied the manual or considered the issue now raised. In the circumstances and given the variations as between them, and in the case of Mr Shannon and Mr Roads, in the course of their evidence, their views were not particularly helpful.

The suggestion that it is enough for an engineer to act in accordance with a strategy without adverting to it is not logical. To know what objectives he must aim at and what he must do by way of compliance with the manual, he must know under what strategy he is acting. It follows inevitably from the strictures of each strategy as to the objectives to be kept in mind and maximum permissible releases that not only must strategies be actively chosen as conditions change, but a flood engineer must be aware throughout his shift of the strategy under which he is operating the dam. If that was not the case throughout the course of the January 2011 flood, there was a breach of the manual.

## 16.4 The flood engineers’ evidence as to the manual’s requirements for adoption of strategies generally

What the flood engineers had to say about the manual’s requirements for the change from strategy W1 to a higher strategy has already been outlined. It is necessary here to refer to the flood engineers’ evidence as to their broader understanding of the manual’s requirements for adopting and meeting the strategies. That is so not because their beliefs could affect whether it was in fact breached, but because, as counsel for Seqwater submitted,<sup>81</sup> what they understood is relevant to whether they honestly considered the manual had been complied with and whether there was any intention to mislead with the March flood event report.

Mr Tibaldi accepted that a strategy must be adopted during the flood event.<sup>82</sup> But he followed that concession with these assertions: that if the lake level changed, the strategy must have changed irrespective of what the engineer operating the dam at the time thought; and that there was no requirement for the engineer to actually turn his mind to the strategy which was applicable at any given time, because the manual did not say so.<sup>83</sup> Subsequently, however, he agreed that it was a ‘reasonable expectation’ that a flood engineer would be required by the manual to turn his mind to a choice of strategy as he was operating the dam<sup>84</sup> and accepted that it was impossible to read the manual in any other way than as requiring that a flood operation engineer make a choice of strategy during the event.<sup>85</sup>

Mr Tibaldi’s evidence given in April 2011 as to the use of the flowchart is set out above. To that can be added his evidence given at the same time about the decision-making process for choosing strategies set out in section 8.4 of the manual, which, he said, was simply a description of what people had always done in making operational decisions. Under section 8.4, the first step in decision-making was the assembling of information as to actual rainfall, forecast rainfall, and stream flow. Mr Tibaldi said: ‘[I]f you want to make the best decision possible, you need to use all those things.’<sup>86</sup>

Mr Ayre accepted that the manual required the conscious choice of a strategy at the time the dam was being operated<sup>87</sup> and that compliance could not be achieved by retrospectively constructing a version of events as to the way the dam was managed.<sup>88</sup>

In his statement of 23 March 2011, Mr Ayre had this to say about choice of strategy:

When determining the appropriate strategy to invoke for Wivenhoe and Somerset Dams a number of factors must be considered and balanced. The combined operation of Wivenhoe and Somerset Dams must be taken into account, rainfall, loss rates and runoff must be calculated, dam levels must be monitored and river flow rates downstream of the Dams need to be considered (including flows from Lockyer Creek and Bremer River into the Brisbane River).<sup>89</sup>

In evidence in April 2011, Mr Ayre, in answer to the proposition that ‘the decision to move between strategies and, more particularly, the decision as how to execute a particular strategy is one ultimately of judgments upon which there will typically be a number of reasonable alternatives, and that operators have to choose one’, said ‘I would agree, and it is an incremental change, as such.’<sup>90</sup> In a similar vein, he agreed that in ‘making decisions as to which strategy to employ, and indeed, how you will transition between the strategies’ he and his fellow engineers made ‘a number of quantitative assessments and qualitative judgments’.<sup>91</sup>

Mr Ayre put his view rather differently in his seventh and final statement:

Strategy labels are generally only attributed after the event as part of the reporting process.

The Flood Engineer selects the strategy during the flood event by testing different release rates and then assessing the suitability of the release rates in respect of achieving objectives. The action that informs the choice of strategy is in fact the gate release rate and how that manages the lake levels and downstream flows.<sup>92</sup>

Mr Malone agreed that for engineers operating the dam during a flood event, one of the strategies must be engaged at any particular point in time, and the flood engineers would be adopting and applying different strategies at different times over the flood event. A strategy involved a primary consideration which whoever was operating the dam would have in mind, while also being mindful of possible other strategies which might occur in the future.<sup>93</sup> At any particular point the engineer would be fully aware what the situation was, and would be fully aware which of the manual strategies he was in.<sup>94</sup> However, he said, there was no occasion for a flood engineer to make a conscious decision to move to W2 or W3 in the event that the lake level exceeded 68.5 metres and the Wivenhoe Dam releases were greater than the natural peaks at Lowood and Moggill.<sup>95</sup> He accepted, though, that an engineer’s failure to determine whether he was in strategy W2 or W3 would be a breach of the manual.<sup>96</sup>

Mr Ruffini accepted that the manual’s reference to the ‘strategy chosen’ meant that the flood operations engineer on duty had to choose a strategy, requiring a conscious decision as to what was the appropriate strategy to apply, and to know consciously under which strategy he was operating in order to understand the objectives to be managed.<sup>97</sup>

What the March flood event report actually represented about choice and observance of strategy, and the evidence about how the flood engineers applied strategy during the January 2011 flood event, is the subject of the sections which follow.

## 16.5 The March flood event report: a record of strategy choice

The manual requires Seqwater to prepare a report after each flood event. That report ‘**must contain details of the procedures used**, the reasons therefore [sic] and other pertinent information’ (emphasis added).<sup>98</sup> Seqwater must forward the report to the chief executive of DERM within six weeks of the completion of the flood event.<sup>99</sup> The report prepared in purported discharge of these obligations for the January 2011 flood event is the March flood event report.

Seqwater provided the March flood event report to the Commission on 3 March 2011, and it was made an exhibit in the Commission’s first round of hearings.<sup>100</sup> In its 11 March 2011 submission, Seqwater confirmed that sections 2 and 10 of the March flood event report identified the steps it had taken throughout the January 2011 flood event and asserted, ‘The explanation provided in those sections demonstrates that operational decisions were carefully considered and made in accordance with the Manual.’<sup>101</sup>

This section considers generally what the March flood event report portrayed about compliance with the manual, and more particularly, whether it represented, firstly, conscious rather than automatic adoption of strategy W3 at 8.00 am on 8.00 January 2011, and secondly, continuing and conscious engagement of that strategy in the days which followed.

### 16.5.1 The executive summary

The executive summary asserts that things were done ‘in accordance with the Manual’. In this regard, it includes the following statements:

- ‘During the January 2011 Flood Event, **operational decisions were made in accordance with the Manual**.<sup>102</sup> (This proposition was also contained in the conclusion).<sup>103</sup>
- The dam was operated ‘**in accordance with the Manual**’.<sup>104</sup>
- ‘The data collection and flood modelling systems... assisted informed decision-making, **in accordance with the Manual**.<sup>105</sup>

(emphasis added)

### 16.5.2 Express statements as to strategy selection

Chapter 2, Flood Event Summary, contains a series of tables which break the flood event up into periods, each of which is distinguished by ‘**a transition or change to the flood operations strategy used, as defined by the Manual**’.<sup>106</sup> The preceding paragraphs also explain that:

Each table also provides a summary of relevant background information and a summary of the information **that was used to make decisions** during the period covered by the table. This information includes:

- The strategy used and/or adopted during the period...<sup>107</sup>

(emphasis added)

The first of the columns in the tables is headed ‘Date/time’, the second ‘Background’. The latter contains information about conditions and strategy transitions. The heading of the third column is ‘Dam conditions’, the fourth ‘Rainfall and model results’. The final column is headed ‘Strategy’, and in that column are identified the strategies said to be operative at particular times, their imperatives and the actions taken within them. So, for the earlier parts of the flood event, the entries relevant to strategy selection and observance are:

- a. Page 10, period from 7.42 am, 6 January 2011, until 2.00 am, 7 January 2011, under heading Background: Strategy W1A and Strategy W1B:  
... Transitioned from Strategy W1A to W1B once the Wivenhoe lake level exceeded 67.50m.
- b. Page 11, period from 2.00 am, 7 January 2011, until 9.00 am, 7 January 2011, under heading Background: Strategy W1B:  
... Transitioned from Strategy W1B to W1C once the Wivenhoe lake level exceeded 67.75m.  
Under heading Strategy: Strategy W1B (Lake level greater than 67.50m, maximum release 380m<sup>3</sup>/s):  
... Water was held in Wivenhoe Dam in an attempt to keep Burtons Bridge trafficable, in accordance with Strategy W1B.
- c. Page 12, period from 9.00 am, 7 January 2011, until 3.00 pm, 7 Jan 2011, under heading Background: Strategy W1C:  
... Transitioned from Strategy W1C to Strategy W1D once the Wivenhoe Dam lake level exceeded 68.0m.

Under heading Strategy: Strategy W1C:

... Releases from Wivenhoe Dam were managed in an attempt to ensure Mt Crosby Weir and Fernvale Bridge remained trafficable, in accordance with Strategies W1D and W1E.

Entries representing a considered move to a higher strategy begin in period 4:

- d. Page 13, period from 3.00 pm, 7 January 2011, until 2.00 pm, 8 January 2011, under heading Background: Transition from Strategy W1D to W1E to W3:

... Transitioned from Strategy W1D to W1E when the Wivenhoe Dam level exceeded 68.25m (22:00 on 7 Jan 2011). Transitioned from Strategy W1E to W3 as it became apparent Wivenhoe Dam level would exceed 68.5m (08:00 on 8 Jan 2011). Strategy W2 was by-passed as it was not possible to achieve this strategy by limiting the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill.

Under heading Strategy: Strategy W3:

... The strategy transitioned from W1 to W3 as it became apparent Wivenhoe Dam level was likely to exceed 68.5m and Strategy W2 couldn't be applied. Strategy W3 also required lower level Manual objectives to be considered...consideration was given to minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable.

Entries thereafter represent active and conscious compliance with the requirements of strategy W3:

- e. Page 14, period from 2.00 pm, 8 January 2011, until 1.00 am, 9 January 2011, heading Background: Strategy W3. Under heading Strategy: Strategy W3:

... Strategy W3 required the flow at Moggill to be lowered to 4,000m<sup>3</sup>/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases). This was already achieved. Strategy W3 also required lower level Manual objectives to be considered. Therefore, with lake levels rising slightly (Wivenhoe Dam) and falling (Somerset Dam) consideration during this period remained on minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable. Wivenhoe Dam outflows were more than doubling the natural peak flows at Moggill. Increasing releases from Wivenhoe Dam to produce a flow rate at Moggill of up to 3,000m<sup>3</sup>/s would have meant transitioning back to operating strategy W1 in around 18 hours from this time. Therefore, increasing Dam releases could not be justified given the resulting impacts such a flow would have downstream, especially on localised flooding in Brisbane.

- f. Page 15, period from 1.00 am, 9 January 2011, until 8.00 am, 9 January 2011, heading Background: Strategy W3. Under heading Strategy: Strategy W3:

... Strategy W3 required the flow at Moggill to be lowered to 4,000m<sup>3</sup>/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases). This was already achieved. Strategy W3 also required lower level Manual objectives to be considered. Therefore, with lake levels falling at both Dams, consideration during this period remained on minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable. Wivenhoe Dam outflows were more than doubling the natural peak flows at Moggill. Increasing releases from Wivenhoe Dam to produce a flow rate at Moggill of up to 3,000m<sup>3</sup>/s would have meant transitioning back to operating Strategy W1 in around 18 hours from this time. Therefore, increasing Dam releases could not be justified given the resulting impacts such a flow would have downstream, especially on localised flooding in Brisbane.

- g. The following three periods, which extend from 8.00 am, 9 January 2011 to 1.00 am, 10 January 2011, chart a history under the 'Background' and 'Strategy' columns of increasing predicted inflows, rising lake levels, and a move away from the aim of minimising disruption to rural life, with recognition of the prospect that urban areas would be affected. No specific allusion is made in these periods to strategy requirements, but the actions and reasoning in each column are recorded under the heading 'Strategy W3'.

- h. Page 19, period from 1.00 am, 10 January 2011, until 9.00 am, 10 January 2011, heading Background: Strategy W3. Under heading Strategy: Strategy W3:

... The approach in the Manual which states the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m<sup>3</sup>/s and protect urban areas from inundation, was adopted. Advice received from Brisbane City Council that the upper limit of non-damaging floods was below the 4,000m<sup>3</sup>/s stated in the Manual was noted and taken into account in the decision making processes.

- i. Page 20, period from 9.00 am, 10 January 2011, until 3.00 pm, 10 January 2011, under heading Background: Strategy W3:

... At 15:00, the attempt to restrict Brisbane River flows at Moggill to 3,500m<sup>3</sup>/s was abandoned due to rainfall in the Dam catchments. A new target of 4,000m<sup>3</sup>/s was set in accordance with the Manual,

on the basis that Strategy W3 intends to limit the flow in the Brisbane River at Moggill to less than 4,000m<sup>3</sup>/s and minimise urban damage. Under heading ‘Strategy’: ‘Strategy W3’... Continued to follow the approach in the Manual which states the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m<sup>3</sup>/s.

- j. Page 21, period from 3.00 pm, 10 January 2011, until 8.00 pm, 10 January 2011, under the heading Background: Strategy W3:

... In accordance with the Manual, a target of 4,000m<sup>3</sup>/s was set, on the basis of the intent of Strategy W3 to limit the flow in the Brisbane River at Moggill to less than 4,000m<sup>3</sup>/s.

Under heading Strategy: Strategy W3:

... The approach in the Manual, which states the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m<sup>3</sup>/s, continued to be followed.

- k. Page 22, period between 8.00 pm, 10 January 2011, until 4.00 am, 11 January 2011, under heading Background: Strategy W3:

... In accordance with the Manual, a target flow of 4,000m<sup>3</sup>/s at Moggill was set on the basis of Strategy W3 to limit the flow in the Brisbane River at Moggill to less than 4,000m<sup>3</sup>/s.

Under heading Strategy: Strategy W3:

... Consideration focused on protecting urban areas from inundation and minimising urban damage. The target maximum flow at Moggill remained 4,000m<sup>3</sup>/s. The approach in the Manual, which states the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m<sup>3</sup>/s, continued to be followed... At 21:00, the Dam Safety Regulator was asked for permission to exceed a level of 74.0m in Wivenhoe Dam for a short period (maximum 12 hours) without invoking Strategy W4, provided the safety of the Dam could be guaranteed.

At section 4.3 of Chapter 4, Flood event procedures, this assertion is made:

When the Flood Operations Centre was mobilised, the Duty Flood Operations Engineer ensured the following actions were undertaken:

... Determined gate operations strategies for Somerset and Wivenhoe Dams based on the resulting data from the operations spreadsheet and **in accordance with the strategies outlined in the Manual**.<sup>108</sup>  
(emphasis added)

Chapter 10 of the March flood event report is titled, Flood Management Strategies and Manual Compliance. Section 10.4, Wivenhoe Dam – Manual Compliance, explains the table which follows it:

Table 10.4.1 summarises **the strategies used** in the operation of Wivenhoe Dam during the January 2011 Flood Event and provides explanations of how **the use of these strategies complies with the Manual**.<sup>109</sup>  
(emphasis added)

Table 10.4.1 has four headings: ‘Period’, ‘Strategies used during the period’, ‘Explanation of strategies used during the period’ and ‘Manual requirements’.<sup>110</sup> Apart from the references in those headings to use of strategies, the ‘Manual requirements’ are expressed in terms of commands to *use* strategies at different lake levels. Extracts from the table of particular relevance are set out below:

- a. Page 189, period between 10.00 pm, 7 January 2011, until 8.00 am, 8 January 2011, heading Strategies used during the period: Strategy W1E. Under heading Explanation of strategies used during the period:  
... The strategy transitioned from Strategy W1D to Strategy W1E once the lake level exceeded 68.25m. The strategy transitioned from Strategy W1E to Strategy W2 once the lake level reached 68.50m.
- b. Page 190, at 8.00 am, 8 January 2011, heading Strategies used during the period: Attempt to transition to Strategy W2. Under heading Explanation of strategies used during the period:  
... At this time, it was not possible to satisfy Strategy W2 by limiting the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill. The calculated naturally occurring peaks at Lowood and Moggill were 530m<sup>3</sup>/s and 800m<sup>3</sup>/s respectively, whereas the release rate from the Dam at this time was 927m<sup>3</sup>/s. Accordingly, it was not appropriate to switch to Strategy W2, and Strategy W3 was adopted for use at 08:00 on Saturday 8 January 2011.

- c. Page 191, period between 8.00am, 8 January 2011, until 8.00am, 9 January 2011, heading Strategies used during the period: Strategy W3, under heading Explanation of strategies used during the period:  
... The naturally occurring peak at Moggill was estimated to have occurred at 05:00 on 08 January 2011 (i.e. in the past). Strategy W3 requires the flow at Moggill to be lowered to 4,000m<sup>3</sup>/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases). This was already achieved. Strategy W3 also requires consideration of lower level Manual objectives, and on the basis of this requirement, consideration during this period was given to minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable.
- d. Page 194, period between 8.00 am, 11 January 2011, until 12.00 pm, 13 January 2011, heading Strategies used during the period: Strategy W4, under heading Explanation of strategies used during the period:  
... On the basis of the information from the previous period, at the start of this period it was decided to transition to Strategy W4.

Of note is the following observation in chapter 16, Review of the Manual's Objectives and Strategies:

As discussed in detail in Section 10, a range of strategies were used during the Event, in accordance with the Manual. Having to **apply** the strategies **during such an extremely large and rare event provided the opportunity to consider how the strategies are worded from a practical sense.**<sup>111</sup>

(emphasis added)

The description of the tables in chapter 2 as giving information in relation to the flood operations strategy 'used' or 'adopted' can only mean that the strategies identified in them were actually used or adopted by the flood engineers; they were not simply the product of the conditions. The verb 'transitioned' is used repeatedly in the 'Background' column to convey active movement between strategies. Particularly significant are the comments in relation to the change recorded between W1 and W3. The first is: '[t]ransitioned from Strategy W1E to W3 as it became apparent Wivenhoe Dam level would exceed 68.5m (08:00 on 8 Jan 2011)'. If this were an automatic process, there was no reason to use the verb 'transitioned', and it was unnecessary to refer to what was 'apparent' if human intervention were not required in response to that appearance. What is being conveyed is the engineer's reaction to a consideration of the lake level by moving between strategies. The next is: 'Strategy W2 was by-passed as it was not possible to achieve this strategy'. This sentence conveys a consideration of the feasibility of W2 and rejection of it.

The Chapter 10 table actually records a move to W2: 'The strategy transitioned from Strategy W1E to Strategy W2 once the lake level reached 68.50m'. The choice then made is expressed unequivocally: 'Accordingly, it was not appropriate to switch to Strategy W2, and Strategy W3 was adopted for use'. Those sentences cannot be read as meaning anything other than that, as the manual requires, strategy W2 was actively in play but rejected as inappropriate, in favour of a positive choice of W3.

Mr Tibaldi drafted the Executive Summary and parts 2 (Flood Event Summary), 10 (Flood Management Strategies and Manual Compliance) and 19 (Report Conclusion) of the March flood event report.<sup>112</sup> When it was put to him that he had intended to convey by the entries in the preceding paragraph the impression that the operator of the dam in fact made a decision and adopted strategy W3 at 8.00 am on 8 January, he said that he regarded the words 'adopted', 'used', 'transitioned' and 'applied' as interchangeable.<sup>113</sup> That may well be so; the difficulty is that all represent conscious actions.

The document represents actions carried out in recognition of and compliance with the W strategies; in particular, it repeatedly alludes to undertaking considerations and steps needed to meet strategy W3. Those are presented as being taken in direct response to the strategy's requirements; for example, 'Strategy W3 required the flow at Moggill to be lowered'... 'Strategy W3 also requires consideration of lower level Manual objectives, and on the basis of this requirement, consideration during this period was given to minimising disruption to downstream rural life...' Adherence to the manual's approach to strategy W3's intent is reiterated: 'The approach in the Manual which states the intent of Strategy W3 ... was adopted.' 'Continued to follow the approach in the Manual which states the intent of Strategy W3.' The language is consistent with only one interpretation: continuing advertence to the intent and requirements of strategy W3 as in place from 8.00 am on 8 January.

## 16.6 Evidence of strategy choice: the flood operations engineers

As the preceding sections explain, the manual required conscious adoption of, and operation within, strategies, and the March flood event report conveyed that both had occurred. This section deals with the evidence the flood engineers gave about actual strategy choice.

### 16.6.1 Mr Ruffini

Mr Ruffini asserted, in his statement of 24 March 2011, that the dams (Wivenhoe, Somerset and North Pine) were operated in accordance with the approved flood mitigation manuals.<sup>114</sup> In an interview, he said that he had gone through the main body of the flood event report, the flood event summary and the section concerning compliance with the manual ‘pretty well’,<sup>115</sup> he endorsed the manual compliance section as being accurate, and had no reason now to think it was not accurate.<sup>116</sup>

Mr Ruffini started a shift at 7.00 pm on 7 January 2011, taking over from Mr Malone, and stayed on duty until 7.00 am the following day. He began his evidence in February 2012 by saying that, during his 7-8 January 2011 shift, ‘we started to transition into the W3 strategies’.<sup>117</sup> Subsequently, he elaborated on the basis for that statement. When he started his shift, a spreadsheet produced by Mr Malone, which he reviewed, showed the lake level getting towards 68.5 metres, the transition point into W3, at the end of his shift. He explained:

So when I took over in terms of that, then we would have been W1 strategy. At the end of the shift - towards the end of the shift after Rob took over, it would have - the lake level would have hit the 68.5 and you would have transitioned into the W3. But what I was wanting to say is that you asked - make clear is that do I today I have a direct, clear memory that at that time did I say - did I write down anywhere that I was in W1, did I write down anywhere that I was in W3? At the time, no, I didn't. I didn't write those down. But what I was pointing to is that in the situation report I had written a little bit - there was a bit in there about the downstream boundary and what was happening at the downstream end, so that was - so I looked - so there was that bit. And when I look at those operational spreadsheets and I look at the drain pattern that we're going to after that, then that sort of fits in with that proposition. But I was saying I don't - I didn't want to say that yes, I had a direct - I can today recall exactly - for that - there are very few periods now twelve months on where you can say in this period can you exactly recall on that day at that time what you were doing. At this point on I don't, no.<sup>118</sup>

Mr Ruffini was asked to say, while looking at his own hard copy of the manual, whether he had during his shift turned his mind to any part of section 8.4. He responded, ‘as a matter of normal operating practice we would turn our minds to those issues’. Asked to say whether he had a conscious recollection of considering section 8.4, he said that he could describe what he was thinking about by looking at the operational spreadsheet he had before him on the morning.<sup>119</sup> Mr Ruffini was shown a spreadsheet but said it was a later version; there was an earlier one which contained a model run showing the lake level reaching 68.5 metres some time on the morning on 8 January.<sup>120</sup>

Mr Ruffini was asked specifically, and repeatedly,<sup>121</sup> to identify the parts of section 8.4 to which he would have referred during his shift. He answered, unresponsively, that he ‘would have’ looked at the lake levels and the spreadsheet showing that ‘we’re heading to that transition at 68.5’.<sup>122</sup> He then did refer to looking at something actually in section 8.4 – the flowchart – but digressed again into saying he would have looked at the release pattern and a situation report.<sup>123</sup> He would like, he said, to look at his spreadsheet to refer to the release pattern and the lake level.<sup>124</sup> He concluded by saying:

The things that I would have looked at when I came on, I would have looked at - if you had the spreadsheet in there, I would have said here's the lake levels, and then I would have referred to these levels and strategies about where the lake level – where we were with lake levels. So during my shift I'm looking at that. The release pattern, that sort of – that I'm proposing – that was given to me and then I futurely [sic] endorsed and went out there was proposing that we would move to – after the shift, or very soon after the shift, you would hit that 68.5 and move to a – move to a W3.<sup>125</sup>

None of that, it may be seen, was very much help in identifying what reference, if any, Mr Ruffini had had during his shift to the section of the manual dealing with strategy selection. It is not suggested that Mr Ruffini was being evasive; he typically had a rambling, discursive style of giving evidence, and he plainly was having difficulty grasping

what he was being asked: to point out what parts of section 8.4 of the manual he was considering, not what data he might have been looking at.

However, submissions from counsel for the State and Seqwater asserted that Mr Ruffini had been ‘prevented’ while giving evidence from seeing the spreadsheet he had prepared on the morning of 8 January;<sup>126</sup> indeed the State went so far as to assert that this was a ‘denial of natural justice’ to Mr Ruffini.<sup>127</sup> Both assertions are a nonsense, and may quickly be dealt with. An electronic copy of the document was in the possession of the solicitor acting for the State and it had been foreshadowed that counsel for the State might refer Mr Ruffini to it.<sup>128</sup> Moreover, before counsel for the State took his turn to question Mr Ruffini a Commission solicitor advised him that the spreadsheet could be brought up on a screen.

In the event, no counsel sought to show Mr Ruffini the spreadsheet, although counsel for the State did confirm with Mr Ruffini that he had been given the spreadsheet prior to hearings and gone through it to confirm what was in his mind during the flood event.<sup>129</sup> If counsel for the State – or any other counsel – seriously considered that referring Mr Ruffini to the spreadsheet would make his answers any clearer, or would in any broader way support his evidence, there was absolutely nothing to prevent his showing Mr Ruffini the document.

Mr Ruffini was asked whether he asserted there would have been a conversation with Mr Ayre at the handover of his shift at 7.00 am on 8 January during which the term W3 was used. He responded:

I definitely believe I would have talked about exceeding the threshold and I probably would have - yes. Yes. I think so.<sup>130</sup>

Mr Ayre’s evidence, as will shortly appear, was to different effect.

Under examination from counsel for Seqwater about his state of mind during his second shift in the flood event (from 7.00 pm on 9 January to 7.00 am on 10 January), Mr Ruffini said that his understanding during that shift was that he was operating the dam in strategy W3.<sup>131</sup> He was minimising the impact of urban flooding, something which, he maintained, the flood engineers had been doing since transition into W3, which, on his understanding, occurred when the lake level had crossed 68.5 metres on 8 January.<sup>132</sup>

When questioned about the March flood event report, Mr Ruffini said that Mr Tibaldi’s method, as he understood it, was to look at what happened and decide what strategy it matched.<sup>133</sup> After putting all the information together, Mr Tibaldi had provided it to the other engineers to see if it ‘matched their recollection’. He had looked at the information Mr Tibaldi assembled in his strategy spreadsheet for the March flood event report to inform himself about the state of mind he was in when he was making decisions and ‘came up with what [his] recollections of that sort of thing were’.<sup>134</sup> His evidence as to what he had told Mr Tibaldi was as follows:

Mr Callaghan: What did you say in response to the query as to whether or not it matched your recollection?

Mr Ruffini: When I reviewed it I thought what he had written was accurate.

Mr Callaghan: Did you say, ‘yes, that matches my recollection?’

Mr Ruffini: Did I say, ‘That matches my recollection?’

Mr Callaghan: Yeah. That was the question he asked you?

Mr Ruffini: Well, yeah, I would think – did I – yes, I think that – well, obviously, yeah, I would have said that, yeah.

Mr Callaghan: So you told him, ‘Yes, that does match my independent recollection?’

Mr Ruffini: That matches my recollection, yeah.

Mr Callaghan: So it wasn’t the case that you looked at it and came up with what your recollections were?

Mr Ruffini: No. Well, I don’t remember at the time as to – like, if he didn’t remember – are you saying, okay, if we didn’t remember at the time exactly what we were doing...<sup>135</sup>

Taken back to the issue of his response to Mr Tibaldi, Mr Ruffini said that he had looked at the material he had been using during the flood event – spreadsheets, situation reports, Bureau of Meteorology information and the flood event log – and concluded, ‘Yep, that looks reasonable.’<sup>136</sup>

It is clear that Mr Ruffini’s evidence as to his state of mind, in so far as it related to strategies, was not an actual and independent recollection but the product, after the event, of his examination of the data and Mr Tibaldi’s analysis.

## 16.6.2 Mr Ayre

Mr Ayre began his shift at 7.00 am on 8 January 2011, an hour before the lake level reached 68.5 metres, requiring a change to a higher strategy. At the start of his shift, he and Mr Ruffini had not discussed any W strategy; they had talked about the amount of water stored in the dam, the current release rates, and the gate sequence that Mr Ruffini had proposed.<sup>137</sup> He could not recall any specific discussion about ‘transitioning’.<sup>138</sup> Mr Ayre said that as far as he was aware, flood engineers did not make reference to the W strategies at shift handovers. Seqwater’s flood procedure manual<sup>139</sup> prescribed that flood release procedures being applied should (with other information) be made known to incoming flood engineers at handovers, but that was a reference to existing or proposed gate sequences.<sup>140</sup>

In his statement of 23 March 2011, Mr Ayre included a table which set out a ‘summary of strategies implemented’.<sup>141</sup> It includes a column which records the ‘Time of Transition’. The strategy changes are documented as occurring at the times set out in the March flood event report, and the description of the by-passing of strategy W2 is in identical terms to those used in part 2 of the March flood event report. (A table included in one of Mr Ayre’s later statements similarly listed the ‘actual times strategies were implemented by the FOC [flood operations centre]’<sup>142</sup> consistently with what was recorded in the March flood event report.)

In a statement made on 29 March 2011, Mr Ayre gave this account of the strategy change:

By about 8 am, Wivenhoe Dam had reached 68.52m AHD. Because this level was above the predicted lake level of 68.5 AHD relevant to strategy W1, I was conscious of the fact that we were transitioning the strategies from W1 to W2 or W3.<sup>143</sup>

He went on to say that he noted from a schedule attached to his first statement, which showed dam levels, inflow and release rates, that:

by 8 am on Saturday Wivenhoe Dam was within the parameters of strategy W3 because the level of the lake was slightly above 68.5m AHD and Wivenhoe Dam was releasing above the naturally occurring peak flow at Lowood.<sup>144</sup>

When he gave evidence in April 2011, Mr Ayre was cross-examined about the first part of that account, particularly the reference to ‘transitioning the strategies’, and when W3 was actually engaged. He said it was engaged with the gate opening directive Mr Ruffini had issued during his shift, which would have had the effect of increasing releases to 1250 m<sup>3</sup>/s by 2.00 pm that afternoon. (The implications of that directive are discussed in *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*.) He believed that to have occurred during the handover between them.<sup>145</sup>

Mr Ayre’s evidence about how the transition occurred then became somewhat confusing: asked whether it was the case that he was not in fact transitioning from W1 to W2 or W3, but was actually in W3 at 8.00 am, he said that it was ‘not a step jump process’. The engineers ‘transition[ed] gradually from each of the strategies’; and since they had just entered the bottom of the range between 68.5 metres and 74 metres, they were still in that transition process. In further questioning, Mr Ayre continued to maintain both that the transition had occurred at 8.00 am and that the reference to ‘transitioning the strategies’ was correct because it was a ‘gradual transition from each of the strategies’.<sup>146</sup>

The ‘gradual transition’ view was consistent with an answer Mr Ayre gave later in that hearing to a question about there being no stepped procedure for transition between strategies:

Mr Ayre: That’s correct. We progressively or incrementally change the release rates to accommodate the change in objectives.

Mr Dunning: And, in effect, there is no bright line between when you have ceased to be in one strategy and you are in the next?

Mr Ayre: Indeed. Yes, I agree with that.<sup>147</sup>

Mr Ayre’s evidence in April 2011 suggested a view of strategy W2 as a transition between W1 and W3:

Mr Ayre: Strategy W2 really is a transition strategy between strategies W1 and W3, where it may be possible to prevent the inundation of all except the two larger bridges, which is Mt Crosby Weir Bridge and Fernvale Bridge. So it has a limiting capacity in there. But it is designed to limit the flows to the naturally occurring flows that emanate out of the Lockyer and Bremer River if possible.<sup>148</sup>

...

Mr Rangiah: All right. And then you then get to Strategy W2 and Strategy W2 is itself a transition strategy, isn't it?--

Mr Ayre: That's what it's described as, yes.

Mr Rangiah: So, that's a period of time in which you're in transition from W1 to W3, in effect?

Mr Ayre: Yes.<sup>149</sup>

In his seventh statement, made in February 2012, Mr Ayre said that when he was on duty on 8 January 2011, he had noted that the predicted peak lake level, 68.8 metres, was above the limit of strategy W1's application, so that he would need to transition to a higher strategy, W2 or W3;<sup>150</sup> he also noted that the lake level had exceeded 68.5 metres at 8.00 am 'and so therefore the strategy had transitioned out of W1 and progressed to W3'.<sup>151</sup>

In his evidence given in February 2012, Mr Ayre reiterated that he was aware at the handover from Mr Ruffini on 8 January that the lake level was approaching 68.5 metres so that 'we would be transitioning from W1 to W2 or 3'.<sup>152</sup> Asked, however, whether it was the case that strategy W3 was adopted by him for use at 8.00 am that day, he responded:

Well, the conscious decision to move to Strategy 3 was taken at 5 p.m. when John [Ruffini] issued the directive to increase the flows above the naturally occurring ones.<sup>153</sup>

(Mr Ayre corrected his reference to time to 5.00 am.) But the strategy, he went on to explain, remained a W1 strategy until the lake level exceeded 68.5 metres, at which point it became a W3 strategy, because Mr Ruffini had selected a release rate higher than the naturally occurring flow at Lowood.<sup>154</sup>

All of this had a distinct air of after-the-fact rationalisation, however, given Mr Ayre's acknowledgement that he could not consciously recall knowing, at 8.00 am on 8 January, whether he was in W2 or W3. He knew, he said, they had 'transitioned out', but there was nothing happening which meant he needed to differentiate between W2 and W3.<sup>155</sup> That was more generally true of the whole of his shift that day:

I'm saying that I don't have a conscious recollection now of whether I thought we were in W2 or W3. I - there was nothing that, I suppose, occurred on that day which would have prompted me to make a decision as to are we in 2 or 3. We're meeting the objectives or the primary objectives of both scenarios. I wasn't actually responsible for making the conscious decision to move to 3. That was done by John Ruffini at the 5 o'clock directive. We were operating in a range which didn't bring the limits into play. So I guess I wasn't really contemplating anything other than we weren't in W1.<sup>156</sup>

To similar effect was Mr Ayre's response to a question about whether a flood engineer did or did not have in mind the question, 'What is the current strategy I'm using':

I believe we are aware of the objectives. We are aware of all of the associated parameters or conditions that describe the relevant strategies but do I go around necessarily thinking W3? No, not necessarily.<sup>157</sup>

Mr Ayre recalled that when Mr Tibaldi was drafting his sections of the March flood event report, he commented to the effect that strategy W2 had not been implemented. Looking at the flow data Mr Tibaldi had before him on his computer screen, Mr Ayre concurred; he recognised that the dam release was higher than the naturally occurring flow at Lowood.<sup>158</sup> It was, he said, a couple of weeks after the event, and he didn't 'necessarily recall with clarity', although he 'knew we transitioned at that time'.<sup>159</sup>

Mr Ayre said that Mr Tibaldi would have provided him with a draft of the March flood event report which said that strategy W3 was engaged at 8.00 am on 8 January. He did not dissent from that proposition, as he explained:

Mr Ayre: No, because I knew the transition out of W1 had occurred at that time. I - in terms of the process, I would have been reviewing the sections which I knew, had most knowledge of and, according to my own forensic examination, that's what we came up with, yeah.

Mr Rangiah: But you certainly made no conscious decision to move from the W1 strategy to the W3 strategy on the 8th of January?

Mr Ayre: I didn't, no. That was effectively implemented through when the lake level had crossed 68.5.<sup>160</sup>

In questioning of Mr Ayre by counsel for Seqwater, this exchange took place:

Mr O'Donnell: On the basis of your evidence we've discussed before, your role as flood engineer wasn't one of deciding to transition it to the higher strategy, your role was to use the higher strategy in managing the dam for the balance?

Mr Ayre: Yes.

Mr O'Donnell:...while the water remained over 68.5?

Mr Ayre: On that occasion, yes.

Mr O'Donnell: And you've given evidence yesterday in your earlier statements that you were conscious that the water level had gone over 68.5 and, therefore, you were required to apply a higher strategy?

Mr Ayre: Yes.

Mr O'Donnell: And you also said in evidence yesterday that during that day, you appreciated your primary consideration had to be protection of urban inundation?

Mr Ayre: Yes.

Mr O'Donnell: And do you have a natural [probably 'an actual'] recollection of those being your thoughts on Saturday, the 8th, while acting as a flood officer?

Mr Ayre: Yes. I suppose having done the previous Thursday night shift and also having talked to Terry Malone when the event was being mobilised and, indeed, when Terry first proposed a strategy at the start of the event, I was very much aware that the sequencing they were putting in place was going to be designed to meet the objective as such.

Mr O'Donnell: So it's your sworn evidence to the Commission that during your shift on the Saturday, after 8 am, you were conscious that you had to apply a higher strategy?

Mr Ayre: Yes. I was conscious that we were looking at the objective of optimising the protection of urban areas.

Mr O'Donnell: And that you did apply the higher strategy in managing the dam during your shift?

Mr Ayre: I believe I did, yes.<sup>161</sup>

Despite the leading nature of the questions, the answers do not really advance matters beyond the evidence earlier cited. Both W2 and W3 meet the description of a 'higher strategy', and the primary objective of optimising the protection of urban areas is common to both.

Mr Ayre's evidence contains a number of concessions that he did not consciously adopt strategy W3 on 8 January, nor did he operate the dam with it in mind. Those concessions fit with his acknowledgement that 'strategy labels are generally only attributed after the event as part of the reporting process'.<sup>162</sup> The approach is consistent with what is now known about how the March flood event report was produced, and inconsistent with the manual's requirement that a strategy actually be adopted during the event. And it is at odds with other assertions by Mr Ayre about having 'engaged' or 'implemented' strategy W3 at 8.00 am.

Counsel for Mr Ayre argued that it was improbable that he, as a senior and experienced flood engineer, could have overlooked the significance of the lake level at 68.5 metres;<sup>163</sup> other counsel suggested that it was inconceivable any of the engineers could have done so.<sup>164</sup> But Mr Ayre said that this was the first time he would have been involved in a transition to strategy W3 and his understanding was that this was the first time for use of the strategy since 1999 – when he was not directly involved.<sup>165</sup> (Other evidence suggests that the dam was in fact operated under strategy W3 during flood events in October and December 2010,<sup>166</sup> on occasions when Mr Ayre was on duty, although he was not present at the transition to that strategy occurred, according to the flood event report.)<sup>167</sup>

Mr Ayre's experience was not such that his recognition of the need to adopt strategy W3 can be assumed from it. While some of his statements and evidence are to the effect that decisions about strategies were in fact made at the time of the event, the effect of his evidence is overwhelmingly to contrary effect: he made no conscious adoption of strategy W3 and indeed did not appreciate, in operating the dam, a need to draw a distinction between strategies W2 and W3. Contemporary documentary evidence, which is the subject of later sections in this report, suggests an even more fundamental failure to appreciate what stage the flood event had reached in terms of the manual strategies.

### 16.6.3 Mr Tibaldi

Mr Tibaldi took over duties from Mr Ayre at 7.00 pm on 8 January. He had no recollection of the handover.<sup>168</sup> Mr Ayre, however, said that he would have told Mr Tibaldi about the existing release rates and the three-day forecast. There was ‘no naming of the strategy labels’.

In his statement of 25 March 2011, Mr Tibaldi said that W3 was ‘adopted’ at about 8.00 am on Saturday 8 January 2011.<sup>169</sup> In the same statement, Mr Tibaldi repeated the language of the March flood event report in relation to strategy W2: it was ‘bypassed’. He explained that it was not possible to ‘invoke’ or ‘implement’ it ‘in a practical sense’;<sup>170</sup> a form of words which suggests that a decision was made at the time on considerations of feasibility.

In giving evidence in February 2012, Mr Tibaldi said that the evidence of change of strategy during the flood event lay in the data: the lake levels, the flows and releases. That information would indicate that a change of strategy had occurred, regardless of what was in people’s minds.<sup>171</sup> He had found nothing recorded beyond what was contained in the March flood event report.<sup>172</sup> At the start of his first shift he expected that he would have read a situation report prepared by Mr Ayre at 5.53 pm (which is the subject of later consideration).<sup>173</sup> The focus was on increasing releases while keeping the Mt Crosby Weir and Fernvale bridges open; he imagined Mr Ayre would have explained that at handover.<sup>174</sup> But he had no actual recollection of what strategy he was operating the dam in:

Mr Tibaldi: In terms of what strategy we were in, whether – I couldn’t say if it was in the forefront of my mind or not if I put my mind to it. I could easily see that we weren’t in strategy W1 because it was over 68.5, and I could easily see we weren’t in strategy W2, if I had checked, because of the fact that we were just releasing too much water. As I said, whether that was in my mind at that time, I couldn’t say. But certainly there’s no question at that time, even though we’re in strategy W3 – as we’re allowed to, and as the manual requires – that we were protecting the bridges – the two highest bridges.

Mr Callaghan: You’re in W3 because you worked out that’s what you must have been in?

Mr Tibaldi: Since - you mean in the flood report?

Mr Callaghan: Yes?

Mr Tibaldi: Yes, that’s correct.<sup>175</sup>

As was noted earlier (in 16.3 *The manual requires a choice of strategy*) Mr Tibaldi’s evidence on the topic of whether it was necessary for a flood engineer to undertake a conscious choice and implementation of strategy varied. His evidence did not suggest any conscious choice or use of strategy. His view that the dam had been operated in strategy W3 from 8.00 am on 8 January was based on a process of reconstruction from the data, although the March flood event report gave a different impression.

### 16.6.4 Mr Malone

Giving evidence in April 2011, Mr Malone said that he knew, when he came on duty at 7.00 am on 9 January 2011, that the dam was operating in W3 because ‘it would have been discussed at the handover that morning’; ‘or’ (suggesting, presumably, an alternative explanation for his knowledge) it was ‘obvious’.<sup>176</sup> In February 2012, however, he said that he did not recall any specific conversation about strategy with Mr Tibaldi, from whom he took over; their discussion would have been about flows and volumes.<sup>177</sup> He also gave evidence that he knew the ‘basic requirements of the lake levels and the flow rates for the determination of strategies’, and did not need to turn to the Wivenhoe manual to ‘see what were the requirements for W2 or W3’.<sup>178</sup>

Asked some questions about his interpretation of the situation report issued by Mr Ayre at 5.53 pm on 8 January 2011, Mr Malone said that he knew the dam was being operated above strategy W1 and in strategy W2 or W3 on that day.<sup>179</sup>

Similarly, Mr Malone explained a reference to the application of W2 on 8 January in a summary document he had authored (the subject of discussion in a later section). It was possible that a reason for his reference to strategy W2 was that W2 was described as a transition from W1 to W3; and at the time he produced the summary (on 15 January 2011) no-one had worked out that W2 had been ‘skipped’. No-one was really sure at the time of the flood event whether W2 or W3 was ‘in play’. Although the March flood event report unequivocally recorded the bypassing of W2, that was not the state of mind of anyone at the time.<sup>180</sup> Subsequently, he qualified his evidence to say that that was his impression, but not necessarily the understanding of the other flood engineers; no-one had corrected his impression.<sup>181</sup>

That evidence suggests that Mr Malone had no contemporary belief that strategy W3 had been adopted on 8 January. It is consistent with what he said about his response to a report by Mr Brian Cooper, who was asked to audit compliance with the flood manual. The report contained a statement that ‘W2 would have been in place’ a day or so before 12 January 2011. Mr Malone said that he read Mr Cooper’s report during the flood event. While ‘there were some questions’ about Mr Cooper’s discussion of the application of strategies and whether he had interpreted the manual correctly, he saw ‘nothing untoward’ in the report; nor did anything stand out as requiring his attention.<sup>182</sup>

When it was put to Mr Malone that he had, during the January 2011 event, no real appreciation of what was involved with the strategy W2, he agreed that that might well be true.<sup>183</sup> Later he explained that W2 was confusing; it was referred to in the manual as a transition, and the conditions for its application were unclear. He did not, however, consider it to have been applicable on either of his shifts, on 7 and 9 January.<sup>184</sup>

Mr Malone’s evidence raises doubt about whether the engineers consciously adverted to or adopted strategy during 8 January 2011. His evidence about his own state of mind, as at the start of his shift on 9 January 2011, does not suggest that he had then attempted any differentiation between W2 or W3.

Returning to the contention that the flood engineers could not have overlooked the implications of lake level for application of strategy, one can readily say what the flood engineers should have appreciated, and what they should have done. But the lack of any actual recollection about whether W2 or W3 was in place and the method by which the history of the flood event was later made the subject of record gives little confidence that what should have occurred is what did occur. Assertions that strategy W3 was in fact operative from 8.00 am on 8 January must be measured against the objective and contemporary evidence as to strategy choice.

## 16.7 Objective evidence as to strategy choice on 8 and 9 January 2011

There are a number of contemporaneous documents from which inferences might be drawn as to which operating strategies were engaged and when during the January 2011 flood event, and as to the states of mind of the four flood engineers about those matters.

They fall into four categories:

- information and data used by the flood engineers to make decisions (including inflow and outflow data, rainfall forecasts and results from the real time flood model)
- objective evidence of decisions made by the flood engineers (for example, release rates, gate operations directives and gate operations spreadsheets)
- documents prepared at the flood operations centre relevant to the operation of the dam (for example, situation reports, entries in the flood event log)
- documents prepared by others relevant to the operation of the dam (for example, technical situation reports, notes of teleconferences involving persons other than the flood engineers).

A schedule of documents contained in the flood event report and prepared in the period between 6.00 am on 8 January 2011 and 9.00 pm on 9 January 2011 was compiled by the Commission and tendered as Exhibit 1046. The schedule summarised four situation reports, two technical situation reports and 23 flood event log entries.

The flood event log and the situation reports were places in which it would have been appropriate to record the operating strategy in place at any given time.<sup>185</sup> None of those documents mentions operating strategy W3, nor, until late on 9 January 2011, the prioritisation of the prevention of urban inundation.<sup>186</sup> Two of the items listed in Exhibit 1046, the situation report of 5.53 pm on 8 January 2011<sup>187</sup> and the flood event log entry of 3.30 pm on 9 January 2011, refer to other operating strategies (W1 and W2). These two documents are dealt with separately below in sections 16.7.2 and 16.7.3.

Submissions have been made to the Commission as to the inferences that can be drawn from particular contemporaneous documents as to the state of mind of the flood engineers. Many of those documents, for the reasons explained below, do not enable an inference to be drawn.

Those documents that do enable an inference to be drawn do not support the view that W3 was implemented on the morning of 8 January 2011.

## 16.7.1 Documents from which no inference as to strategy can be drawn

### Situation reports

There were six situation reports issued between 4.00 am on 8 January 2011 and 4.00 am on 10 January 2011.

Situation Report 8 was issued by Mr Ruffini at 6.32 am on 8 January 2011. Relevantly it states:<sup>188</sup>

#### Wivenhoe (Full Supply Level 67.00 m AHD)

At 0600 Saturday, Wivenhoe Dam was 68.45 m AHD and rising steadily with all five gates open and releasing about 890 m<sup>3</sup>/s. River levels upstream of Wivenhoe Dam were rising again, generating further inflow to the dam. It is intended to ramp up the release from Wivenhoe to 1,200 m<sup>3</sup>/s by midday Saturday 08/01/2011. Further assessments will be undertaken to determine increases above this level. However, given the high likelihood of significant inflows in the next week, this may be increased.

...

#### Impacts downstream of Wivenhoe

The projected Wivenhoe release of 1,200 m<sup>3</sup>/s combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected but they could potentially be affected if the predicted rainfall totals eventuate.

The current available assessments indicate that the combined flow in the lower Brisbane R would only add 50mm to an upper limit of 100mm to the recorded water levels in the City Reach of the Brisbane Rive [sic]. However, it is noted that tides in the lower Brisbane R will be 0.4 to 0.5 metres higher than predicted tides.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Counsel for Seqwater submitted that this situation report suggested that Mr Ruffini was ‘giving careful consideration to balancing the protection of rural and urban areas’ and that he recognised that there would not be, at that stage, impacts in Brisbane.<sup>189</sup> If it were to be regarded as equivocal as to whether Mr Ruffini was operating the dam in W1 or W3, it still could not be used to infer that he was contemplating that the dam would continue to operate in W1.<sup>190</sup>

Situation report 9 was issued by Mr Ayre at 12.16 pm on 8 January and states:

#### Wivenhoe (Full Supply Level 67.00 m AHD)

At 1200 Saturday, Wivenhoe Dam was 68.60 m AHD and rising steadily with all five gates open and releasing about 1,150 m<sup>3</sup>/s. River levels upstream of Wivenhoe Dam have peaked and are now receding. However the further inflows into the dam has led to elevated levels. It is intended to increase the release from Wivenhoe to 1,250 m<sup>3</sup>/s by 14:00 on Saturday 08/01/2011. This will maintain flows of up to 1,600 m<sup>3</sup>/s in the mid-Brisbane River throughout the afternoon.

Further assessments will be undertaken to determine increases above this level given the high likelihood of significant inflows in the next few days. The interaction with runoff from the Bremer River and Warrill Creek catchment will also be assessed to determine an appropriate release strategy. Projections based upon the forecast rainfalls suggest flows of up to 1,200 m<sup>3</sup>/s will emanate from the Bremer River catchment.

...

#### Impacts downstream of Wivenhoe

The projected Wivenhoe release of 1,250m<sup>3</sup>/s and combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected, but they could potentially be affected if the predicted rainfall totals eventuate and higher releases from Wivenhoe Dam are considered necessary.

The current available assessments indicate that the combined flow in the lower Brisbane River would only add 50mm to an upper limit of 100mm to the recorded water levels in the City Reach of the Brisbane River. However, it is noted that tides in the lower Brisbane R will be 0.4 to 0.5 metres higher than predicted tides. The tide level at the Port Office Gauge at 1200 Saturday was 1.56 m and rising.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

The next situation report was issued at 5.53 pm on 8 January, again by Mr Ayre, and is dealt with below in *16.7.2 Situation Report at 5.53 pm on 8 January 2011*. It does not have a number because it was not included in Appendix E to the flood event report. In its relevant parts, it states:

#### **Wivenhoe (Full Supply Level 67.00 m AHD)**

At 1800 Saturday, Wivenhoe Dam was 68.65 m AHD and rising slowly with all five gates open and releasing about 1,250 m<sup>3</sup>/s. River levels upstream of Wivenhoe Dam have peaked and are now receding. However the further inflows may result from any additional rainfall. The current gate operation strategy will maintain flows of up to 1,600 m<sup>3</sup>/s in the mid-Brisbane River throughout the evening.

Since the commencement of the event on 02/01/2011, approximately 227,000ML has flowed into Wivenhoe Dam (including Somerset releases) with a further 200,000ML expected based on the recorded rainfall to date. Approximately 93,000ML has been released from Wivenhoe via the radial gates, hydro and regulator.

#### **Impacts downstream of Wivenhoe**

The current Wivenhoe release of 1,250m<sup>3</sup>/s combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days (until Wednesday 12 January). At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected, but they could potentially be affected if the predicted rainfall totals eventuate and higher releases from Wivenhoe Dam are considered necessary.

The current available assessments indicate that the combined flow in the lower Brisbane River would only add 50mm to an upper limit of 100mm to the recorded water levels in the City Reach of the Brisbane River. However, it is noted that tides in the lower Brisbane R will be 04. to 0.5 metres higher than predicted tides. The tide level at the Port Office Gauge at 1700 Saturday was 0.06m and falling.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

#### **Forecast scenario – Based upon mid-range rainfall forecasts.**

Assessments have been undertaken to determine possible increases to releases given the high likelihood of significant inflows in the next few days. The interaction with runoff from the Bremer River and Warrill Creek catchment is an important consideration as the event magnitude will require the application of Wivenhoe Dam flood operation strategy W2 (Transition strategy between minimizing downstream impacts and maximizing protection to urban areas).

Projections based upon the forecast rainfalls suggest flows of up to 1,200m<sup>3</sup>/s will emanate from the Bremer River catchment. If similar rainfall magnitudes occur in the Upper Brisbane and Stanley Rivers then increased releases may be required from both Somerset Dam and Wivenhoe Dam. Preliminary projections suggest that such a forecast will extend the release duration until next Saturday 15 January, but mid-Brisbane River flows will be kept to a maximum of 1,800m<sup>3</sup>/s. However, if falls are greater than those forecast releases from Wivenhoe Dam may need to adversely impact Mr Crosby Weir Bridge (1,900m<sup>3</sup>/s) and possibly Fernvale Bridge (2,100m<sup>3</sup>/s) but will be maintained below 3,500 m<sup>3</sup>.

Situation report 10 was issued by Mr Tibaldi at 6.15 am on 9 January 2011, and states:<sup>191</sup>

#### **Wivenhoe Dam (Full Supply Level 67.00 m AHD)**

The dam level is currently falling slowly, with the current level being 68.58m AHD. River levels upstream of the dam are receding, however further inflows will result from any additional rainfall. The current gate operation strategy will maintain flows of around 1,600m<sup>3</sup>/s in the mid-Brisbane River. The current release rate from Wivenhoe Dam is 116,000ML/day. Since the commencement of the event on 02/01/2011 approximately 150,000ML has been released from the dam, with a total of at least 450,000ML to be released based on the currently recorded rainfall. The total release for the event is likely to increase over the next few days based on the current rainfall forecasts. At this stage, releases will continue until at least Wednesday.

### Impacts downstream of Wivenhoe Dam

The current Wivenhoe Dam release combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted until at least Wednesday 12 January. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected, but this may be revised if the predicted rainfall totals eventuate and higher releases from Wivenhoe Dam are considered necessary.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Situation report 11 was issued by Mr Malone at 5.51 pm on 9 January 2011, and states:<sup>192</sup>

#### **Wivenhoe Dam (Full Supply Level 67.00 m AHD)**

The dam level is currently rising again, with the current level being 68.70m AHD. Estimated peak inflow to the dam just from the Upper Brisbane R is about 5,000m<sup>3</sup>/s and, at this stage, the dam will reach at least 72.5 m AHD during Wednesday morning. River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. The current gate operation strategy will maintain flows of around 1,600m<sup>3</sup>/s in the mid-Brisbane River for the next 24 hours. This may mean temporarily reducing releases from Wivenhoe Dam as Lockyer flows increase. However, releases may have to be increased significantly during Monday depending on the rain in the next 12 to 24 hours. The current release rate from Wivenhoe Dam is 1,400m<sup>3</sup>/s (120,000ML/day).

Since the commencement of the event on 02/01/2011 approximately 210,000ML has been released from the dam, with an event total approaching 1,000,000ML (including Somerset outflow) based on the recorded rainfall to date. The total release for the event is likely to increase over the next few days based on the current rainfall forecasts. At this stage, releases will continue until at least Saturday 15th January 2011.

### Impacts downstream of Wivenhoe Dam

The current Wivenhoe Dam release combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted until at least Saturday 15 January.

**At this stage Fernvale and Mt Crosby Weir Bridge will not be affected for the next 24 hours but there is a strong possibility that, if the predicted rainfall totals eventuate in the next 12 to 24 hours, higher releases from Wivenhoe Dam will be necessary. This may adversely impact upon Fernvale and Mt Crosby Weir Bridges as early as Tuesday morning.**

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

(emphasis in original)

Situation report 12 was issued by Mr Malone at 9.04 pm on 9 January 2011 and states:<sup>193</sup>

#### **Wivenhoe Dam (Full Supply Level 67.00 m AHD)**

River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have already reached 6,700m<sup>3</sup>/s and the river is still rising.

The dam level is rising again, with the current level being 69.10m AHD (1,410,000ML with about 300,000 [sic] of flood storage). Estimated peak inflow to the dam just from the Upper Brisbane R alone may reach as high as 7,500m<sup>3</sup>/s and, at this stage, the dam will reach at least 73.0 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it will be necessary to increase the release from Wivenhoe Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m<sup>3</sup>/s and the combined flows is [sic] the lower Brisbane will be limited to 4,000m<sup>3</sup>/s. This is below the limit of urban damages in the City reaches.

The current release rate from Wivenhoe Dam is 1,400m<sup>3</sup>/s (120,000ML/day). Gate opening will start to be increased from noon Monday and the release is expected increase to at least 2,600m<sup>3</sup>/s during Tuesday morning.

Since the commencement of the event on 02/01/2011 approximately 220,000ML has been released from the dam, with an event total approaching 1,000,000ML without further rain and as much as 1,500,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

#### **Impacts downstream of Wivenhoe Dam**

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Situation report 13 was issued by John Ruffini at 1.14 am on 10 January and states, relevantly:

#### **Wivenhoe Dam (Full Supply Level 67.00 m AHD)**

River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have already reached 7,350m<sup>3</sup>/s and the river has just peaked at 23:00 on Sunday 9 January.

The dam level is rising quickly, with the current level being 69.60m AHD (storing 301,000 ML). Estimated peak inflow to the dam just from the Upper Brisbane R alone may reach as high as 8,800m<sup>3</sup>/s and, at this stage, the dam will reach at least 73.3 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it will be necessary to increase the release from Wivenhoe during Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m<sup>3</sup>/s and the combined flows in the lower Brisbane will be limited to 4,000m<sup>3</sup>/s if possible.

Fernvale Bridge approaches and Mt Crosby Weir Bridge have been inundated and both bridges are now closed or are in the process of being closed.

The current release rate from Wivenhoe Dam is 1,400m<sup>3</sup>/s (120,000ML/day). Gate opening will start to be increased during early Monday morning and the release is expected to increase to at least 2,600m<sup>3</sup>/s.

Since the commencement of the event on 02/01/2011 approximately 240,000ML has been released from the dam, with an event total approaching 1,500,000ML without further rain and as much as 2,100,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

#### **Impacts downstream of Wivenhoe Dam**

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam. If the predicted rainfall eventuates in the downstream tributary catchments the resultant combined flows in the lower Brisbane may exceed the threshold of damaging discharge in the urban areas within the next 24 to 48 hours.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Counsel for the Fernvale Residents submitted that the situation reports and flood event log entries between the middle of the day on 9 January and the morning of 10 January indicated that the flood engineers were focussed on keeping Mt Crosby Weir bridge and Fernvale bridge open. This, it was said, evinced a failure to make the protection

of urban areas from inundation their primary consideration as required by strategy W3.<sup>194</sup> In particular, counsel pointed to flood event log entries (9 January, 4.15 pm, 4.20 pm and 4.27 pm) and situation reports (9 January, 5.51 pm and 9.04 pm) in which, he said, the current strategy was identified as being to keep those bridges open.<sup>195</sup> The first indication that the Mt Crosby Weir bridge would be closed in the immediate future was a flood event log entry at 10.30 pm on 9 January, in which Mr Ayre suggested that the rails be taken off the bridge. Counsel submitted that the first time the objective of minimising the impact of urban inundation was mentioned in a situation report was the 1.14 am, 10 January 2011 report.<sup>196</sup>

Other counsel argued, to the contrary, that the lack of reference to 'W3' or 'urban inundation' could be explained by the requirement of the manual that reference be had to lower level objectives in all strategies, such as the prevention of disruption in rural areas by the submergence of bridges.<sup>197</sup> The situation reports, they said, provided the following 'clear evidence' that the impacts of releases on urban areas were being considered by the flood engineers at all stages of the event:

- (i) indications that the councils responsible for urban areas had been consulted
- (ii) references to increases in tides in the lower Brisbane River
- (iii) references to other flood events<sup>198</sup>
- (iv) the inclusion of the dam safety regulator on the list of recipients<sup>199</sup> and
- (v) references to flows in the lower Brisbane River.<sup>200</sup>

As to the last, it was said that references in the situation reports over the weekend of 8 and 9 January 2011 to flows in the Brisbane River could only be relevant to strategy W2 or W3.<sup>201</sup> In response, counsel for the Fernvale Residents pointed out that while situation report 9 (12.16 pm, 8 January 2011), one of those relied on, did refer to water levels in the lower Brisbane River; so did situation report 6 (6.32 am, 8 January 2011), issued when the lake level was below 68.5 metres, and the only applicable strategy was W1.<sup>202</sup>

It is clear from the text of the situation reports, as early as the one issued at 5.57 pm on 7 January,<sup>203</sup> that the flood engineers were considering the effects of the releases they would make from the dam on the closure of bridges and on tide heights and flows in the lower Brisbane River. There were references to those issues both before and after the time at which W3 was said to have been engaged. That is unsurprising given the manual's direction that, in every strategy, all the objectives must be considered in order of priority,<sup>204</sup> so that in each of strategies W1, W2 and W3, disruption to rural life and inundation of urban areas should be considered. It is also clear that the bridges were a greater focus up until 9.00 pm on 9 January, when inundation of urban areas was given greater emphasis. While, if the flood engineers were operating the dam in strategy W3, protecting urban areas from inundation had to be their primary consideration, it does not follow that it would have been necessary to highlight it in situation reports while there was no immediate risk of urban flooding and it was still feasible that some, at least, of the bridges could be kept open.

Mention of either or both of the two priorities, directly or indirectly, does not establish which strategy the flood engineer writing the report thought was being applied, or the primary consideration that he held. The situation reports (excluding the situation report issued at 5.53 pm on 8 January 2011, dealt with below) are consistent with the flood engineers' having been in either strategy W1 or strategy W3, or, equally, with their operating the dam according to the described objective but without reference to strategy.

It is apparent from the excerpts of situation reports set out above that the first situation report to mention urban inundation is situation report 12, issued at 9.04 pm, 9 January 2011. It, as does situation report 13, uses the phrase '[t]he objective for dam operations **will be** to minimise the impact of urban flooding in areas downstream of the dam' (emphasis added). (That the wording is exactly the same in these two situation reports is likely to be due to the flood engineers' practice of cutting and pasting content in successive reports.)<sup>205</sup> It was put to some of the flood engineers that the use of the future tense 'will be' suggested that the objective had not been, up until that point, the prevention of urban inundation.<sup>206</sup>

Counsel for Seqwater submitted that, in the lower stages of W3, urban areas could be absolutely protected, making it unsurprising that the minimisation of urban inundation was not mentioned in earlier situation reports. The situation report simply indicated that the event had reached a stage where inundation of some urban areas was inevitable, and that the flood engineers were then focussed on the minimisation of impacts.<sup>207</sup> Counsel for Mr Ayre

and SunWater made a similar argument,<sup>208</sup> characterising the change in language as reflecting the point where the flood engineers abandoned any hope of achieving lower level objectives in strategy W3.<sup>209</sup>

Both views are reasonably open: the change in language to that of urban protection and the use of the future tense might signal a change of objectives and a move to a higher strategy; on the other hand, it might do no more than reflect a recognition of the change in immediate risk. In the circumstances, the Commission does not think any conclusion can be drawn either way from the language of situation reports 12 and 13.

### **Wivenhoe gate directives 3 and 4**

Mr Ayre said in his evidence that the conscious decision to move to strategy W3 was effectively made by Mr Ruffini when he issued a gate opening directive at 5.00 am on 8 January 2011.<sup>210</sup> (In fact, the gate opening directive was issued at 4.50 am.<sup>211</sup>) That directive, and one issued by Mr Ayre at 8.15 am, put in place openings to increase dam releases to 1200 m<sup>3</sup>/s by 2.00 pm on 8 January. Mr Ayre's contention was taken up in submissions.<sup>212</sup>

The argument was that the gate openings modelled by Mr Malone (and implemented by Mr Ruffini and Mr Ayre in their gate directives) contemplated a lake level higher than 68.5 metres, and thus, it was contended, contemplated a change of strategy, which could only be to W3, given that the intended releases exceeded the projected downstream peaks. Counsel for Seqwater also submitted that the releases were consistent with W3, inconsistent with W2 and 'neutral as regards W1'.<sup>213</sup>

The contemporaneous gate operations spreadsheets used by the flood engineers during their shifts do not support Mr Ayre's contention that Mr Ruffini's directive issued at 4.50 am on 8 January indicates a change in strategy from W1 to W3.

The series of gate openings implemented by Mr Ruffini and Mr Ayre on 8 January<sup>214</sup> is almost identical to the gate openings that had been planned by Mr Malone by 3.17 pm on 7 January 2011 in his operational spreadsheet.<sup>215</sup> The only differences between the actual gate openings and those planned by Mr Malone was the transposition of the time of one gate opening and consequent adjustment to the time of the gate openings that followed.<sup>216</sup> The actual gate openings and Mr Malone's planned gate openings produce almost identical outflows.<sup>217</sup> Mr Malone's operational spreadsheet from 7 January 2011 predicted a peak lake level less than 68.5 metres;<sup>218</sup> it follows that Mr Malone must have decided those gate openings were appropriate moving into the future at a time when he was operating in W1 with no expectation of moving to W2 or W3. It is to be noted that Mr Malone did not give any evidence that he contemplated the future use of strategy W3 during his shift, although he did say that he was aware of the potential for heavy rainfall in the beginning of the following week.<sup>219</sup>

It is true, as submitted by counsel for Seqwater,<sup>220</sup> Mr Tibaldi,<sup>221</sup> Mr Malone,<sup>222</sup> and Mr Ruffini and the State of Queensland,<sup>223</sup> that Mr Malone subsequently created a different spreadsheet,<sup>224</sup> which was used by Mr Ruffini during his shift, which did predict the lake level would rise above 68.5 metres. That does not change the fact that the gate openings actually implemented by Mr Ruffini and Mr Ayre on 8 January reflect the plan for increasing releases decided by Mr Malone at a time when there was no prospect of the lake level's rising above 68.5 metres. It may be that Mr Ruffini and Mr Ayre independently determined that Mr Malone's chosen plan to increase releases, despite having been devised for strategy W1, was nonetheless appropriate for strategy W3. On the other hand, it might be that they implemented Mr Malone's plan without recognising that the lake level indicated the need to adopt a different strategy. In the result, the gate openings directed by Mr Ruffini and Mr Ayre are consistent with management of the dam in either of strategies W1 and W3 (or neither).

In respect of Wivenhoe directive 4, Counsel for SunWater and Mr Ayre also submitted that the engineers must have used strategy W3, because they achieved the primary objective of strategy W3, protecting urban areas from inundation. It was argued that the primary objective was 'completely achieved', so the flood engineers were able to achieve lower level objectives as well, including by keeping open some rural bridges.<sup>225</sup> That was because the release strategy implemented by Mr Ayre with Wivenhoe directive 4 was aimed at keeping the flow in the mid-Brisbane River to 1600 m<sup>3</sup>/s, a flow which, Mr Ayre said in evidence, was designed to prevent any urban inundation.<sup>226</sup>

As with all the release rates on the weekend of 8 and 9 January, this directive is consistent with three possibilities: that the dam was operated in strategy W1, with the dominant objective of keeping some bridges open; that it was operated in strategy W3 with a primary objective of avoiding urban inundation; and that whatever the objectives, no strategy was consciously chosen. It does not point to any one conclusion about the state of mind of the engineers at the time.

### Somerset directive 3

At 11.30 am on 8 January, Mr Ayre issued a gate directive to the dam operators at Somerset Dam. That gate directive reads:<sup>227</sup>

Somerset Dam is expected to peak at around mid-day at about EL 100.48 m. As we have exceeded EL 100.45 m (fixed crest level), but Wivenhoe Dam is still rising we will need to implement Strategy S2.

This strategy is aimed at maximising the benefits of the mitigation storage in both Somerset and Wivenhoe dams. Consequently we will endeavour to follow the target line as defined in the manual.

- Please open Sluice M to 100% at 12:00.

Please confirm this gate operation by fax once you have completed the opening.

Counsel for Seqwater submitted that the language of the directive ‘suggests a flood engineer who is watching for changes in key levels under the manual, who is appreciating that reaching the level of 100.45 mandates the use of a different strategy (namely strategy S2)’.<sup>228</sup> It showed, it was submitted, that ‘Mr Ayre was a man who was conscious that a change in lake levels on Somerset triggered a need for a different strategy for that dam’;<sup>229</sup> and that he was paying careful attention to the manual, lake levels and the regulation of release rates.<sup>230</sup> It was argued that the reference to strategy S2 was significant, because it is a strategy concerned with significant flood events that are dominated by rainfall upstream of Wivenhoe Dam. Other evidence suggested that strategy W3 was used for such events.<sup>231</sup> The argument appears to be that the ‘adoption’ of strategy S2 indicated recognition that the event was one to which strategy W3 should be applied. Counsel for Mr Ayre and SunWater<sup>232</sup> and for Mr Malone<sup>233</sup> made submissions to similar effect.

There are three strategies for flood mitigation operation at Somerset Dam: S1, S2 and S3.<sup>234</sup> They are markedly different from the W strategies used at Wivenhoe Dam. Strategy S1 is used when Somerset Dam is expected to exceed its full supply level (99.0 metres) but Wivenhoe Dam is not; its focus is on minimising disruption to rural life upstream of Somerset Dam. It is obvious that S1 should have had no application in the January 2011 flood event; Wivenhoe Dam was above full supply level for the entire event. Strategy S2 is used when Somerset Dam exceeds its full supply level and Wivenhoe Dam’s level is between full supply level (67.0 metres) and 75.5 metres (the level of the first fuse plug<sup>235</sup>). There are a number of actions within strategy S2 depending on the situation at both dams; the level of 100.45 metres at Somerset is a trigger point for the implementation of some of those actions. Strategy S3 is used when Wivenhoe Dam is expected to exceed 75.5 metres and it is expected that a fuse plug will be initiated.<sup>236</sup> It is obvious that S3, also, could not properly have been used in the January 2011 flood event.

Mr Ayre gave oral evidence about the directive. He agreed he composed the message in it,<sup>237</sup> and said that he included reference to the strategy because one of the Somerset Dam operators had asked what was going to happen at the dam.<sup>238</sup> He was receiving lake levels every hour and recognised at the time that the dam had ‘just exceeded the fixed crest level’ (100.45 metres).<sup>239</sup> He said his plan at that time was to optimise the flood mitigation benefits of both dams to maximise the protection of downstream areas.<sup>240</sup>

The directive indicates on its face that Mr Ayre was aware of the level of Somerset Dam at the time he wrote the directive. However, Mr Ayre’s statement in oral evidence that the lake level had just exceeded 100.45 metres when he issued the directive was inaccurate; in fact, the level had exceeded 100.45 metres at 8.00 am that morning, risen to 100.46 metres, and then fallen back to 100.45 metres at 11.00 am.<sup>241</sup>

The directive does not indicate that Mr Ayre had clear knowledge of, or was paying attention to, the manual. If the manual were complied with in respect of the Somerset Dam strategies, S2 would have been in force from the declaration of the flood event to the end of it. The manual does not (contrary to the terms of the directive) link the lake level’s exceeding 100.45 metres with the implementation of strategy S2. The directive does suggest that Mr Ayre knew that 100.45 metres was a trigger level for a different release strategy from Somerset.

A reading of the manual negates the last point made by counsel for Seqwater, that the implementation of S2 at this time indicates recognition of a flood event dominated by upper Brisbane River flows, an event which would involve the use of W3. According to the manual, S2 would be used with strategy W1, W2, W3 and W4A. Only in W4B would the strategy at Somerset change, to S3. The use of S2 says nothing about the W strategy that was in operation at that time, except to exclude W4B.

This directive does not show that Mr Ayre was operating the dam in strategy W3, or, for that matter, in W1 or W2, on 8 January 2011.

## Gate operations spreadsheets

Counsel for Seqwater put some emphasis on the gate operations spreadsheets. He submitted that the data Mr Ayre entered in the gate operations spreadsheet he was using during his shift ('SDWD-201101080900') and his 'without forecast' model run 10 (completed at 2.00 pm on 8 January) indicated that he was acutely aware of the level of the lake, the releases and the peak flows at Lowood and Moggill.<sup>242</sup> Similarly, it was inherently probable that Mr Ruffini appreciated the significance of the data in the gate operations spreadsheet and model run that he completed during his shift.<sup>243</sup>

There is no doubt that the gate operations spreadsheets being used at the time by Mr Ayre and Mr Ruffini contained information relevant to choice of strategy. Whether they appreciated the significance of that information to strategy choice, or used it to determine which strategy they were operating, are different issues, which must be assessed in the context of the evidence as a whole. See *16.6 Evidence of strategy choice: the flood operations engineers*.

## Mr Malone's forecast scenario

Mr Malone sent an email at 11.02 am on 9 January that included predictions as to what could be expected if the forecast heavy rainfall eventuated over the following days. That email states:<sup>244</sup>

### Forecast Rainfall

The forecast for the next few days is for heavy rainfall, particularly for period 10pm Sunday to 10pm Monday with totals between 200-300mm. The areas mostly heavily impacted will be the North Pine, Somerset and Leslie Harrison catchments with less rain in the upper Brisbane. <http://www.bom.gov.au/jsp/watl/rainfall/pme.jsp>

The rain contracts to the area around North Pine for the period 10pm Monday to 10pm Tuesday with totals in the order of 100 to 150mm.

The interactive model at <http://www.bom.gov.au/australia/charts/viewer/index.shtml> shows the heaviest falls during the next 48 hours are likely to be overnight Sunday/Monday and overnight Monday/Tuesday.

The QPF for the period 24 hours to 9am show totals between 40-60mm for both North Pine and Somerset/Wivenhoe catchments. Note that this is only half the period of the above forecast durations.

### Recorded Runoff

To date recorded inflows to the dams since 02/01/2011 have been

North Pine	23,000ML
Somerset	120,000ML
Wivenhoe	380,000ML (including Somerset outflow)

Presently, the conversion rate between rainfall and runoff is about 0.45 for Wivenhoe, 0.60 for North Pine and 0.75 for Somerset.

### Expected Runoff

Based on the approximate runoff conversion rates and the forecast rainfall, estimated runoff volumes (ML) generated could be the order of:

Catchment	Monday	Tuesday	Wednesday	Three Day Total
North Pine	10,000-20,000	35,000-55,000	25,000-35,000	70,000-110,000
Somerset	50,000-100,000	200,000-300,000	75,000-150,000	325,000-550,000
Wivenhoe	125,000-250,000	250,000-500,00	125,000-250,000	500,000-1,000,000

The lower limit of the inflow to Somerset and Wivenhoe will be similar to the October 2010 flood while the upper limit is similar to the February 1999 floods. However, the starting level of the dams is much higher than in these historical events.

This points to continued flood operations for Somerset and Wivenhoe until at least the weekend of 15/16 Jan and maybe a shorter time for North Pine.

**It should be noted that these estimates are based upon forecast rainfall which may or may not eventuate.**

Terry Malone  
Duty Engineer  
Flood Operations Centre  
(emphasis in original)

Mr Malone gave evidence that the figures did not cause him to ‘ramp up’ releases significantly; it would have been irresponsible to do so, because there was no rainfall on the ground and sometimes forecast events ‘just don’t come off’.<sup>245</sup> Counsel for Seqwater submitted that this document should be taken to indicate that Mr Malone recognised that this was a significant flood because of the foreshadowed inflows into the dam and the reference to the October 2010 and February 1999 events.<sup>246</sup> The document does establish that Mr Malone was aware that, if forecast rainfall eventuated, a significant flood would ensue; but it says nothing about what strategy was being applied at the time.

### Change to two engineers’ being on shift together

From the shift starting at 7.00 pm on 9 January until after the peak of the event had passed, there were two flood engineers on each shift. Counsel for Seqwater submitted that this change in staffing reflected the seriousness with which the event was being treated by the engineers.<sup>247</sup> Mr Ayre said in his interview with Commission staff that one of the reasons that the flood engineers decided to do shifts in pairs was because they recognised that in larger flood events, more people were going to be requiring information from the flood operations centre because more people would be affected.<sup>248</sup> The Commission accepts the submission of counsel for Seqwater. The decision to have two engineers on shift together was, obviously, recognition by the flood engineers that the event was increasing in magnitude.

### Releases from Wivenhoe Dam

The releases from Wivenhoe Dam during the relevant period were as follows.

Figure 16(b)

Date/Time	Release (m <sup>3</sup> /s)	Date/Time	Release (m <sup>3</sup> /s)
08/01/2011 04:00	719	09/01/2011 08:00	1334
08/01/2011 05:00	773	09/01/2011 09:00	1333
08/01/2011 06:00	825	09/01/2011 10:00	1332
08/01/2011 07:00	879	09/01/2011 11:00	1332
08/01/2011 08:00	927	09/01/2011 12:00	1384
08/01/2011 09:00	980	09/01/2011 13:00	1385
08/01/2011 10:00	1031	09/01/2011 14:00	1386
08/01/2011 11:00	1085	09/01/2011 15:00	1388
08/01/2011 12:00	1138	09/01/2011 16:00	1394
08/01/2011 13:00	1189	09/01/2011 17:00	1398
08/01/2011 14:00	1239	09/01/2011 18:00	1404
08/01/2011 15:00	1240	09/01/2011 19:00	1411
08/01/2011 16:00	1241	09/01/2011 20:00	1419
08/01/2011 17:00	1242	09/01/2011 21:00	1428
08/01/2011 18:00	1242	09/01/2011 22:00	1440
08/01/2011 19:00	1242	09/01/2011 23:00	1450
08/01/2011 20:00	1242	10/01/2011 00:00	1462
08/01/2011 21:00	1242	10/01/2011 01:00	1473
08/01/2011 22:00	1242	10/01/2011 02:00	1539
08/01/2011 23:00	1242	10/01/2011 03:00	1605
09/01/2011 00:00	1241	10/01/2011 04:00	1672

Date/Time	Release (m <sup>3</sup> /s)	Date/Time	Release (m <sup>3</sup> /s)
09/01/2011 01:00	1240	10/01/2011 05:00	1740
09/01/2011 02:00	1286	10/01/2011 06:00	1806
09/01/2011 03:00	1285	10/01/2011 07:00	1875
09/01/2011 04:00	1285	10/01/2011 08:00	1944
09/01/2011 05:00	1336	10/01/2011 09:00	2015
09/01/2011 06:00	1335	10/01/2011 10:00	2031
09/01/2011 07:00	1334	10/01/2011 11:00	2044

That data shows that releases were increased from 773 m<sup>3</sup>/s at 5.00 am on 8 January, just after Mr Ruffini had issued Wivenhoe directive 3, to around 1240 m<sup>3</sup>/s by 2.00 pm on that day. Releases were maintained at that level for 11 hours, until 1.00 am on 9 January. A further gate directive increased releases to around 1330 m<sup>3</sup>/s, a level that was maintained from 5.00 am to 11.00 am on 9 January. The releases were slowly increased over 1400 m<sup>3</sup>/s by 6.00 pm and continued a gradual progression through the 1400s. From 2.00 am on 10 January, the releases started to increase faster, exceeding 1700 m<sup>3</sup>/s at 5.00 am, 1900 m<sup>3</sup>/s at 8.00 am and 2000 m<sup>3</sup>/s at 9.00 am.

Counsel for the Fernvale Residents submitted that the release rates provided no evidence of a transition to strategy W3 at 8.00 am on 8 January 2011. On his contention, it was not until releases exceeded 1900 m<sup>3</sup>/s, at 8.00 am on Monday 10 January, that the release rates indicated unequivocally that the strategy being used was not W1.<sup>249</sup> Counsel for the Mid-Brisbane River Irrigators submitted that the release strategies used over the weekend of 8 and 9 January and through to the morning of 10 January were W1 strategies.<sup>250</sup>

Counsel for Seqwater's submissions in respect of releases from Wivenhoe Dam contained two strands. The first was that the release rates, on their face, indicated that strategy W3 was invoked or that the primary consideration at the time was the protection of urban areas from inundation. On this point, it was contended that the release rates set out in the situation report issued at 12.16 pm on 8 January (with flows in the mid Brisbane River maintained at 1600 m<sup>3</sup>/s) were consistent with considering urban inundation, given Mr Ayre's evidence that in the October and December 2010 floods, it was at this flow that low lying areas in Brisbane started to be affected by flooding.<sup>251</sup> By 4.00 pm on 9 January, the engineers had decided upon a gate opening sequence which would result in releases above 2000 m<sup>3</sup>/s, the maximum release rate of W1.<sup>252</sup> (In fact, it appears that model run 19, which is relied upon by Seqwater for this argument, is an inaccurate reconstruction.<sup>253</sup> The contemporaneously saved gate operations spreadsheets do not indicate a release rate above 2000 m<sup>3</sup>/s until a spreadsheet named 'SDWD-201101091900' which was saved at 8.29 pm, 9 January 2011.<sup>254</sup>)

Counsel for Seqwater also submitted that the releases on 8 and 9 January were considerably greater than the naturally occurring peak flows at Lowood and Moggill, making the releases inconsistent with the use of strategy W2.<sup>255</sup>

The second strand of the submissions relied on the evidence of the experts who peer reviewed the Seqwater flood event report and Mr Babister as to the appropriateness and reasonableness of the releases made. Counsel for Mr Malone,<sup>256</sup> Mr Ruffini and the State of Queensland,<sup>257</sup> and Mr Ayre and SunWater<sup>258</sup> also made submissions relying on the expert evidence as to the consistency of the releases made, and the model runs performed, by the engineers with the operation of the dam in W3, as well as on the evidence of Mr Ayre<sup>259</sup> and Mr Tibaldi<sup>260</sup> that they considered the releases consistent with the use of W3.<sup>261</sup> In particular, counsel for Mr Malone submitted that the fact there was no 'jump' in releases at 8.00 am on 8 January did not mean there was no transition from W1 to W3; to have radically increased releases at that time would have been irresponsible.<sup>262</sup> Counsel for Mr Ayre and SunWater also pointed out that Mr Cooper, an expert engaged by the SEQ Water Grid Manager to review the operators' performance on 11 January 2011, held the view that the operators had taken appropriate decisions.<sup>263</sup>

The experts unanimously agreed that the release rates chosen by the flood engineers were appropriate for being in W3 and holding the primary consideration of the protection of urban areas from inundation. But none of them said that the releases were inconsistent with operation in W1; indeed, one of them, Mr Roads, said they were consistent. No expert said that the releases were inconsistent with the primary consideration of preventing the submergence of bridges. That was obvious. Strategy W1 has a maximum release rate of 1900 m<sup>3</sup>/s.<sup>264</sup> Strategy W3

has a maximum release rate of 4000 m<sup>3</sup>/s and no minimum release rate. Until releases exceeded 1900 m<sup>3</sup>/s at 8.00 am on 10 January, the release rates were consistent with both W1 and W3. The plan to increase releases over 1900 m<sup>3</sup>/s is first evidenced in a contemporaneous gate operations spreadsheet titled 'SDWD-201101091900',<sup>265</sup> which is the subject of a flood event log entry at 7.00 pm on 9 January; shortly after, calls were made to councils, Seqwater's chief executive officer and the dam safety regulator advising that, given the rainfall, high releases from Wivenhoe, with the prospect of damaging flooding, were likely to be necessary.<sup>266</sup>

Releases at the rates adopted over the weekend of 8-9 January achieved the objective of minimising disruption to rural life, because they allowed the Farnvale and Mt Crosby Weir bridges to remain open. At those rates, though, they also achieved the objective of protecting against urban inundation. Both objectives were relevant whether the dam was being operated in either W1 or W3 (or for that matter, W2 or W4) but it is impossible to say from the level of releases which objective was being treated as the primary one.

The release rates are intractably neutral as to whether the flood engineers were operating the dam in W1, or W3, or outside of any strategy and concentrating only on objectives.

## 16.7.2 Situation report at 5.53 pm on 8 January 2011

At 5.53 pm on 8 January 2011, Mr Ayre sent a situation report from the Duty Engineer email account.<sup>267</sup> That situation report relevantly states, under the heading 'Forecast Scenario – Based upon mid-range rainfall forecasts':

Assessments have been undertaken to determine possible increases to releases given the high likelihood of significant inflows in the next few days. The interaction with runoff from the Bremer River and Warrill Creek catchment is an important consideration as **the event magnitude will require the application of Wivenhoe Dam flood operation strategy W2** (Transition strategy between minimizing downstream impacts and maximizing protection to urban areas).

Projections based upon the forecast rainfalls suggest flows of up to 1,200 m<sup>3</sup>/s will emanate from the Bremer River catchment. If similar rainfall magnitudes occur in the Upper Brisbane and Stanley Rivers then increased releases may be required from both Somerset Dam and Wivenhoe Dam. Preliminary projections suggest that such a forecast will extend the release duration until next Saturday 15 January, but mid-Brisbane River flows will be kept to a maximum of 1,800 m<sup>3</sup>/s. However, if falls are greater than those forecast releases from Wivenhoe Dam may need to adversely impact Mt Crosby Weir Bridge (1,900 m<sup>3</sup>/s) and possibly Farnvale Bridge (2,100 m<sup>3</sup>/s) but will be maintained below 3,500 m<sup>3</sup>/s.

(emphasis added)

### Natural meaning

On their face, the words 'the event magnitude will require the application of Wivenhoe Dam flood operation strategy W2', read in context, appear to be intended to communicate that the next strategy would be W2 and that this would be a move to a higher strategy. On that reading, it would follow that Mr Ayre's understanding was that the strategy in place at the time he wrote the situation report was W1. If that was the case, there was a breach of the manual.

### Recent explanation

Mr Ayre's evidence was that this passage meant something different.

Mr Ayre's most recent explanation, on 3 February 2012, for this entry was:

It is possible that based on the forecast rainfall and the temporal distribution of that forecast rainfall, current release rates will drive the lake level down below the threshold limit, back into W1, and then with the rainfall that was coming through on the Sunday and the Monday, you would be back up into the range again. However, this time the forecasted peaks in the Lockyer and the Bremer will be much higher than what they were previously.<sup>268</sup>

In essence, Mr Ayre's 3 February 2012 explanation was that the strategy in use on the afternoon of 8 January 2011 was W3, but the first paragraph under the heading flagged the possibility that there would be a move from W1 to W2 after the strategy had changed from W3 to W1 as a result of a fall in the lake level.<sup>269</sup> Mr Ayre's evidence in February 2012 was initially that the dam would be back in W2 on 'Sunday night, Monday'.<sup>270</sup> He was later asked

whether he was ‘saying that there was a possibility that you might get into W2 the following Tuesday’ and replied ‘Possibility’.<sup>271</sup> And finally when he was asked, ‘if the rainfall came with the inflows on Tuesday or Wednesday increasing the lake level, if it goes back above 68.5, you’re back in either strategy two or three?’ Mr Ayre responded, ‘[y]es, that’s correct.’<sup>272</sup>

Mr Ayre’s evidence was that what he had written:

was predominantly a heads-up, I suppose, more internally for John Tibaldi, but it was basically to give people an idea that there was certainly more rain coming, but the current strategy could – adopted – sorry, adapt to it relatively straightforward. The W2 reference is pretty meaningless, I suppose, for most people in that context.<sup>273</sup>

The entry was, Mr Ayre acknowledged, a ‘bit cryptic’.<sup>274</sup>

## Explanation in March and April 2011

Mr Ayre appeared before the Commission over the days from 11 April 2011 to 13 April 2011. Asked during that appearance about the reference to W2 in the situation report, he said, ‘That was an error on my behalf’.<sup>275</sup> In further evidence, Mr Ayre made these statements:

I was certainly contemplating, at the time I wrote that, that we were in transition between strategy W1 and W3.<sup>276</sup>

I do acknowledge that I had inadvertently recorded strategy W2 at that point in time but recognise that that wasn’t correct, we had transitioned into W3 earlier in the day.<sup>277</sup>

Asked, ‘What you thought at the time you wrote it was that you were still applying the W2 strategy?’, Mr Ayre responded, ‘At the time I would have otherwise I wouldn’t have put it in the situation report’.<sup>278</sup>

Mr Ayre provided a supplementary statement, signed on 29 March 2011,<sup>279</sup> in which he said:

One important point to note from this situation report is the information under the heading ‘Forecast Scenario - Based on mid-range forecasts’. The models that I used in preparing the projections I refer to were based on 72 hour rainfall forecasts (I note that the 72 hour forecast models were included in Appendix K of the Wivenhoe and Somerset Dams Flood Report 2011). The information contained in this section was included to make the regional councils aware that:

- (a) If the forecast rainfall eventuated the flows could be limited to 1,800m<sup>3</sup>/s and Fernvale Bridge and Mt Crosby Weir Bridge could remain open;
- (b) If more than the forecast rainfall eventuated then Fernvale Bridge and Mt Crosby Weir Bridge would be closed; and
- (c) The model projections were that downstream flow would still be maintained below 3,500m<sup>3</sup>/s (which is the W&S Manual reference to 3,500m<sup>3</sup>/s at Lowood).<sup>280</sup>

## Submissions in favour of recent explanation

Counsel for Mr Ayre and SunWater,<sup>281</sup> Mr Malone,<sup>282</sup> Mr Ruffini and the State of Queensland,<sup>283</sup> Seqwater,<sup>284</sup> and Mr Tibaldi<sup>285</sup> submitted that Mr Ayre’s explanation given in the February 2012 hearing should be accepted. It was argued<sup>286</sup> that there was contemporaneous documentation consistent with Mr Ayre’s recent explanation. Mr Ayre had conducted modelling at about 3.00 pm on 8 January 2011.<sup>287</sup> At that time, the three day forecast assessment showed a continuous drop in the inflows at Wivenhoe Dam until about the morning of 10 January 2011.<sup>288</sup> On the morning of 10 January 2011, the inflows would drop below 200 m<sup>3</sup>/s, but would then rise to just under 1400 m<sup>3</sup>/s on the evening of 11 January 2011.

Mr Ayre agreed with the proposition that, if 1250 m<sup>3</sup>/s continued to be released from Wivenhoe Dam, but the inflows, as predicted, dropped significantly, there was ‘a good likelihood that the lake level would fall back below 68.5’.<sup>289</sup> If the flow from the Bremer River later reached 1200 m<sup>3</sup>/s, as foreshadowed in the situation report, it was possible that the releases from Wivenhoe Dam might be reduced to allow the peak to pass and then ‘piggy-back’ on that downstream peak.<sup>290</sup>

By this process of reasoning, the strategy would drop back to W1 once the lake level dropped below 68.5m and then change to W2 when the lake level rose, but releases would be kept under the downstream natural peak while the ‘piggy-back’ technique was used.

Counsel for Mr Ayre and SunWater submitted that modelling contained in Attachment 34 of Exhibit 524 was consistent with Mr Ayre’s evidence that ‘the lake level would fall below 68.5’.<sup>291</sup> Attachment 34 of Exhibit 524 contains many modelling spreadsheets. The spreadsheet to which Counsel for Mr Ayre and SunWater was referring seems to be ‘SDWD-201101081500-Forecast72hr’.<sup>292</sup> That spreadsheet appears to be the model run by Mr Ayre on the afternoon of 8 January 2011 based on a three day forecast.

Counsel did not advert to a particular worksheet in that spreadsheet, titled ‘WivenhoeEL’. It showed a projected lake level for Wivenhoe Dam based on a three day forecast. It projected the lake level falling below 68.5m at about midday on Sunday, 9 January 2011, and then rising again above 68.5m on about the evening of Tuesday, 11 January 2011. That worksheet supports Mr Ayre’s evidence that he was anticipating that the lake level would fall below 68.5m and then subsequently rise again above 68.5m. But it says nothing about the release strategy being employed either on the evening of Saturday, 8 January 2011 or throughout the next week.

Counsel for Mr Ruffini and the State of Queensland submitted that ‘[t]he model runs as examined by the peer reviewers were consistent with the notion of a change from W3 to W2 after transitioning from W1’.<sup>293</sup> The footnote to that assertion refers to evidence given by Professor Apelt, Mr Roads and Mr Shannon. The evidence does not support the assertion.

Professor Apelt, after agreeing to a series of propositions setting out the logic of Mr Ayre’s February 2012 explanation said, ‘I can see that as a possible interpretation. It would have helped if they had written it a bit more clearly.’<sup>294</sup>

Mr Roads was also taken through a series of propositions setting out the logic of Mr Ayre’s recent explanation.<sup>295</sup> He was then asked:<sup>296</sup>

Mr O’Donnell: And on that understanding, you would not see that situation report as inconsistent with the author operating – consciously operating under W3 as at the time the situation report is written?

Mr Roads: Yeah. It will take a little bit longer to get my head around everything but certainly everything you’re saying makes sense.

As with Professor Apelt and Mr Roads, Mr Shannon was taken through a series of propositions setting out the logic of Mr Ayre’s recent explanation and showing that it was not inconsistent with modelling.<sup>297</sup> Mr Shannon was ultimately asked:<sup>298</sup>

Mr O’Donnell: And therefore the concept of transition to W2 could be something some days ahead, Tuesday or Wednesday; not something the flood engineer is contemplating doing on the Saturday or soon after the Saturday?

Mr Shannon: This is all speculative.

Mr O’Donnell: Yes?

Mr Shannon: What they might be considering.

Mr O’Donnell: That’s right. But you see it’s consistent with the flood engineer thinking that he is then operating the dam – that is, on the Saturday – under W3. If the inflows continued to fall to the dam, the level would drop back below 68.5; maybe on Tuesday or Wednesday it might rise above 68.5; and at that time they could transition to W2. Does that make sense to you?

Mr Shannon: That’s possible, yes. I couldn’t imagine that that’s at the forefront of somebody’s mind. When they are dealing with a flood and they are thinking at the forefront of their mind that – what might happen in three days’ time. First of all, they need to think about what’s happening here and now.

Counsel for Mr Ayre and SunWater also relied on the evidence of the experts, but put the proposition less strongly, submitting only that the experts, ‘when confronted with the objective facts that were prevailing at the time and available to Mr Ayre through his modelling … could understand the reference in the 5.53pm Situation Report in its proper context’.<sup>299</sup> In addition to the evidence of Professor Apelt, Mr Shannon and Mr Roads, Counsel for Mr Ayre and SunWater relied upon the evidence of Mr McDonald.

As with the other experts, Mr McDonald was taken through the various propositions involved in Mr Ayre's recent explanation. Mr McDonald was then asked if he thought it was a fair interpretation that, 'putting the model together with the Situation Report', the relevant part of the situation report was speaking of a possible move to W2, if the rate of inflows increased with further rain on 11 January 2011, after a fall to W1 from W2 or W3.<sup>300</sup> Mr McDonald's response was, 'you may be right, that may have been what was in the mind of the author but it's not confirmed by explicit language that that is so'.<sup>301</sup> Mr McDonald was asked if 'it might be consistent that it's contemplating the transition to W2, some days hence, if there is fresh rainfall as per this model'.<sup>302</sup> Mr McDonald said that was a possibility.<sup>303</sup> Pressed on the point, Mr McDonald ultimately said, 'It's not entirely clear where you are coming from. But anyway, the proposition you put is possibly what the author had in mind'.<sup>304</sup>

The evidence of the peer reviewers is of very limited assistance. At best it amounts to saying that they could follow the logic of the proposition now put as to what the situation report meant. They gave their evidence in ignorance of Mr Ayre's earlier statements about the situation report; quite properly, because Mr Ayre's credibility was not a matter for them.

## **Difficulties with Mr Ayre's recent explanation**

Mr Ayre's recent explanation cannot be accepted, for a number of reasons.

Firstly, it is utterly inconsistent with the explanation Mr Ayre gave for the entry in his evidence in April 2011: that the entry was a mistake, made in the belief he was in W2 because he was contemplating that he was in transition between W1 and W3. That account cannot be reconciled with his explanation on 3 February 2012 that he knew strategy W3 was being used on the afternoon of 8 January 2011, but was intending through the situation report to give a 'heads-up' or the 'idea' that the dam might be operated through a W3-W1-W2 series of changes.

When challenged, on 3 February 2012, about the inconsistency, Mr Ayre said that he thought he might 'have been confused by that line of questioning' (in April 2011) and that 'it was a confusion between what the current situation was or what we were talking about in that forecast scenario'.<sup>305</sup> In particular, Mr Ayre attempted to explain his answer on 12 April 2011 that 'I had inadvertently recorded strategy W2 at that point in time but recognise that that wasn't correct, we had transitioned into W3 earlier in the day' as the result of confusion as to whether he was being asked about what he was doing at the time the situation report was written or what he was planning by way of future operation.<sup>306</sup>

Mr Ayre: Again, it was the context of were we talking about the future operation or the point - or what we were actually implementing at the time.

Mr Callaghan: Well, I'm sorry, but the question is did you think that you were applying strategy W2?

Mr Ayre: Well, I was applying strategy W2 in the forecast scenario, yes.

There is no doubt that in April 2011, Mr Ayre was explaining the words in the situation report as a mistake. His attempt, in his evidence given in February 2012, at a far more elaborate explanation which did not involve any such error cannot be accepted.

Counsel for Mr Ayre and SunWater submitted that Mr Ayre gave his answers on 12 April 2011 without having had his attention drawn to 'those model results [that] indicated that the lake level would fall below 68.5m, and be followed by another peak in a few days time'.<sup>307</sup> Counsel for Seqwater made a similar submission.<sup>308</sup> That is not a logical explanation for Mr Ayre's answers on 12 April 2011 and it is not the explanation now advanced by Mr Ayre. Mr Ayre says that he was confused. He does not say that he had forgotten the modelling that he had performed. Indeed, as counsel for Mr Ayre and SunWater also submitted, Mr Ayre appears to have been conscious when giving his evidence on 12 April 2011 of the modelling he had performed on the afternoon of 8 January 2011, because he referred to that modelling in another part of evidence.<sup>309</sup>

Secondly, it is not credible that Mr Ayre would, in a situation report intended to inform others, launch into an obscure and complicated hypothesis of projected strategy use. The use of strategy W3 was not something which commonly occurred in his experience,<sup>310</sup> but instead of recording it, or of alerting the reader to the next strategy which might be applicable (on Mr Ayre's February 2012 evidence, strategy W1) he alluded only to a strategy which might become applicable after both of those had run their course.

Thirdly, Mr Ayre's explanation depends on his having appreciated that he was operating in strategy W3 but that there would have to be a strategy change to W1 as the lake level dropped, followed by adoption of strategy W2. His evidence, however, was that on 8 January 2011 he saw no need to distinguish between W2 and W3:

- (a) 'I can't record [sic] with clarity - there was nothing at that point in time that I needed to distinguish between Strategy W2 or W3.'<sup>311</sup>
- (b) 'I was conscious that we weren't in W1. I knew we had transitioned. I wasn't necessarily - I can't recall right now whether at 8 o'clock on Saturday the 8th of January I was consciously aware that we were in W3. I know we'd transitioned out, but there was nothing happening at that time that meant that I needed to differentiate between strategy W2 or W3.'<sup>312</sup>
- (c) 'Well, all through the day I guess the volume that we had to manage was effectively the same. There was no additional rainfall on the catchment, so there was no real decision to be made necessarily once I put that gate sequence in place. Nobody asked me what strategy we were in, so I guess I didn't really need to actually know at that point, I suppose.'<sup>313</sup>

Mr Ayre's seventh and most recent statement also suggested that he did not, on the afternoon of 8 January 2011, distinguish between W2 and W3:

- (a) 'Strategy labels are generally only attributed after the event as part of the reporting process.'<sup>314</sup>
- (b) 'In selecting a target release rate of 1,250 m<sup>3</sup>/s I was cognizant of the requirement to optimize protection of urban areas from flooding as is noted in strategies W2 and W3.'<sup>315</sup>

Fourthly, the account of strategy change that Mr Ayre now says he meant to communicate is simply not borne out by the terms of the situation report. It gives no clue as to the complicated reasoning process now said to be intended by it. As Mr Ayre himself said, 'The W2 reference is pretty meaningless, I suppose, for most people in that context.'<sup>316</sup>

Fifthly, the purpose and effect Mr Ayre attributed to the statement has changed. It was portrayed in his supplementary statement as a straightforward representation to the regional councils of what was to be expected in the scenarios that the forecast rainfall eventuated or that rainfall was in excess of what was forecast. In the first event, what is suggested in the supplementary statement is an outcome consistent with W1 – the limiting of flows to 1800 m<sup>3</sup>/s and the keeping open of the Fernvale and Mt Crosby Weir bridges; in the second, the closure of the bridges but the maintaining of flows below 3500 m<sup>3</sup>/s, with a reference to the manual prescription for W2 (as Mr Ayre confirmed when giving evidence in February 2011<sup>317</sup>). There was no hint then of any application of W3 or any 'heads-up' for Mr Tibaldi.

The only rational interpretation of the situation report is that Mr Ayre was speaking in it of a possible move, with an increase in the magnitude of the event, from the existing strategy to a higher one: W2.

### Recent invention

Mr Ayre was asked, when he gave evidence in February 2012, when he had first advanced the explanation now given to anyone else.<sup>318</sup> He said that he did not have any recollection of when he had 'first described it to anyone' but believed that he had 'described that to the legal team when we were preparing statements' for the purpose of the hearings in 2011.<sup>319</sup> Asked if it appeared in any of his statements, he responded that '[i]t would be in the supplementary statement as such'.<sup>320</sup> The content of the supplementary statement has been dealt with above. It does not support the recent explanation; to the contrary.

Mr Ayre could have adduced evidence of any instance in which he had previously given his current account of the situation report. He has not done so. Counsel for Mr Ayre has provided written submissions to the Commission. Those submissions do not suggest that Mr Ayre had advanced this explanation at an earlier time.

The fact of Mr Ayre's willingness to invent an account to explain the 5.53 pm situation report weighs heavily against his credibility more generally.

### 16.7.3 Flood event log, 3.30 pm, 9 January

The flood event log records a conference between the four flood engineers at 3.30 pm on 9 January 2011, with Mr Ruffini, Mr Ayre and Mr Malone physically present and Mr Tibaldi joining by telephone.<sup>321</sup> There had been

no conference of the kind between all four engineers up to that point in the flood event. The 3.30 pm entry in the flood log reads:

Duty Engineer Conference held at the FOC: Attended by RA, JR, TM with JT on conf phone. *At this stage operating at the top end of W1 and the bottom end of W2.* Storing approx. 300,000 ML at present (above Wivenhoe) with an additional 500,000 ML expected to flow into the dams from rainfall on the ground. The rainfall system is currently in the N-E part of the catchment and expected to travel south over the next 24-36 hours according to the BoM forecasts. This has the potential to significantly increase flows in Lockyer Ck & the Bremer River which potentially could close Fernvale Bridge and Mt Crosby Bridge and increase the risk of flooding in the Lower Brisbane. Releases from Wivenhoe Dam will be maintained at the current level of ~ 1,400 cumecs. If required, releases from Wivenhoe will be reduced to contain the flow in the Mid-Brisbane to 1,600 cumecs and 3,000 cumecs in the Lower Brisbane. At this stage it is anticipated that levels below 102.5 in Somerset and 72.5 in Wivenhoe can be attained.

(emphasis added)

## Evidence as to authorship and meaning

The entry has the initials 'NGA' as the person who made the entry.<sup>322</sup> 'NGA' refers to Neville Ablitt, a flood officer. Mr Ablitt gave evidence. He was the only flood officer rostered on for that shift.<sup>323</sup> He said that he would have created the entry and written a brief summary. The time, 3:30 pm, was probably inserted by him, as were the words 'Duty Engineer Conference held at the FOC: Attended by RA, JR, TM with JT on conf phone.' The remainder of the words in the entry were not his.<sup>324</sup>

Counsel for Mr Ruffini and the State of Queensland submitted that 'Mr Ablitt suggests that the entry may have been "cut and paste[d]" from another entry'.<sup>325</sup> That is wrong. The passage of Mr Ablitt's evidence footnoted by counsel relates to a different entry in the flood log.<sup>326</sup>

Mr Ablitt was a coherent and compelling witness. The Commission accepts his evidence. The only reasonable view is that the body of the text in the entry was written by one of the three flood engineers physically present at the conference.

Mr Tibaldi, who participated by telephone, said that his only recollection of the conference was that he held the belief that the lake levels were dropping and his impression was that 'I couldn't understand why they were getting concerned'.<sup>327</sup>

Mr Tibaldi had commented on the flood event log that appeared as Appendix M to Seqwater's March flood event report.<sup>328</sup> Those comments were made by 21 March 2011. Next to the 3.30 pm entry, Mr Tibaldi's comment was:

Discussion on possible operational strategies over coming days. Numerous scenarios were possible.

That comment suggests that, at the time he made it, Mr Tibaldi had some recollection of this conversation, and did not take any issue with the content of the entry.

Mr Ayre described the statement that they were 'operating at the top end of W1 and the bottom end of W2' as 'a Ruffini-ism' and said that it 'was an expression that John Ruffini used, although I can't be exactly sure it was him'.<sup>329</sup> His explanation for what the statement meant was:

I suppose what I took that to mean was we were achieving the top objective of strategy W1, that is to keep the high-level bridges open, and I took the bottom end of W2 to be meaning exactly the same thing, in reality; it is minimising disruption to downstream rural life. ...

I think all he was trying to describe was the phase that we'd been operating up to and that we were able to store water in the dam at that point and make releases in a manner that optimised the protection, but also had the benefit of keeping the high-level bridges open.<sup>330</sup>

Mr Ruffini had no recollection of using the words.<sup>331</sup> He initially speculated that the use of 'W1' and 'W2' might have been shorthand methods of referring to the discharge rates. Mr Ruffini was taken through the logic of that proposition and ultimately accepted that it 'doesn't seem to make sense'.<sup>332</sup>

Mr Ruffini had also previously commented on a draft of Appendix M in his 24 March 2011 statement.<sup>333</sup> His comment on the 3.30 pm entry was, 'I can't recall the exact words spoken at this meeting. The description provided is consistent with my recollection of the meeting'.<sup>334</sup> In his February 2012 evidence, he represented the effect of

the comment as, ‘I said I didn’t remember the details of what was spoken at that meeting but, you know, basically the general thrust of it was probably okay’,<sup>335</sup> but as the comment itself makes plain, he accepted the content of the entry in considerably stronger terms than that.

Mr Malone could not recall anyone speaking during the conference about being ‘at the top end of W1 and bottom end of W2’.<sup>336</sup> However, he said that he could ‘quite understand why it was stated’.<sup>337</sup> The relevant questions and answers were as follows:<sup>338</sup>

Mr Malone: ...[T]he statement is correct. ... It doesn’t say we are not operating under strategy 3. It says we are operating at a particular point.

Mr Callaghan: You’d just better explain that for us?

Mr Malone: At this stage, we are operating at the top end of W1 and the bottom end of W2. It says we are operating at a particular point. It doesn’t say we are operating under strategy W1 or W2.

Mr Callaghan: So, that should be read to interpret, ‘Even though we are in three, we are at one and end of two,’ is that the way we should read it?

Mr Malone: If you look at the levels ... and the releases at that particular point, that was the condition – those conditions might also satisfy the top end of W1 or the bottom end of W2.

Mr Callaghan: Well, quite, they might, but-----

Mr Malone: But it doesn’t say that you’re operating under strategy W2.

Mr Callaghan: Well, under, okay?

Mr Malone: It says ‘at’.

Mr Callaghan: It’s all in the prepositions, is it?

Mr Malone: Well, if we’re being very precise, yes.

All of the answers given about the entry were speculative; none of the flood engineers admitted to recalling the statement, let alone having made or recorded it.

## Natural meaning

The natural meaning of the entry is that, during their discussion, one or more of the flood engineers identified that the dam operations were then on the cusp, or point of transition, between strategies W1 and W2 (not W3).

## Submissions against natural meaning

Counsel for Mr Ayre and SunWater submitted that it was never put to any of the flood engineers that the entry means that ‘they were at the point of change from W1 to W2’.<sup>339</sup> Each of the flood engineers was questioned at length as to what they could recall about the entry, which was nothing, and given an opportunity to hypothesise as to what the entry means. To the extent that there is any doubt, the Commission accepts that none of the flood engineers gave evidence consistent with the natural meaning.

Counsel for Seqwater submitted that, ‘[t]he meaning of the entry is obscure’.<sup>340</sup> Counsel for Mr Malone submitted that the entry could not be sensibly advanced as evidence supporting the submissions made by counsel assisting because it was ‘an exercise in conjecture to ascribe meaning to the entry’ and ‘it was not demonstrated that any of the engineers authored it’.<sup>341</sup>

Interpreting the entry only entails difficulty if it is to be construed as meaning something other than what it says. When Mr Tibaldi and Mr Ruffini reviewed it almost a year ago, neither suggested that it was inaccurate or should be understood as meaning anything other than what it said on its face.

Counsel for Mr Ruffini and the State of Queensland submitted that the statement ‘operating at the top end of W1 and the bottom end of W2’ could not be a statement relating to the strategy because the uncontradicted evidence ‘is that the dam can only operate in one strategy at a time’.<sup>342</sup> Counsel for Mr Ayre and SunWater made a similar submission and pointed to evidence from Mr McDonald and Mr Shannon to the effect that they understood that the statement should not be read literally.<sup>343</sup> Counsel for Seqwater<sup>344</sup> and counsel for Mr Tibaldi<sup>345</sup> also made this submission.

Counsel for Mr Ruffini and the State of Queensland made a further submission pointing to matters that suggest that, objectively, the manual required that strategy W3 be used at that time.<sup>346</sup> Counsel for Mr Ayre and SunWater made a similar submission in these terms:<sup>347</sup>

... because the lake level was in excess of 68.5 (it was 68.61) there was never any belief that they were still in W1. They were and they knew they were in W3 because of the lake levels and the release rates were greater than the natural peak flows at low-level Moggill.

Counsel for Mr Ayre and SunWater also submitted:

that the 3.30pm conference was a clear recognition that flows that *would* impact upon urban areas were now in contemplation. Indeed, that entry in the event log refers to the fact that it was anticipated that a level below 72.5m in Wivenhoe Dam can be achieved. This is well within the range of W3, and towards the top of that range. ... The 3.30pm conference is simply a recognition that the engineers knew that combined flows would likely have to be increased to the upper limit of strategy W3.<sup>348</sup>

The Commission accepts that the flood engineers plainly recognised at the 3.30 pm conference that Fernvale Bridge and Mt Crosby Weir Bridge might have to be closed as a consequence of further rainfall.

But the remainder of the submissions amount to an assertion that the flood engineers were operating in W3 because the Wivenhoe Dam lake level and anticipated releases were within the range of W3. The difficulty is that the submissions effectively identify the strategy that the manual required and assume that the flood engineers were following it. They do not assist in answering the question because their starting point is to assume the answer.

Counsel for Mr Ayre and SunWater submitted that the best explanation for the use of W1 and W2 in the entry is as ‘a shorthand description... in terms of the objectives that were still able to be achieved’.<sup>349</sup> This is essentially the explanation given by Mr Ayre in evidence.

It is a strange explanation. On this view, instead of saying ‘At this stage still keeping Fernvale and Mt Crosby Weir open while protecting against urban inundation’, somebody used the same number of words, intending to say the same thing but expressed it imprecisely and opaquely in order to convey something entirely different from the natural meaning of what was said. They did so using, as shorthand for particular ideas, technical words with which they were supposedly very familiar but otherwise never used.

Counsel for Seqwater submitted for a different interpretation: the ‘more likely construction of the entry is that it is referring to *release rates*’.<sup>350</sup> Counsel for Mr Tibaldi made a similar submission.<sup>351</sup> That was the interpretation initially advanced by Mr Ruffini and then abandoned because it did not make sense to him.<sup>352</sup> The difficulty with this interpretation is that while the reference to ‘the top end of W1’ might be understood to refer to the maximum release rate permissible under W1, ‘the bottom end of W2’ means nothing. There is no minimum release rate in W2. It makes no sense to refer to W2 if the strategy is in fact W3. This is also not a credible interpretation.

## Conclusion

The only satisfactory and reasonable interpretation is that the words mean what they say. They record the recognition by one or more of the flood engineers in their conference on the afternoon of Sunday, 9 January 2011 that they were at a point of transition out of W1 and into W2. That reading is consistent with the evidence that suggests that Mr Tibaldi,<sup>353</sup> Mr Ayre<sup>354</sup> (though in his evidence this year he appeared to suggest that this was a trap into which others might fall)<sup>355</sup> and Mr Malone (though he denied he was confused about the implementation of W2),<sup>356</sup> at least, may have thought at the time that the progression between strategies W1, W2 and W3 was linear, with W2 a necessary transition between W1 and W3. The reference to W2 is also consistent with what follows: the prospect that the flows from the Lockyer and the Bremer would increase significantly, requiring that releases from Wivenhoe would be reduced to contain the flow downriver,<sup>357</sup> as the flood engineers indicated was their practice in W2.

The statement is unlikely to have been a mere passing observation; it was significant enough for a flood engineer to record it in the flood event log, an indication that it was regarded as representing the current state of affairs in the operation of the dam.

## 16.7.4 Situation Report at 9.04 pm, telephone conference at 9.30 pm, and emails from Mr Spiller at 11.07 pm on 9 January 2011

The situation report issued (by Mr Malone) at 9.04 pm on 9 January 2011 has already been discussed (see 16.7.1 *Documents from which no inference as to strategy can be drawn*). Relevantly for these purposes, it contained this statement:

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m<sup>3</sup>/s and the combined flows is [sic] the lower Brisbane will be limited to 4,000m<sup>3</sup>/s. This is below the limit of urban damages in the City reaches.<sup>358</sup>

As noted above, this is the first situation report that mentioned protection of the urban environment.

The flood event log<sup>359</sup> shows that Mr Drury spoke to Mr Ayre at 9.10 pm. At 9.18 pm, Mr Drury sent an email to, among other people, Daniel Spiller, then acting chief executive of the SEQ Water Grid Manager.<sup>360</sup> The email attached Technical Situation Report W34, which was based on the 9.00 pm situation report and included the statement excerpted above.

At 9.30 pm on 9 January 2011, a telephone conference was held between, among other people, Mr Spiller, Mr Drury and Debra-Lee Best, then acting Director-General of DERM.<sup>361</sup> Mr Drury did not recall the 9.30 pm telephone conference.<sup>362</sup> Mr Spiller initially said in his evidence that his recollection was that during this teleconference Mr Drury had indicated that there had been a change in objectives to protect against urban inundation and this ‘was the genesis and the introduction to the teleconference’.<sup>363</sup>

However, other answers given by Mr Spiller were less clear about whether Mr Drury had mentioned a change in strategy from protecting rural areas to protecting against urban inundation, as opposed to simply identifying the primary objective as the latter. He believed what was said to be consistent with what was in the emails and technical situation reports he had received from Mr Drury and the summaries he had subsequently sent out.<sup>364</sup>

Ms Best took notes of that teleconference.<sup>365</sup> Her notes relevantly record against Mr Drury’s name, ‘have to start releasing large’, ‘looking at urban inundations’ and ‘will impact on bridges’.<sup>366</sup>

The flood event log shows that Mr Drury called and spoke with Mr Ayre at 10.20 pm in the flood operations centre. The entry relevantly records, ‘A teleconference with Water Grid Manager and DERM was completed. Explained 9.00 pm situation report. Water Grid Manager will be distributing media release in the morning regarding closure of bridges.’

At 11.07 pm that evening, Mr Spiller sent an email to a number of people, including the Minister, Mr Robertson, and copied to recipients that included Mr Drury, that stated:

To date, the primary objective for this event has been managing to prevent inundation of the Mt Crosby Weir and Fernvale Bridges.

With the forecast volumes, this primary objective is being changed to minimizing the risk of urban inundation.<sup>367</sup>

The inference is open on the evidence that Mr Drury told Mr Spiller and Ms Best in the 9.30 pm teleconference, that there had been a change of objective to protecting against urban inundation. However, given the uncertainty of some of Mr Spiller’s answers on the point, the Commission is not prepared to draw that inference.

## 16.7.5 Mr Drury’s email to Mr Spiller on the morning of 10 January 2011

On the morning of 10 January 2011, at 8.13 am, Mr Spiller sent an email to Mr Drury asking:

Are you now operating under release strategy W2 or W3?<sup>368</sup>

At 8.23 am, Mr Drury answered:

W2<sup>369</sup>

Mr Drury was asked about this statement in evidence:

Ms Wilson: Where did you get that information from?

Mr Drury: That would have been what I thought at the time.

Ms Wilson: So you just made that up?

Mr Drury: I didn't make it up. I assume at the time I just thought that was what we were still on and to be honest it might have been from an earlier report or it may have been what I thought at the time.<sup>370</sup>

Mr Drury was asked a number of times during the course of his evidence what the basis of his understanding was for the statement that the strategy in operation was W2. He said repeatedly that it was 'what [he] thought at the time'.<sup>371</sup>

It was suggested by counsel for SunWater<sup>372</sup> that Mr Drury came to the view expressed in the email, that W2 was in operation, on the basis of information contained in a situation report he had received from the flood operations centre. That is unlikely. None of the situation reports referred to strategy W2, with the exception of Mr Ayre's situation report issued at 5.53 pm on 8 January, and it was by then more than 36 hours old. Mr Drury's evidence about his knowledge of flow rates and releases did not suggest he would have been able to draw the inference about the strategy from information in the situation reports. And it seems improbable that he would have answered the question by guessing, when he could readily have learned the answer from the flood engineer on duty.

On the other hand, Mr Drury's evidence was that he could not recall having checked with anyone what strategy was being used,<sup>373</sup> 'asking anyone or ringing' the flood operations centre.<sup>374</sup> Given his apparently complete lack of recall on the subject, the Commission is not prepared to draw the inference that he obtained the information from a flood engineer.

## 16.7.6 Teleconference at 8.30 am on 10 January 2011

Representatives of the SEQ Water Grid Manager and representatives of Seqwater had a teleconference at 8.30 am on 10 January 2011.

Mr Lee Hutchison, from the SEQ Water Grid Manager, prepared minutes of the teleconference<sup>375</sup> which refer to W2 and W3. Mr Hutchison prepared those minutes 'contemporaneously using a computer in the Emergency Room'. He said that he 'used the same language as that used by the participants'.<sup>376</sup> He 'would not have used terms like 'W2' and 'W3' in the Minutes unless they were specifically mentioned by someone'; but he could not recall who used the terms, or the context in which they used them.<sup>377</sup>

Mr Spiller said in his third statement that he clarified on the morning of 10 January 2011 that the strategy being used was W2 both in his email exchange with Mr Drury 'and during a subsequent teleconference that morning in which he and Mr Peter Borrows, the CEO of Seqwater, were involved'.<sup>378</sup>

In his evidence, Mr Spiller said that he did not recall who in particular had spoken about W2 and W3 during the teleconference, only that they had been discussed.<sup>379</sup>

Mr Dennien also took part in the teleconference. He said that he had no specific recollection of the term 'W2' being used during the meeting, but had read the minutes after the meeting and did not have any issue with them.<sup>380</sup> He agreed with the proposition put to him by counsel for Seqwater that what the minutes reflected, when they mentioned W2 and W3, was not any reference to strategy but a discussion to the effect that flows in the order of 3500 m<sup>3</sup>/s could be tolerated, but that flows above that would risk flooding homes. In fact the subject of strategy was not, he agreed, actually raised in the meeting; it was really about release rates.<sup>381</sup>

Mr Drury could not recall the teleconference.<sup>382</sup>

Mr Peter Borrows, the CEO of Seqwater, and two other employees of Seqwater also participated in the conference. Mr Borrows denied any discussion of the operating strategies.<sup>383</sup> Mr Stan Stevenson of Seqwater made some notes of the conference which contain no reference to operating strategies;<sup>384</sup> he had no independent recollection of the teleconference.<sup>385</sup>

Mr Paul Bird of Seqwater also took notes which do not refer to any operating strategies.<sup>386</sup> Although he had no independent recollection of the teleconference, he did not believe, given the absence of reference to any of the 'W' terms in his notes, that there was any discussion involving them.<sup>387</sup>

Mr Michael Lyons, from the SEQ Water Grid Manager, recalled 'that the 'W' term was used during the teleconference' but could not 'recall who used that term or in what context'.<sup>388</sup>

Counsel for Seqwater submitted that there was ‘no foundation for a finding that Mr Borrows or Mr Drury mentioned W2 or W3 during this meeting’,<sup>389</sup> no contemporaneous document recorded either doing so. While the Commission is of the firm view, given the evidence of the Water Grid Manager personnel, that the ‘W’ strategies were discussed, that submission is accepted.

Given the uncertainty about who referred to the W2 and W3 strategies in the 8.30 am teleconference, and in what context, the evidence does nothing to establish which of the strategies was in use in the operation of the dam, or the state of mind of the four flood engineers in relation to them.

### 16.7.7 Mr Allen’s email to Mr Cooper at 10.57am on 12 January 2011

At 10.22 am on the morning of 12 January 2011, Mr Cooper sent an email to Mr Allen attaching his draft report into compliance with the manual at Wivenhoe.<sup>390</sup>

Mr Cooper’s draft report relevantly stated:

Until the last day or so, Wivenhoe Dam has been below EL74.0 and accordingly, would be operating under Strategy W1...

Over the last couple of days, the storage level in Wivenhoe Dam has increased to above EL 74.0... This situation would demand strategy W3 for Wivenhoe Dam...<sup>391</sup>

Mr Allen replied to Mr Cooper at 10.57 am, saying:

Just a couple of comments after a very quick read of your report.

2<sup>nd</sup> page: Strategy W1 applies until the reservoir exceeds 68.5 and then it moves into W2 or W3. For the last day or so before yesterday’s big rise, it would have been in W2. It moved into W4 at about EL 73.5 ...<sup>392</sup>

Mr Allen said in evidence that this email was his understanding at the time, but he did not know where he had got it from. He had not made his own assessment<sup>393</sup> and had not turned his mind to which of the W strategies might have been employed.<sup>394</sup> Consequently, what he said to Mr Cooper must have in turn been based on something he had received or been told.<sup>395</sup> He identified as possible sources of the information the technical situation reports,<sup>396</sup> information he ‘could get on the internet’,<sup>397</sup> ‘stuff provided by Seqwater’<sup>398</sup> or telephone conversations with people at the flood operations centre.<sup>399</sup>

It was suggested to Mr Allen by counsel for Seqwater that he must have drawn an inference as to the strategy being used based on information contained in the technical situation reports.<sup>400</sup> Mr Allen accepted that this was possible, but said that he could not recall where he ‘got the W2 from’.<sup>401</sup>

The flood event log records:

- a. A telephone call from somebody at the flood operations centre to Mr Allen at 7.15 pm on 9 January 2011.
- b. A telephone call from somebody at the flood operations centre to Mr Allen at 9.00 pm on 10 January 2011.
- c. A telephone call at 8.10 am on 11 January 2011 between Mr Tibaldi and Mr Allen.
- d. A telephone call at 4.41 pm on 11 January 2011 from Mr Allen to somebody at the flood operations centre.

Counsel for Mr Tibaldi submitted that there was no evidence that Mr Allen had been told by a flood engineer at the flood operations centre that W2 was in operation.<sup>402</sup> Counsel for Seqwater submitted that Mr Allen’s email when it said ‘it would have been in W2’ rather than ‘it was in W2’, used the language of supposition, the inference being that the supposition was Mr Allen’s own.<sup>403</sup>

However, it is difficult to accept either that Mr Allen was relying on supposition that the strategy was W2, or that his understanding was the product of inference from the technical situation reports or information obtained from the internet. His evidence was that he had not made his own assessment.<sup>404</sup> He had been asked by the Water Grid Manager to liaise with Mr Cooper;<sup>405</sup> he presumably knew that Mr Cooper’s report was a report for the Premier as to compliance with the Wivenhoe manual; and he subsequently recommended that it be cited in Seqwater’s briefing note to the Minister.<sup>406</sup> He could have been under no misapprehension as to the significance of Mr Cooper’s report.

It is unlikely that he would have lightly given Mr Cooper information so vital to his conclusions without checking with the flood engineers, with whom he was in regular contact.

It is more probable than not that Mr Allen gained his understanding that the dam ‘would have been in W2’ from one of the flood engineers.

### **Submission by the State of Queensland**

Counsel for the State of Queensland submitted that, for it to be accepted that a strategy other than W3 was implemented from the morning of 8 January 2011, it was necessary that two things be established:<sup>407</sup> first, that the contemporaneous documents represented ‘the true state of affairs at the relevant time indicated in those documents’; second, ‘that the dam was being operated in accordance with those statements’. They went on to submit that ‘[i]f the documents do not contain statements made or adopted by all four flood engineers, then, the first part of the allegation [that the contemporaneous documents represented the true state of affairs at the relevant time] fails’.<sup>408</sup>

The last proposition is plainly wrong. It can be dealt with briefly. At some relevant times, only one flood engineer was on duty and present in the flood operations centre. If that flood engineer prepared a contemporaneous document that recorded the current operational strategy, that would be clear evidence of the state of affairs at the relevant time. The value of the evidence would not be diminished by the fact that the other three engineers, who were not on duty and did not prepare the document, did not adopt the document as correct.

### **16.7.8 Conclusion on contemporaneous documents**

None of the contemporaneous documents supports the contention that the flood engineers began operating under the W3 strategy at 8.00 am on Saturday, 8 January 2011. Instead:

- a. Mr Ayre’s reference to W2 as a possible future and higher strategy on the afternoon of 8 January 2011 is evidence that no transition had been made from strategy W1.
- b. The 3.30 pm entry for the flood engineers conference on 9 January 2011 referring to being at the top of W1 and the bottom of W2 shows that the flood engineers then believed they were operating under W1, on the cusp of moving to W2.
- c. Mr Allen’s understanding, expressed in the email to Mr Cooper, that strategy W2 would have been in place before strategy W4 came into effect, supports the view that at least one of the flood engineers with whom he was in communication believed that strategy to have been applied.

## **16.8 The first attempts to record strategy choice**

Between 15 and 17 January 2011, three documents were prepared which purported to record the strategies used in the January 2011 flood event and the timing of their adoption: Mr Malone’s Summary of Manual, the Strategy Summary Log and the briefing note to the Minister. The time at which the documents were produced is significant: it was only days after the relevant strategy choices were made. It was also a time at which the flood operations centre was still operating; the engineers had been working for days with little sleep and under considerable pressure.<sup>409</sup>

Each of these documents records a different version of strategy choice and timing, but all three record that strategy W2 was engaged during the January 2011 flood event. By contrast, the March flood event report recorded that there were only two changes in W strategy: the transition from W1 to W3 and from W3 to W4; W2 was skipped entirely. One might reasonably expect the engineers to have had a clear recollection of both, at least in mid-January 2011. It is surprising, then, that conflicting and apparently erroneous records were prepared so soon after the January 2011 flood event.

### **16.8.1 Mr Malone’s Summary of Manual document**

The first of the three documents, a Microsoft Word document with the file name Summary of Manual<sup>410</sup> appears to be the earliest written account of the strategies used at Wivenhoe Dam in the January 2011 flood event. It was written by Mr Malone,<sup>411</sup> who forwarded it to the other flood engineers as an attachment to an email, in which he advised that Mr Borrows, the chief executive officer of Seqwater, had asked for a two page summary of the manual. In that email, he asked for comments before the document was passed on to Mr Drury. The email ends with the sentence, in bold red font, ‘JT bring out the red pen!’<sup>412</sup> That was a reference to Mr Tibaldi, with his penchant for thorough review of documents.<sup>413</sup>

The document attached to the email is titled Summary of Manual of Operational Procedures for Flood Mitigation at Wivenhoe and Somerset Dam. The summary seems to have been created between 11.30 am on 15 January, when the flood event log records that Mr Drury rang the flood operations centre to request a summary of the manual, which ‘Terry’<sup>414</sup> (Mr Malone)<sup>415</sup> was to ‘provide after checking with all duty engineers’, and 1.02 pm on the same day, when Mr Malone sent the email attaching the document to Mr Ruffini, Mr Tibaldi, Mr Ayre and Mr Drury.

The flood event log also records that at 1.10 pm Mr Allen telephoned about the summary and was told by Mr Malone that it was with the other engineers for checking before issuing.<sup>416</sup> At 1.15 pm, according to the log, Mr Drury rang with questions on the summary.<sup>417</sup>

The Summary of Manual gives an overview of the Wivenhoe manual and includes a précis of the W strategies. Importantly, incorporated into that précis of strategies are the times at which the different W strategies were ‘exceeded’ during the January flood event. The relevant entries are:<sup>418</sup>

*The Flood Operations Centre was mobilised at 8am Saturday 6 January 2011.*

...

*[W1] was exceeded at 8am Saturday 6 January 2011.*

...

*[W2] was exceeded approximately 6pm Saturday 8 January 2011.*

...

*[W3] was exceeded approximately 9am Tuesday 11 January 2011.*

(italics in original)

Accepting the reference to W1’s being exceeded on 6 January as a typographical error for 8 January,<sup>419</sup> the chronology differs from all other versions of when strategy changes took place.

Mr Malone said that the Summary of Manual was his understanding, at that time, of the way in which the dam had been operated. As to the first of the entries for strategy change, he had not been on duty on 8 January; it was clear to him, looking at the lake level, that W1 had been exceeded at 8.00 am that day, and no-one had decided at that stage that W2 had been skipped. The reference to W2’s being exceeded at approximately 6.00 pm on 8 January might have emanated from a situation report by Mr Ayre (presumably the one at 5.53 pm) or from the fact that W2 was described as a transition from W1 to W3.<sup>420</sup> He was not on duty for those periods, hence his request for the other engineers to review the document.<sup>421</sup> His next shift was from 7.00 am to 7.00 pm on 9 January 2011, when, he said, he understood W3 to be in place.<sup>422</sup>

## Feedback on Mr Malone’s summary

Mr Malone confirmed that his email was an invitation for feedback on the document, but he did not recall receiving any. He expected, he said, any comments to be sent on to Mr Drury, and also anticipated that Mr Tibaldi would ‘mould’ the document.<sup>423</sup> Mr Malone said he did not know when the document was sent to Mr Borrows.<sup>424</sup>

Mr Ayre had some recall of Mr Malone’s mentioning that he was preparing such a document; he knew that a report was being prepared, but could not recall for whom.<sup>425</sup> He remembered receiving the email Mr Malone sent at 1.02 pm, but not the attached document.<sup>426</sup> He could not recall if he had provided the information on when W1 was ‘exceeded’ to Mr Malone; it was possible<sup>427</sup> (although Mr Malone’s evidence was that he reached that conclusion on the basis of the lake level).<sup>428</sup>

Mr Ruffini (who was not on duty until the evening of 15 January) said he had ‘no real recollection’ of Mr Malone’s preparing the summary or of seeing or going through the document.<sup>429</sup>

Mr Tibaldi did not recall the email, although he accepted that it had certainly been sent to him. He did not recall the summary although he imagined he would have read it; the email message was a request to him to review it. He had no recollection of the day at all.<sup>430</sup>

Mr Drury accepted that he had made the telephone call to the flood operations centre asking for the summary. He had no recall of its purpose other than that he might have made the request so that Mr Borrows could have a short summary of the manual prior to a teleconference being held at 2.00 pm that day.<sup>431</sup> Mr Drury could not remember the questions he rang to ask at 1.15 pm;<sup>432</sup> Mr Malone had no recollection of this conversation with Mr Drury.<sup>433</sup>

Mr Navruk was the flood officer on duty at the time Mr Malone received the request to provide the Summary of Manual, at the time Mr Malone drafted it and at the times the follow up calls from Mr Drury and Mr Allen were received. Mr Navruk accepted he made the entries in the flood event log that recorded communications about the summary,<sup>434</sup> but had no recollection of having seen the document.<sup>435</sup>

### Further circulation

Mr Drury was unable to say whether, at the time he received Mr Malone's summary, he regarded it as consistent with his understanding of the strategies engaged during the flood event.<sup>436</sup> His evidence was completely unclear as to whether or when he had sent it on to Mr Borrows. Mr Borrows had no recollection either of having requested<sup>437</sup> the Summary of Manual, or having seen it,<sup>438</sup> and there is no documentary evidence that he did.<sup>439</sup>

Mr Allen had some recall of seeing the document, or something like it.<sup>440</sup> He had no real recall of the call he was recorded as making at 1.10 pm, but suggested its purpose might have been to check that information of the kind in the summary was available for his later review.<sup>441</sup>

### Conclusions on the Summary of Manual

The Summary of Manual was Mr Malone's 'best work' in making 'a record of the strategies which were employed'<sup>442</sup> as he understood them at the time, for the information of Seqwater's senior management. He had some concerns, he said, that parts of it might not be correct, but did not express them to anyone; what he did instead was send it to the other engineers for review.<sup>443</sup>

The document is significant as the first written record of the strategies used and when they became applicable. It records, accurately, that the flood operations centre was mobilised at 8.00 am on 6 January 2011, a time when Mr Malone was on duty. It records that strategy W3 was in place from, approximately, 6.00 pm on 8 January over a period which includes Mr Malone's shift between 7.00 am and 7.00 pm on 9 January 2011, and is consistent, in respect of Mr Malone's shift, with what appears in the March flood event report. The time it gives (approximately 9.00 am on 11 January 2011) for the exceeding of W3 is later than that given in the March flood event report, which says that the decision was made to transition to strategy W4 at 8.00 am;<sup>444</sup> but the word 'approximately' conveys some lack of precision. The summary's real divergence from the March flood event report is in showing strategy W2 as in effect from 8.00 am till 6.00 pm on 8 January, a period when, it must be said, Mr Malone was not on shift.

The summary raises the question why, if the unavailability of W2 was as obvious as was suggested in other evidence, Mr Malone could not have speedily established that fact by looking at the flow data. More importantly, Mr Malone's means of compiling it was, apparently, not to ask the other engineers directly about what had occurred during their shifts but to attempt a reconstruction for those parts before seeking their comments. That suggests, at least, a lack of confidence that clear answers would be forthcoming. Moreover, not only did Mr Malone not know that W2 was bypassed (as it was said to be in the March flood event report), but, at the time, he believed that none of the engineers did. That is in a context in which the four of them had conferred on 9 January about objectives and release strategies and they had been working two to a shift from that evening. It is evidence that Mr Malone, at any rate, did not think there had been any clear and conscious adoption of, or adherence to, strategy, and that this document was an early exercise in reconstruction of the flood event.

### 16.8.2 Strategy Summary Log

The second of the strategy record documents produced on 15 January is an Excel spreadsheet entitled Strategy Summary Log.<sup>445</sup> As its name suggests, the document purports to record the times at which different operational strategies were engaged at Wivenhoe Dam. It shows the following:

- Strategy W1 was engaged at or around 7.00 am on 6 January 2011<sup>446</sup>
- Strategy W2 was engaged at or around 3.30 pm on 9 January 2011<sup>447</sup>
- Strategy W3 was transitioned to at or around 7.15 pm and was engaged by 9.04 pm on 9 January 2011<sup>448</sup>
- Strategy W4 was engaged between 6.12 am and 12.00 pm on 11 January 2011.<sup>449</sup>

The times of the changes in operating strategies indicated in this document differ from all other versions.

## The documentary record

It seems that the Strategy Summary Log was created by ‘saving as’ a version of the flood event log on the evening of 15 January 2011. It was saved onto the shared network space for the flood operations centre in the same electronic folder as the flood event log.

The points of transition are highlighted in the document in bright yellow. Entries in the flood event log which did not relate to choice of strategies were deleted from it.

Identical copies of the Strategy Summary Log were forwarded as attachments to emails on four occasions:

- At 6.57 pm on 15 January 2011, the Strategy Summary Log was emailed from the Duty Engineer address to Mr Tibaldi by a person who signed off as ‘Rob’.<sup>450</sup>
- At 7.51 pm on 15 January 2011, Mr Tibaldi emailed the Strategy Summary Log to the Duty Engineer email address.<sup>451</sup>
- At 1.03 pm on 17 January 2011, the Strategy Summary Log was emailed from the Duty Engineer address to Mr Allen and Mr Drury.<sup>452</sup>
- At 6.06 pm on 17 January 2011, the email sent to Mr Allen and Mr Drury, including attachments, was forwarded from the Duty Engineer address to Mr Ruffini’s email address.<sup>453</sup>

## The creation and circulation of the Strategy Summary Log

The evidence as to how the Strategy Summary Log came into existence and was circulated was extraordinarily limited; most witnesses denied any recall of it.

Mr Tibaldi said he had no recollection of the document or the emails sent to and from him on 15 January 2011. He accepted that the 6.57 pm email appeared to have been sent to him and assumed that he would have opened the email and looked at the attachment at the time.<sup>454</sup> He also accepted that it appeared that he had sent an email attaching the Strategy Summary Log at 7.51 pm that evening to the then Duty Engineer, Mr Ruffini.<sup>455</sup>

Mr Tibaldi acknowledged that on the same evening, 15 January 2011, he was working on preparing part of a brief for the Minister (discussed further in section 16.8.3 below).<sup>456</sup> It is possible, given the timing, that the Strategy Summary Log was drafted to assist in preparing that brief, which included a summary of the strategies used and the times at which they were employed. They differed, however, from those in the Strategy Summary Log.

Mr Ruffini accepted that an email attaching the Strategy Summary Log was sent to him.<sup>457</sup> He could not recall viewing the document or discussing it, but said that given that the email had been sent to him he could not ‘imagine’ that he would not have opened it and at least glanced at it.<sup>458</sup> He denied any involvement in the preparation or review of the document.<sup>459</sup>

Mr Ruffini accepted that the email attaching the Strategy Summary Log was sent from the duty engineer account to Mr Drury and Mr Allen at the time that Mr Ruffini was on duty, but had no recollection of sending the document himself.<sup>460</sup> He thought it unlikely that he would have sent the document to Mr Drury or Mr Allen unless one of them had requested it.<sup>461</sup>

Mr Ayre was the only witness able to recall anything about the creation of the Strategy Summary Log. He was, at times, unclear as to whether the evidence he gave was of an actual recollection of events or an after the event reconstruction. He assumed that the Strategy Summary Log was created in the time between Mr Drury’s arrival at ‘about’ 5.30 pm and 7.00 pm, when the email first attaching it had been sent.<sup>462</sup> (The flood event log records that Mr Drury arrived at 5.00 pm.<sup>463</sup>) He said that he did not believe he had created the spreadsheet and could not recall who had,<sup>464</sup> although it was possible he might have done some work on it, copying the flood event log and making suggestions about how to proceed.<sup>465</sup>

Mr Ayre’s fullest explanation of the origin of the document was that one of the flood officers, told to do a high level filter of the flood event log on 15 January 2011, had created the separate spreadsheet titled Strategy Summary Log, stripped out the information that did not relate to strategy and made an assessment of the strategies used based on the remaining information, but ignoring release rates, lake levels and naturally occurring flows.<sup>466</sup> Mr Ayre went into detail:<sup>467</sup>

At the time we simply said, ‘Here’s a copy of the manual. Have a go at allocating what your interpretation is of the strategy at that given time.’

When asked whether that was an actual recollection, Mr Ayre said that this was ‘probably a reconstruction’ of events.<sup>468</sup>

Mr Ayre rejected the suggestion that he might have been the person who inserted the strategies after a flood officer had done an initial edit of the document.<sup>469</sup> He pointed to the inclusion of strategy W4B in the spreadsheet, which he said all duty engineers knew had never been engaged.<sup>470</sup> (Strategy W4B relates to the situation where the initiation of the fuse plugs at Wivenhoe Dam is possible.<sup>471</sup>)

Mr Ayre suggested that Mr Navruk or Mr Pokarier was probably the author of the Strategy Summary Log.<sup>472</sup> At one point Mr Ayre suggested that he delegated the task of creating the Strategy Summary Log to one of Mr Navruk, Mr Pokarier, or, possibly, Mr Drury.<sup>473</sup> When questioned further on this point Mr Ayre was unsure as to whether it was he, Mr Tibaldi or Mr Drury who had given the instruction to the flood officer,<sup>474</sup> but was relatively confident that it was one of the three.<sup>475</sup> The document was then sent to Mr Tibaldi to assist him with preparing the briefing for the Minister.<sup>476</sup> Mr Ayre’s understanding of the arrangement was that Mr Tibaldi would review the document.<sup>477</sup>

Mr Ayre explained that the Minister’s office had requested that the briefing for the Minister focus on what had occurred on 11 January 2011 and that, accordingly, this was the focus of the flood engineers’ work.<sup>478</sup> For this reason, apparently, the work of considering the timing of strategies other than W4 was delegated to a flood officer or Mr Drury.<sup>479</sup> Mr Ayre accepted that this process was flawed, but said that at the time there were not enough resources or time to do a comprehensive report and that it would have been grossly unfair to make the already exhausted flood engineers work through the night to verify all aspects of the work that was done.<sup>480</sup>

Mr Ayre gave inconsistent accounts about whether the ‘Rob’ who sent the 6.57 pm email attaching the Strategy Summary Log was he or Mr Drury. On 30 January 2012, Mr Ayre provided a statement to the Commission saying that he sent the email,<sup>481</sup> but then gave another statement on 1 February 2012 stating that he no longer believed this to be true.<sup>482</sup> Mr Ayre explained that he changed his explanation when he learned that his assumption, at the time he wrote his 30 January 2012 statement, that he had been the only ‘Rob’ in the flood operations centre at the time the email was sent, was incorrect.<sup>483</sup> In oral evidence Mr Ayre said that he had no specific recollection<sup>484</sup> and simply did not know whether or not he had sent the email.<sup>485</sup>

Mr Ayre had some recollection that ‘a document like’ the Strategy Summary Log was discussed amongst the engineers at a meeting, looking at it on a computer screen, and that they reached the conclusion that it contained errors in the attribution of the times at which strategies were employed. Mr Ayre was unsure if the document discussed was in fact the Strategy Summary Log.<sup>486</sup> He said this meeting occurred while the flood engineers were working on the flood event report.<sup>487</sup>

Mr Malone had no recollection of seeing the Strategy Summary Log and was unable to explain its purpose.<sup>488</sup> There is no evidence to suggest that Mr Malone was the author of the Strategy Summary Log or that he received a copy of it.

The only assistance Mr Malone could provide the Commission was to comment that he had seen Mr Drury working on a computer in the flood operations centre at the time the Strategy Summary Log was probably written.<sup>489</sup> The document seemed to Mr Malone unlike something Mr Ayre would have written; he believed Mr Ayre’s practice was to write his name and position on all emails; and he thought Mr Ayre would have sent the document to all of the flood engineers, not just Mr Tibaldi.<sup>490</sup>

Mr Drury accepted that he was in the flood operations centre at around the time the Strategy Summary Log was probably created.<sup>491</sup> He said he had no recollection of seeing it, and ‘certainly didn’t create the document’.<sup>492</sup> When asked why he would not have been its author, he explained that he was only at the flood operations centre for two hours to work on the brief to the Minister, would not have known how to create the document, had no need to create it and would not have known where to find the flood event log that likely formed the base of the document.<sup>493</sup> Questioned further, Mr Drury accepted that if he had been provided with the relevant information and had sufficient time to do the work he could have created the document.<sup>494</sup>

Mr Drury said that he had no recollection of sending the email signed ‘Rob’ that attached the Strategy Summary Log and pointed to the fact he had sent an email from another email account (suggesting that he was using a

different computer) around the time that email was sent.<sup>495</sup> Mr Drury acknowledged that he had been sent an email that attached the Strategy Summary Log, but said he had no recollection of opening or looking at the email.<sup>496</sup>

Mr Allen was sent an email attaching the Strategy Summary Log on 17 January 2011. Mr Allen gave evidence that he recalled having seen the document and the yellow lines that referred to W strategies<sup>497</sup> some time in the period 15 to 17 January 2011.<sup>498</sup>

Mr Borrow had no recollection of ever seeing the Strategy Summary Log.<sup>499</sup>

Mr Navruk was the flood officer on duty at the time the Strategy Summary Log was probably created on 15 January 2011. He finished his shift at 7.00 pm,<sup>500</sup> a few minutes after the first email circulating the Strategy Summary Log was sent.

Mr Navruk said that he believed he had not created the document but could not rule out having assisted in its creation.<sup>501</sup> He did not recall having worked on the document, but thought that creating a copy of the flood event log and removing some of the rows was the type of task a flood engineer might have asked him to do.<sup>502</sup> Mr Navruk said he might have made such modifications and then provided the document to someone else, but that he 'certainly didn't add any of the strategies'.<sup>503</sup> Mr Navruk commented that if he had been asked to perform the task of assigning strategies, he would have done it by reference to lake levels to determine when W1 was exceeded<sup>504</sup> (which was not, apparently, the approach of the author of the Strategy Summary Log).

Mr Navruk said that if he did assist in the creation of the document, he must have done so at the request of one of the three flood engineers at the flood operations centre at that time or Mr Drury.<sup>505</sup>

Mr Van Blerk was the flood officer on duty at the times of the 1.03 pm and 6.06 pm emails that circulated the Strategy Summary Log on 17 January 2011.<sup>506</sup> Mr Van Blerk had no recollection of having seen the Strategy Summary Log<sup>507</sup> and said that he did not send either of the emails.<sup>508</sup>

None of the other flood officers recalled having seen the Strategy Summary Log or having sent an email that attached it.<sup>509</sup>

## Conclusions on Strategy Summary Log

Mr Ayre was the only witness before the Commission who vouchsafed any knowledge of the likely origin and use of the Strategy Summary Log. His account as to who had actually sent it to Mr Tibaldi on the evening of 15 January 2011 varied. The email forwarding the document was signed 'Rob'; it was, presumably, sent by either Mr Drury or Mr Ayre, the only two 'Robs' with access to the email account from which the email was sent at that time. Emails tendered showed that Mr Ayre sometimes signed off with his full name and title but on other occasions simply used 'Rob'. Mr Drury consistently denied sending the email and pointed to his having sent an email from another address at around that time. In contrast, Mr Ayre's account was relevantly inconsistent and disclosed at least some knowledge of the document's creation.

It is extremely probable that Mr Ayre was the sender of the email. The forwarding of the document was consistent with his understanding that Mr Tibaldi was to review it.<sup>510</sup> That would account for why it was not sent to the other flood engineers. The fact that it was intended for a single recipient, in whose company Mr Ayre had been in the flood operations centre that afternoon and with whom he understood there to be an arrangement for its review, may explain why he did not think it necessary to sign the email more formally.

The question of who actually authored the Strategy Summary Log is more difficult to resolve. Mr Ayre was the only person who admitted to any recollection as to the origin of the document, but he, tentatively, attributed authorship to either a flood officer or Mr Drury, possibly acting under his instructions. Mr Drury was firm in saying that he had no recollection of having been involved. None of the flood officers knew anything of it, although Mr Navruk did not categorically rule out the possibility that he might have assisted in creating it.

It may be unlikely, given the reference in the document to strategy W4B, that Mr Ayre was actually its author. However, he conceded involvement in its creation. It is probable, given his position as the senior flood engineer for the flood event, that he took the lead in giving the directions for its production. What is telling is that the document needed to be prepared in the way it was. There were only two significant strategy transitions. The fundamental question was at what time each occurred, and in respect of the move from strategy W1, whether the change was from W2 or W3. All that needed to be ascertained was what happened when, and at what time, each strategy was exceeded. It should have been simple, if Mr Ayre's recall as to the actual timing of the change from

W1 was uncertain, to confirm it by looking at when the lake level exceeded 68.5 metres; there ought to have been no doubt in his mind that there was then a transition, and it was to W3. Given the pressures of which Mr Ayre spoke – the lack of resources and the fact that the flood operations centre was still managing the flood event<sup>511</sup> – it is inexplicable that he did not volunteer the information as to the change of strategy to W3 at 8.00 am on 8 January, if indeed he was in possession of it. The second curious aspect is that Mr Ayre apparently sent the spreadsheet to Mr Tibaldi for review without any check of it. If Mr Ayre had made a decision to bypass W2 a week earlier, even a cursory glance at the Strategy Summary Log would have revealed how wrong the document was.

It is also significant that Mr Tibaldi recirculated the document to Mr Ruffini an hour later and that someone, probably Mr Ruffini, then sent it to Mr Drury and Mr Allen on 17 January and subsequently forwarded the email to Mr Ruffini's personal address. Neither Mr Tibaldi nor Mr Ruffini admitted to any recollection of having seen the document. The evidence before the Commission does not show that all recipients of the Strategy Summary Log read it, but it is reasonable to infer that at least those who chose to recirculate the document had some understanding of its contents.

Seqwater, in its written submission to the Commission, suggested that the inference to be drawn (despite Mr Tibaldi's lack of recollection) was that he would have recognised the document's errors and discarded it on the evening of 15 January.<sup>512</sup> On the other hand, it was also submitted that there was a real prospect that the effect of the Strategy Summary Log was to confuse Mr Tibaldi, affecting his drafting of the brief to the Minister.<sup>513</sup> But if, as Seqwater suggested, Mr Tibaldi did place some weight on the Strategy Summary Log in his drafting of the brief to the Minister so as to become confused by it, that evidences further a lack of contemporary knowledge of the strategies implemented in the January 2011 flood event.

Mr Ayre said that there was an oral discussion amongst the engineers about a document that may have been the Strategy Summary Log, in which they concluded that it contained errors in the times it attributed to strategies W1 to W4 coming into effect.<sup>514</sup> None of the other engineers admitted to any recollection of the document at all, let alone a considered discussion of its contents. If Mr Ayre's account of this conversation is truthful, it is remarkable that no one else remembered it.

The Commission concludes that Mr Ayre was involved at least to the extent of giving instructions for the preparation of the document. Had he, at the time of its preparation, any clear understanding of what strategy he had operated the dam in on 8 January 2011, he would have ensured that, at least, was reflected in it. The document is strong evidence to the contrary. The inference is drawn that the Strategy Summary Log was an early attempt at reconstruction of the flood event, against a background in which Mr Ayre could not himself have identified changes in strategy during the flood event and had no confidence that the other engineers could.

### 16.8.3 The brief for the Minister

Towards the end of the January 2011 flood event, the then Minister for Natural Resources, Mines and Energy and Minister for Trade, Mr Stephen Robertson, requested a briefing note about the flood event and Wivenhoe Dam operations during it. He asked for it to be provided to him on 16 January 2011 in advance of an emergency Cabinet meeting on 17 January 2011.<sup>515</sup>

That briefing note was provided to the Minister by the chief executive of the SEQ Water Grid Manager, Mr Barry Dennien, through the Director-General of DERM, Mr John Bradley, on 16 January 2011.<sup>516</sup> The briefing note had five attachments. Relevantly for the Commission's purposes, Attachment A was a ministerial briefing note from Seqwater; Attachment D was the Flood Mitigation Manual compliance review by Mr Brian Cooper, and Mr Cooper's curriculum vitae.<sup>517</sup>

Attachment A, Seqwater's ministerial briefing note, provided information to the Minister about five topics: background information on Wivenhoe dam, flood operations at the dam, the Wivenhoe and Somerset dams flood mitigation manual, the regulatory context for the manual and the flood event report. The last section said that it was Seqwater's intention to produce a comprehensive flood event report in accordance with its obligation under the Wivenhoe manual, and attached a report titled 'January 2011 Flood Event'. Attachment A explained that the January 2011 Flood Event report should be used '...in the short term...as the basis for communications and discussion'<sup>518</sup> until the comprehensive report was available.

The January 2011 Flood Event report appears to be the first account of the choice and timing of strategies used at Wivenhoe Dam during the January 2011 flood event produced for scrutiny by external agencies. Although the

text of Attachment A explains that the January 2011 Flood Event report may be superseded by the comprehensive report, it also makes clear an intention that some reliance be placed on the January 2011 Flood Event report.

An account of the W strategies used in the January 2011 flood event is contained in a table under the heading 'Event Decision Making'. The text above the table explains that 'the following table contains a summary of the key decision points associated with the current event'. An extract of the table appears below.<sup>519</sup>

**Figure 16(c)**

DATE AND TIME	FLOOD EVENT MILESTONE
15:00 07/01/2011 (Friday)	Wivenhoe releases commence, with operational strategy W1 in use. Rainfall for the next four days is estimated to be between 140mm and 300mm, with a forecast for rain easing on Tuesday 11 January 2011. All bridges downstream of the dam with the exception of Fernvale Bridge and Mt Crosby Weir Bridge are expected to be inundated for a number of days.
06:00 09/01/2011 (Sunday)	Moderate to heavy rain periods forecast until Tuesday, but both Wivenhoe and Somerset dam levels were falling slowly, with Somerset at 1.27 m AHD above FSL and Wivenhoe 1.58 m AHD above FSL.
15:30 09/01/2011 (Sunday)	Following significant rain during the day a meeting of Duty Engineers is held. The QPF issued at 16:00 indicates 50mm to 80mm over the next 24 hours. Based on this forecast, it is anticipated that dam levels can be held to a maximum of 3.50 m AHD above FSL in Somerset and 5.5 m AHD above FSL in Wivenhoe. However, by 19:00 it was apparent that both Fernvale Bridge and Mt Crosby Weir Bridge would be inundated by the combined dam releases and Lockyer Creek flows and that the operational strategy had progressed to W2.
06:30 10/01/2011 (Monday)	Rainfall continued during the night and based on rainfall on the ground it was apparent the operational strategy had progressed to W3.
06:30 10/01/2011 (Monday)	Rainfall continued during the day but based on rainfall on the ground, operational strategy W3 remained in use. However it was apparent that any further heavy rain would result in progression of the operational strategy to W4.
08:00 11/01/2011 (Tuesday)	Rainfall continued during the night with isolated heavy falls in the Wivenhoe Dam catchment area and based on rainfall on the ground it was apparent the operational strategy would soon progress to W4 with Wivenhoe Dam exceeding 8.00 m AHD above FSL. The objective now was to limit outflows and subsequent flood damage to urban areas, while ensuring the structural safety of the dam.
11:00 11/01/2011 (Tuesday)	Rapid inflows were experienced in Wivenhoe Dam, with the dam rising almost a metre in eight hours. Releases were increased until the dam level stabilised in accordance with Strategy W4. Computer models were not reflecting actual dam inflows due to intense point rainfalls in the immediate catchment around the dam. Falls are estimated to be similar to those experienced at both Toowoomba and Upper Lockyer the previous day and are falling outside and between existing rain gauges.

The language used in the table clearly suggests that the W strategies referred to were actually employed at the times indicated. The changes in strategy are presented as events that actually occurred.

## Production of the brief

The brief to the Minister, including Attachment A and the January 2011 Flood Event report, was prepared on relatively short notice.

The flood event log records a teleconference between Mr Malone, Mr Ayre, Mr Tibaldi, Mr Drury, Mr Allen, Mr Borrows, Mr Bradley and Mr Robert Reilly (general manager of the Office of the Water Supply Regulator, DERM) at 2.00 pm on 15 January 2011 to discuss a report for the Minister by close of business on Sunday 16 January 2011.<sup>520</sup> The discussion points for the teleconference, which were emailed to the Duty Engineer email account at 2.21 pm stated that one objective was preparation for a public inquiry. Seqwater and DERM were listed as

responsible for providing information on the development of the manual, including the ‘four strategies’. Seqwater was also listed as responsible for providing information about the operation of the dam during the event.<sup>521</sup>

Mr Drury gave evidence that it was left to the flood operations centre and him to put together the brief to the Minister.<sup>522</sup> The flood event log records Mr Drury arriving at the flood operations centre at 5.00 pm.<sup>523</sup> Mr Malone, Mr Ayre and Mr Tibaldi had been there since the 2.00 pm teleconference.<sup>524</sup> (Mr Malone was the duty engineer on shift.<sup>525</sup>) Mr Ruffini was on shift from 7.00 pm that evening until 7.00 am on 16 January.

Mr Drury, Mr Ayre, Mr Tibaldi and Mr Malone had a discussion about what each of them would do to prepare the briefing note.<sup>526</sup> None of them could recall exactly what each did. The evidence suggests that:

- Mr Tibaldi wrote the text of the ‘January 2011 Flood Event Report’<sup>527</sup> including the table of ‘Event Decision Making’. A comparison of the draft versions of the brief that were circulated suggests that he completed the table between 6.34 pm on 15 January, when he sent a version to Mr Drury that did not include the table<sup>528</sup> and 9.10 pm on 15 January, when he sent a draft to Mr Borrows, Mr Drury, Mr Ruffini, Mr Malone, his own Seqwater email account and the Duty Engineer email account.<sup>529</sup> As Mr Tibaldi has no memory of 15 January 2011<sup>530</sup> there is no evidence of how he went about creating this document.
- Mr Drury was involved in pulling together parts of the ‘front of the briefing note’ to provide ‘a bit of a summary of the manual’.<sup>531</sup> He says he did not discuss the use of strategies with any of the flood engineers at any time during the production of the briefing note.<sup>532</sup>
- Mr Malone did some modelling work to produce the graphs that appear on page 4 of Attachment A.<sup>533</sup>
- Mr Ayre spent time gathering background documents<sup>534</sup> and adding comments and annotations of gate directives to a gate operations spreadsheet relevant to the morning of 11 January 2011.<sup>535</sup>
- Mr Ruffini was not involved in preparing the briefing note during the evening of 15 January because he was the duty engineer.<sup>536</sup>

### The flood engineers’ awareness of the briefing note

At 9.10 pm on 15 January 2011 Mr Tibaldi sent a draft version of the ‘January 2011 Flood Event Report’ section of the briefing note by email to Mr Ruffini, Mr Malone and the Duty Engineer email.<sup>537</sup> Another draft was sent to the Duty Engineer account and Mr Ayre’s and Mr Ruffini’s work accounts at 6.42 am on 16 January 2011.<sup>538</sup> A further draft was then sent to the same recipients at 8.17 am on 16 January 2011.<sup>539</sup> The drafts attached to those emails all included a table identical to that which appeared in the final briefing note. The Duty Engineer email account was also sent copies of later versions of the whole briefing note, by Mr Allen at 11.58 am on 16 January<sup>540</sup> and by Mr Borrows at 3.59 pm<sup>541</sup> and 4.28 pm<sup>542</sup> on 16 January. At 8.30 am on 16 January 2011, Mr Borrows, Mr Tibaldi, Mr Drury and Mr Malone met to discuss the brief being prepared for the Minister.<sup>543</sup>

Mr Ayre said he could not recall reading the version of the ministerial briefing note which was sent at 9.10 pm.<sup>544</sup> It was not sent to his personal address, and while Mr Tibaldi sent the email to the Duty Engineer account, Mr Ayre was not on shift until 7.00 am the following day.<sup>545</sup> Mr Ayre was on shift on 16 January 2011, and subsequent drafts were sent to his SunWater email account and the Duty Engineer account that day. Mr Ayre said he was concentrating on operating the dams during his shift.<sup>546</sup> He later said that he had read a draft of the brief at some stage, but said that when he reviewed that draft he focussed on the section of the report that related to the releases made on the morning of Tuesday 11 January 2011 and was unlikely to have read the rest.<sup>547</sup>

The Commission’s conclusion is that Mr Ayre must in fact have read the brief on 15 or 16 January 2011, or, at least, as he suggested, at some later stage. He accepted that it was not lengthy,<sup>548</sup> and he had access to it in more than one email account. Mr Ayre was the senior flood operations engineer for the flood event;<sup>549</sup> he had been personally involved in determining the strategies employed in the event; and he had been specifically requested to be at the 2.00 pm teleconference where the request was made for the brief to the Minister to be prepared.<sup>550</sup> The briefing note was destined for the Minister; it was an important document.

Mr Malone said that he had a minor role in the production of the material for the Minister,<sup>551</sup> he was concentrating on operating the dam, as he was on shift until 7.00 pm on 15 January 2011.<sup>552</sup> He could not recall seeing a copy of the brief at the time.<sup>553</sup> Mr Malone recalled meeting with Mr Borrows, Mr Tibaldi and Mr Ayre on 16 January 2011 about the briefing note, but said that even at that stage he did not familiarise himself with the briefing note.<sup>554</sup>

He acknowledged, however, that he wanted to make sure that the parts he provided were correct and that he had an interest in the other parts; he ‘could have’ read it.<sup>555</sup> Again, the Commission regards it as more probable than not that he did.

Mr Ruffini said that he never saw a draft of the briefing note.<sup>556</sup> He said he was not involved in discussions with Mr Tibaldi, Mr Malone or Mr Ayre about it;<sup>557</sup> he was exhausted and had many other pressing concerns including from his full time role at DERM.<sup>558</sup> He accepted that he was sent the document four times, but said he never opened it.<sup>559</sup> No firm conclusion can be reached that he did.

### **Others’ awareness of the briefing note**

Drafts of the brief to the Minister were circulated to many persons involved in the agencies with an interest in the operation of Wivenhoe Dam: Seqwater, SEQ Water Grid Manager, DERM and the Minister’s office. In evidence, some said they had not opened or read the document. The state of the evidence for each person is as follows:

- Mr Robertson said he read the ‘January 2011 Flood Event Report’ section of the briefing note.<sup>560</sup>
- Mr Smith had no recollection of ever receiving the briefing note.<sup>561</sup>
- Mr Dennien said he read the Seqwater section of the briefing note, but did not read the table of event decision making in any detail.<sup>562</sup>
- Mr Spiller said he would have read through the entire document when he received it by email from Mr Borrows at 4.28pm on 16 January 2011.<sup>563</sup>
- Mr Borrows said he read the Seqwater contribution to the briefing note in its entirety.<sup>564</sup>
- Mr Pruss said he read the briefing note and glanced through the attachments. He recalled the fact that there was a table which detailed when each strategy had been used.<sup>565</sup>
- Mr Drury said he glanced through the final briefing note, but would not have gone through the details or questioned any of the data or information inserted by the flood engineers.<sup>566</sup>
- Mr Bradley, then Director-General of DERM, received several versions of the ministerial briefing note, and was involved in its preparation.<sup>567</sup> He forwarded the preliminary draft of the briefing note to the Minister’s office at 10.33 pm on Sunday 16 January 2011, and met with the Minister the following morning when the report was tabled.<sup>568</sup>

### **Conclusions on the Minister’s briefing note**

The account given in the briefing note of the choices and times of W strategies used in January 2011 is inconsistent with those that appear in the Summary of the Manual document, the Strategy Summary Log and, as will be explored in section 16.10, various drafts of the March 2011 flood event report.

A striking feature of the account given in the briefing note is that the dam is shown as having been operated in strategy W1 until after the duty engineer’s conference held at 3.30 pm on 9 January 2011, when the transition from W1 to W2 is said to have been ‘apparent’ by 7.00 pm. (See *16.6 Evidence of strategy choice: the flood operations engineers* and *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*). The move between strategies represented in it also suggests a view of the strategies as being a linear progression between W1, W2 and W3.

Mr Tibaldi said he was not surprised that the table in the briefing note was ‘wrong’, given the circumstances in which it was created, noting that it was written in two hours and that at the time of writing it he had not slept for a long time.<sup>569</sup> He said that to reflect accurately when strategies had been employed, he would have to complete the exercise he did to create the March flood event report (a thorough consideration of all the objective evidence), which he did not do to produce this document.<sup>570</sup> Mr Tibaldi said he had initially doubted that he had been responsible for writing the brief until shown documents that, he accepted, showed he did.<sup>571</sup> He was not operating at a level where he could write something of the nature of a briefing note for a Minister.<sup>572</sup> Mr Drury gave evidence that he knew the engineers were ‘pretty tired’.<sup>573</sup>

But fatigue and stress simply cannot explain the perception that the dam was still being operated in strategy W1 until the evening of 9 January, or that strategy W2 had then been engaged. Mr Tibaldi knew the importance of, and need for accuracy in, the report, as an account to the Minister of what had happened. The only reasonable conclusion is that Mr Tibaldi gave the version of events he did because that was his best recollection and understanding of what occurred.

Again, Mr Malone and Mr Ayre were undoubtedly tired and busy. But it must have been obvious to them that one purpose (perhaps the sole purpose) of Mr Tibaldi's circulating the drafts was to seek feedback and comment on their contents. The importance of accuracy in a report to the Minister was also obvious. It might be understandable if they had overlooked a minor error in the time attributed to a particular strategy being engaged, but it is simply not credible that neither noticed the claims that strategy W1 remained in place until the evening of 9 January or that strategy W2 was used, when, according to the March 2011 report and the flood engineers' evidence to the Commission, a deliberate decision had been made to bypass W2 and move to W3 on 8 January. The conclusion must be that they did not differ from the contents of the report, or else that they did not know themselves what had actually occurred, at least until the implementation of W4 on Tuesday 11 January.

The other aspect worthy of mention is this: if the flood engineers believed the account in the March flood event report to be correct, it is remarkable that at no stage did Mr Tibaldi, who had prepared the summary, or Mr Ayre or Mr Malone, who must have read it, attempt to notify anyone of the errors in the document.

#### **16.8.4 Conclusions from Summary of Manual, Strategy Summary Log and the brief for the Minister**

All three of the documents discussed, the Summary of Manual, the Strategy Summary Log and the table Mr Tibaldi prepared for the ministerial brief, came into existence over the three days from 15 January 2011 to 17 January 2011. The purpose of the first two documents is unclear; the Summary of Manual may, as Mr Drury suggested, have been prepared for Mr Borrows' assistance at a telephone conference, while it is likely, given the timing of the Strategy Summary Log's production, that it was intended to assist with the preparation of the brief for the Minister, although not to become part of it. All the flood engineers had the opportunity to review all three, although none admitted to doing so.

Collectively, the documents evidence a process of putting together a record of strategy choice in the flood event. They were brought into existence at a time when it was apparent that there would be considerable scrutiny of strategy choices by Seqwater itself and more widely. It is a striking feature of all three that, despite what should have been the recency of those choices, the simple means of documenting them from the flood engineers' recollections was not adopted. Instead, in each case there was a reconstruction, none tallying with what was eventually to be represented as the definitive account, the March flood event report. In no case did the document prepared give any hint that it was a reconstruction rather than the product of memory or contemporary record. The conclusion must be that at least the three flood engineers involved in their creation did not themselves have a clear understanding of what strategies were adopted and when, or have any confidence that the other flood engineers did.

#### **16.8.5 Another record - Mr Ayre's gate operations spreadsheet comments**

To his sixth statement, Mr Ayre exhibited documents relevant to the March flood event report. One of those documents was an Excel spreadsheet titled 'SDWD-201101190700-RACComments'.<sup>574</sup> Mr Ayre said in that statement that he compiled the document as his own 'aide'. He said he 'dated [the] document as 19 January 2011 at 7.00am in the file name'. He did not believe he gave the document to any of the other flood engineers and could not recall whether he referred to it when reviewing any parts of the March flood event report.<sup>575</sup> The properties of the spreadsheet indicate that it was created and last modified on 19 February 2011 at 11.27:55 am, and last printed on 13 January 2011 at 2.15:00 pm.

In hard copy, the document appears almost identical to a gate operations spreadsheet. However, when viewed electronically, the presence of comments can be seen by red triangles in the top right hand corner of certain cells in the spreadsheet. Those comments can be viewed by hovering the cursor over the cell or selecting 'Comments' in the 'View' menu in Excel. The comments appear as small text boxes next to the cells they are attached to, and indicate who wrote them. Most have 'Rob Ayre' as the author. Of particular interest was the fact that they suggested that strategy W2 was engaged at 5.00 am on 8 January by Wivenhoe directive 3 'as Level > 68.5' and that it remained in force at the time of the flood engineers' conference on 9 January. Another annotation was, 'Revise strategy to transition into W3 due to heavy rain in UB and Stanley'; a later comment suggested that strategy W3 was 'adopted' at 9.00 pm on 9 January.

Mr Ayre was asked to provide a written response as to the significance of the comments in the document, and did so, through his solicitors.<sup>576</sup> He confirmed that the spreadsheet was meant as an aide; to the best of his recollection, it was likely that he had made the annotations to it after 19 January 2011. The spreadsheet was a working document, a starting point in the course of his personal review of the flood event, and was not intended as an official final account. It was explained that in working on it Mr Ayre reviewed some, but not all, of the data, and then inserted the comments at various points ‘to enable him to see, in a preliminary way, the progression of the event in timeline form’.<sup>577</sup>

There is no evidence that any of the other flood engineers were ever shown or made aware of the spreadsheet. But like the strategy summary log and the ministerial briefing note, the spreadsheet is consistent with Mr Ayre’s having believed, in the weeks following the flood event, that strategy W2 had been used on the weekend of 8-9 January.

## 16.9 Another record: Mr Cooper’s report

During the flood event, on 11 January 2011, the Premier instructed the South East Queensland Water Grid Manager to arrange an urgent independent review of the operation of Wivenhoe Dam.<sup>578</sup> Mr Brian Cooper, a dams engineer, was engaged that day to:<sup>579</sup>

- a. review the operation of Wivenhoe Dam, including controlled releases, for compliance against the Flood Mitigation Manual for the period commencing on or about 13 December 2010 to 11 January 2011 (Flood Event); and
- b. advise on whether the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam were prudent and appropriate in light of the Flood Mitigation Manual’s requirements and the circumstances of the Flood Event.

Mr Cooper’s review was based on the information in the technical situation reports. Mr Cooper provided his report on 12 January 2011.<sup>580</sup> He concluded:<sup>581</sup>

The strategies as set out in the [manual] have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded.

The report formed part of the briefing given to the Minister on 17 January 2011 (see 16.8.3 *The brief for the Minister*). It is of particular interest in the context of the Commission’s investigation because it contains the statement that ‘for the last day or so before yesterday’s big rise, Strategy W2 would be in place’.<sup>582</sup>

As discussed in section 16.7 *Objective evidence as to strategy choice on 8 and 9 January 2011*, it is evident that Mr Allen was the source of Mr Cooper’s belief that strategy W2 would have been in force.

Each of the flood engineers received and read Mr Cooper’s report. Mr Malone said he read Mr Cooper’s report during the flood event.<sup>583</sup> The evidence indicates he received it on 15 January 2011, while he was the engineer on duty. At 1.31 pm that day, Mr Allen sent Mr Cooper’s report to the Duty Engineer email address attached to an email addressed to ‘Terry’.<sup>584</sup> It said, ‘Terry… This should be what you want’; suggesting some prior discussion between Mr Allen and Mr Malone about Mr Cooper’s report. The email was forwarded from the Duty Engineer account to Mr Malone’s email address 10 minutes later.<sup>585</sup>

Mr Malone did not recall details of the report when he gave evidence on 11 February 2012. He did recall, though, that ‘there were some questions’ about the content of the report as to ‘the application of strategies’. Nothing, however, caused him to raise any concerns about the report; he saw ‘nothing’ in the report that was ‘untoward’ or that ‘stood out’ as requiring his attention. He did discuss the report with Mr Tibaldi when he read it and pointed out that it seemed Mr Cooper had not interpreted the manual correctly. He said that when the report ‘came in’ he and Mr Tibaldi ‘looked at it’. He thought Mr Tibaldi had taken the ‘lead role’ in raising issues with Mr Cooper’s report; any errors, he said, were ‘set straight’ by the writing of the March flood event report.<sup>586</sup>

Mr Tibaldi has no memory of the period around 15 January.<sup>587</sup> He said, however, that he knew nothing of Mr Cooper’s report during the January flood event, but received it in February 2011, when he was writing the flood event report.<sup>588</sup> He also said that he read it when it was provided to him. As to the content of the report, Mr Tibaldi recalled that he thought Mr Cooper’s ‘use of strategies’ was incorrect, but he did not express dissent or do anything to correct the error, because he was in the process of writing his own report.<sup>589</sup>

On the basis of Mr Malone's evidence, though, it seems Mr Tibaldi received and read the report at the time Mr Malone received the report. Mr Tibaldi was probably also aware of Mr Cooper's report through his involvement in the preparation (on 15 January) of the briefing for the Minister.

Mr Cooper's report may have been discussed at the teleconference about the briefing to the Minister, which occurred at 2.00 pm on 15 January 2011 (not long after Mr Allen sent the report to Mr Malone), in which Mr Tibaldi participated, with Mr Malone, Mr Ayre, Mr Bradley, Mr Drury, Mr Allen, Mr Borrows and Mr Reilly.<sup>590</sup> In 'discussion points' for the teleconference, which Mr Spiller sent to the Duty Engineer email address on 15 January 2011 at 2.21 pm, there is a reference to whether a more comprehensive report should be obtained from Mr Cooper.<sup>591</sup> Mr Bradley, who convened the teleconference, said that Mr Cooper's report was a topic of discussion.<sup>592</sup>

At 5.07 pm on 15 January 2011, Mr Drury sent an outline of the 'ministerial brief' to the Duty Engineer email address.<sup>593</sup> The outline indicated that the brief would contain a section about Mr Cooper's 'Flood Mitigation Manual compliance review', for which the SEQ Water Grid Manager was assigned responsibility. The outline also indicated that the section on Seqwater's report to the chief executive would (or should) 'Reflect Brian Cooper's compliance review'.<sup>594</sup>

At 2.03 am on 17 January 2011, Mr Borrows sent Mr Drury, Mr Pruss and the Duty Engineer email address copies of the final ministerial brief, the final draft of the Seqwater briefing note for distribution, the Seqwater flood event report and Mr Cooper's report (and other documents).<sup>595</sup> The email was addressed to 'Jim, John & Rob'; 'John' was, presumably, Mr Tibaldi, who was then on shift.<sup>596</sup> The final version of the briefing note, with Mr Cooper's report, was sent to Mr Tibaldi (and others) again at 2.32 pm that day.<sup>597</sup>

Mr Ayre and Mr Ruffini were also aware of Mr Cooper's report. Mr Ayre said he saw Mr Cooper's report about a week or two after Mr Cooper delivered it, 'when we were producing the report'. When he read it, he said, he 'recognised' that some of Mr Cooper's descriptions of the use of strategies 'perhaps' were not as he 'recollected the event'.<sup>598</sup> He did not express that view, however, because he considered it would be addressed in the flood event report.<sup>599</sup> Mr Ruffini said he received a copy of Mr Cooper's report and he 'probably' read it. He could not recall when he received it or any of its details (except that 'the focus was on the top end, the W4 issues'). He did not have any recollection of whether or not he disagreed with Mr Cooper's report.<sup>600</sup>

The evidence establishes that all four flood engineers were aware of the content of Mr Cooper's report. The contention of Mr Malone, Mr Tibaldi and Mr Ayre that there was no need to raise the reference to the use of strategy W2 as an error, because the March flood event report would give a correct account, cannot be accepted. This was a report, prepared at the Premier's request, which was relied on to confirm that the dam had been properly managed, and it did so on what must have been, on the flood engineers' account, a completely wrong premise. It is not credible that they would say nothing of the mistake, simply because they knew a different account would eventually be produced. It is far more likely that they did not react to the report either because they still believed that strategy W2 had been applied, or because they were in a state of uncertainty about it.

## 16.10 The March 2011 flood event report

When the flood events at Wivenhoe and Somerset dams ended on 19 January 2011, Seqwater turned its attention to the need for a flood event report, as section 2.9 of the Wivenhoe manual required. The manual requires the report to contain 'details of the procedures used, the reasons therefore [sic] and other pertinent information'.<sup>601</sup> The March flood event report says that it is the document which satisfied that requirement.<sup>602</sup> As discussed further below in section 16.11.6 *Seqwater's systems and procedures for the creation of the flood event report*, Seqwater management determined that it would be the flood engineers who would write the report.

### 16.10.1 The role of the flood engineers

Mr Tibaldi wrote most of the report, and in particular sections 2 (Flood Event Summary) and 10 (Flood Management Strategies and Manual Compliance),<sup>603</sup> which contain the account of the use of each of the W strategies. He said he became the primary author by default: he and Mr Malone were Seqwater employees, so it was appropriate that they worked full time on the report; Mr Ruffini and Mr Ayre were employed by DERM and SunWater respectively.<sup>604</sup> Mr Tibaldi said he started work on the report on 24 January 2011<sup>605</sup> and was working on it up until the end of February 2011.<sup>606</sup>

Although Mr Tibaldi undertook the primary role in writing the report, all of the flood engineers were involved in its creation. Mr Malone agreed that it was a collective exercise in that all were contributing;<sup>607</sup> he wrote parts 5, 6, 8 and 9.<sup>608</sup> He also provided data to Mr Tibaldi to use for his parts of the report,<sup>609</sup> and advised him on the analysis of the data.<sup>610</sup> In his evidence in April 2011, Mr Ayre called it a ‘team effort’; all of the engineers had contributed to the sections on the compliance of the operations with the manual.<sup>611</sup> He wrote parts 5 and 7.<sup>612</sup> Mr Ruffini gave evidence that there was a ‘fair bit’ of discussion amongst the three hydrologists (him, Mr Malone and Mr Ayre) about the hydrology issues to be contained in the report.<sup>613</sup>

Mr Tibaldi and Mr Malone were in the flood operations centre full time from 24 January to write their sections of the report.<sup>614</sup> Mr Ruffini was not often in the flood operations centre while the report was being written; he had other responsibilities in his full time role with DERM.<sup>615</sup> There are different accounts of Mr Ayre’s presence in the flood operations centre. Mr Tibaldi’s recollection was that Mr Ayre was in the flood operations centre only occasionally, and that he was not available to assist because of his responsibilities with SunWater.<sup>616</sup> Mr Ayre, however, said that he was ‘taken offline’ from his usual job at SunWater to assist in the production of the flood event report;<sup>617</sup> he still had some responsibilities to SunWater but was operating out of the flood operations centre for a large portion of his time.<sup>618</sup> Mr Malone said that Mr Ayre was in the flood operations centre ‘on and off’.<sup>619</sup>

The general process adopted was that as drafts of any part of the report were ‘fairly complete’, their author would make them available, usually in hard copy,<sup>620</sup> to the other flood engineers for review and comment.<sup>621</sup> Mr Tibaldi said that he did not give his draft sections of the report to the other flood engineers until he thought they were in a suitable state for distribution.<sup>622</sup> When Mr Ayre and Mr Ruffini visited the flood operations centre, he would show them drafts.<sup>623</sup> The other flood engineers would review Mr Tibaldi’s drafts and make comments in writing or in person. Sometimes, according to Mr Malone, all four engineers met; on other occasions they would meet Mr Tibaldi alone.<sup>624</sup>

Toward the end of the process, all of the flood engineers were given the option to sign a document stating that they agreed with the contents of the March flood event report. Mr Ruffini signed it;<sup>625</sup> Mr Ayre<sup>626</sup> and Mr Malone<sup>627</sup> did not. Mr Ayre said he did not agree with some parts of the report, giving the full supply level section as an example.<sup>628</sup> Mr Malone said that he did not sign the report because he did not feel he had enough time to vet it.<sup>629</sup> Both Mr Malone and Mr Ayre said they felt no difficulty in reporting any concerns they had with the content of the report.<sup>630</sup>

By the end of the process, all the flood engineers had the opportunity to review and comment upon all parts of the March flood event report. In their evidence to this Commission, each of them supported its accuracy.<sup>631</sup>

## 16.10.2 Mr Tibaldi’s methodology

In his statement to the Commission, Mr Tibaldi said that he looked at source data available to him in the flood operations centre to prepare drafts of the report;<sup>632</sup> that data would have included the situation reports,<sup>633</sup> lake levels, release rates,<sup>634</sup> technical situation reports, directives and the flood event log.<sup>635</sup> He said he completed the drafts for distribution to the other flood engineers primarily using that data. He thought he would have had conversations with the other flood engineers during the drafting process, but could not remember them.<sup>636</sup> He did not recall any discussion about which data he would be relying on.<sup>637</sup>

Mr Tibaldi could not have written the report entirely from his own personal recollections of what occurred: he was on leave for the first 60 hours of the flood event and on duty for only 96 of the 324 hours in the flood event, and was only on two shifts prior to the time at which strategy W4 was applied.<sup>638</sup> He also said that when he started to prepare the report, he did not have a clear recollection of events that occurred during the flood event.<sup>639</sup>

Mr Tibaldi agreed that he did not ask for, or have reference to, the personal recollections of the other flood engineers during his production of the draft report to be circulated to the others.<sup>640</sup> Mr Ayre and Mr Ruffini, he said, had other commitments and were not available (although Mr Ayre’s evidence, as already noted, was that he was operating out of the flood operations centre for a large part of the time). His view was that it was necessary to ‘start with the facts’;<sup>641</sup> it was not a good process for the flood engineers to be ‘sitting around sort of throwing in ideas’ for him to draft into the report.<sup>642</sup> The flood event was an emotional time; all the flood engineers had suffered from lack of sleep. Questioned about the possibility of asking the other engineers for their recall, Mr Tibaldi said he had not given it much thought at the time, but he queried how they would remember what happened.<sup>643</sup> The best process, he said, was to write the flood event summary and give it to the other flood engineers to test themselves

against.<sup>644</sup> Specifically, he said that he did not believe he had asked Mr Ayre, who was the flood engineer on shift at 8.00 am on 8 January, whether he transitioned to W3 at that time.<sup>645</sup> Mr Tibaldi accepted that the report was a reconstruction.<sup>646</sup> He described what he was doing in several ways:

- reconstructing the transitions between strategies W1, W2, W3 and W4 with the benefit of the data<sup>647</sup>
- ‘attributing strategy labels’<sup>648</sup>
- drawing an inference as to which strategy applies from the objective circumstances<sup>649</sup>
- ‘tr[ying] to match the strategy transitions against the data’<sup>650</sup>
- finding out which strategies were ‘applicable’ at each stage of the flood event by reference to the data, including lake level and release rates<sup>651</sup>
- writing down, based on the facts, what he believed to have occurred<sup>652</sup>
- trying to write down what actually occurred.<sup>653</sup>

Mr Tibaldi said he believed he was creating an account of what actually happened.<sup>654</sup> As will become evident, his reasoning process was inherently flawed: it started from the assumption that the flood engineers complied with the manual, and then worked back to ascertain what strategy transitions must have occurred to be consistent with that assumption; rather than setting out what did, in fact, occur, and then allowing conclusions to be drawn as to whether there was compliance with the manual. The March flood event report, in consequence, was not, as it purported to be, a report satisfying the requirement of section 2.9 of the manual to produce a report of the procedures used during the event.

### Constructing strategy transitions: 24 January to 1 February 2011

The methodology applied in preparing the report is evident from an examination of the drafts of the flood event summary (which became section 2 of the report) which Mr Tibaldi created between 24 January and 1 February 2011. Mr Tibaldi said in evidence that he developed a picture of what had occurred as he looked at more data.<sup>655</sup> He said he wrote down his initial thoughts and considerations to accept or reject as he tested them against the available information.<sup>656</sup> He frequently emailed drafts from the Duty Engineer email account at the flood operations centre to his Seqwater email account. The drafts illustrate the evolution of his view of when the strategy transitions were made.

The draft was first sent by Mr Tibaldi at 4.35 pm on 24 January 2011 and shows:<sup>657</sup>

- the transition to W2 occurred at some time between 3.00 pm on 7 January 2011 and 2.00 pm on 8 January 2011<sup>658</sup>
- the transition to W3 occurred at some time between 7.00 pm on 9 January 2011 and 1.00 am on 10 January 2011<sup>659</sup>
- the transition to W4 occurred at some time between 4.00 am on 11 January 2011 and 10.00 am on 11 January 2011.<sup>660</sup>

The draft sent by Mr Tibaldi at 4.37 pm on 25 January 2011 changes the time period in which the transition from W2 to W3 occurred to between 2.00 pm on 9 January 2011 and 7.00 pm on 9 January 2011,<sup>661</sup> an earlier time than that recorded in the 24 January 2011 draft.

These two drafts show that, at the start of the process, Mr Tibaldi thought that W2 had been used during the flood event.

A draft sent by Mr Tibaldi at 3.41 pm on 28 January 2011 was the first draft that connected the transition from W1 to W2 with the lake level’s exceeding 68.5 metres, in that it included the words ‘Transition from Strategy W1 to W2 once it becomes apparent that the Wivenhoe Dam level is likely to exceed 68.5 metres’.<sup>662</sup> It identified the time period during which the transition occurred as between 9.00 am on 7 January 2011 and 3.00 pm on 7 January 2011, but showed the actual lake level over that period as below 68.5 metres. The entry suggests that Mr Tibaldi either did not appreciate the significance of the lake level to strategy choice or based the timing of the transition on the predicted, rather than actual, lake level. As to the latter, Mr Malone’s modelling on 7 January showed the lake level *with forecast rainfall* at 68.5 metres at 9.00 am and at 68.9 metres at 3.00 pm, again with forecast rainfall.<sup>663</sup> But given the flood engineers’ uniform disavowal of reliance on forecast rainfall as a basis for strategy change, it

seems unlikely that Mr Tibaldi acted on that data; and in giving evidence he specifically said that in his draft he assumed changes on the basis of actual, not predicted lake levels.<sup>664</sup>

At 4.22 pm on 31 January 2011 Mr Tibaldi sent a draft indicating that W2 had been bypassed, the first draft to do so.<sup>665</sup> On this draft, the transition from W1 to W3 took place between 3.00 pm on 7 January and 2.00 pm on 8 January 2011.<sup>666</sup> Between earlier drafts and this draft, Mr Tibaldi must have realised from the data that the conditions of W2 were not satisfied during the event (at least, according to the flowchart) (see '*Discovery' of the bypassing of W2*, below), or realised that the attempt to fit W2 into a sequence of strategy changes was futile. While Mr Tibaldi changed that part of the draft to indicate that W2 was bypassed, this version was not consistently changed to reflect that bypassing; on later pages, it shows W2 as in force at 1.00 am on 9 January 2011,<sup>667</sup> and the transition from W2 to W3 as occurring at 7.00 pm on 9 January 2011.<sup>668</sup>

The later drafts attached to Mr Tibaldi's statement all reflect the final report: a transition from W1 to W3 at 8.00 am on 8 January.<sup>669</sup>

Mr Tibaldi's statement also attaches what appears to be the first draft<sup>670</sup> of section 10 of the March flood event report (Flood Management Strategies and Manual Compliance). It was sent at 4.21 pm on 31 January 2011, one minute before the draft of the flood event summary discussed in the last paragraph. It says that it was not possible to meet the intent of W2 so W3 was adopted for use at 8.00 am on 8 January 2011.<sup>671</sup>

## 'Discovery' of the bypassing of W2

Examination of the drafts confirms that Mr Tibaldi changed his views about when the flood engineers moved out of strategy W1, and whether, when they did, they transitioned to W2 or to W3.

Mr Tibaldi said he believed that he recorded W2 as being used in early drafts because the strategy selection flowchart in the manual required the transition from W1 to W2 when the maximum flow at Lowood is expected to be below 3500 m<sup>3</sup>/s and the maximum flow at Moggill is expected to be below 4000 m<sup>3</sup>/s.<sup>672</sup> Both those conditions were met when the lake level exceeded 68.5 metres, the trigger for a transition from strategy W1 to W2 or W3, at 8.00 am on 8 January. He considered that the flowchart did not allow a transition to W3 in those circumstances.<sup>673</sup> On the other hand, he regarded the amount of water being released from the dam at the time the lake level exceeded 68.5 metres as too high for strategy W2.<sup>674</sup> To bring the flow at Moggill and Lowood within the limits he considered permissible under W2 at 8.00 am on 8 January 2011 would have required a significant reduction of releases from Wivenhoe,<sup>675</sup> which clearly had not occurred.

Consequently, Mr Tibaldi concluded that the dam was not being operated under strategy W2 at 8.00 am on 8 January 2011,<sup>676</sup> and since the lake level had exceeded 68.5 metres, it must have been operating in W3.<sup>677</sup> It is clear that this reasoning carried with it the assumption that the manual was complied with. The possibility that a flood engineer could have thought he was in W2 but released water in excess of what that strategy allowed was not contemplated, nor was the possibility that an engineer might simply have carried on his existing mode of operating the dam regardless of the change in the lake level.

Mr Tibaldi's conclusion that the releases from the dam indicated it was being operated in W3 from 8.00 am on 8 January gave rise to what he described as 'a dilemma'.<sup>678</sup> He was concerned that the flowchart had not been followed by the flood engineers.<sup>679</sup> He recognised that the manual's flowchart (which he had inserted into the manual when preparing Revision 7) was inconsistent with the conditions for use of strategy W2.<sup>680</sup> In the end, he decided that there was no non-compliance with the intent of the manual because reducing releases from Wivenhoe Dam to the amount he regarded as allowed by W2 would not have been a sensible course.<sup>681</sup>

In his eleventh statement on 1 February 2012, Mr Tibaldi said that he had discussed the possible breach of the flowchart with Mr Allen, Director, Dam Safety at DERM.<sup>682</sup> Mr Tibaldi agreed that he must have explained to Mr Allen, in general terms, that he was writing the report and that he was trying to work out which strategy had been applicable.<sup>683</sup> He said he did not go into detail because Mr Allen would be one of the people judging the report.<sup>684</sup> He recalled in his statement that Mr Allen said words to the effect 'just give us the facts John, and this is what you will be judged on'.<sup>685</sup>

When he gave evidence, Mr Allen could not recall any conversation with Mr Tibaldi about the transition to, or use of, W2,<sup>686</sup> but did not rule it out.<sup>687</sup> He could remember Mr Tibaldi asking him what he should put in the report, to which he said he replied 'everything'.<sup>688</sup>

In his statement, Mr Tibaldi said he could recall raising this issue only with Mr Allen.<sup>689</sup> In oral evidence, however, Mr Tibaldi said he was fairly certain he would have raised it with Mr Ayre when discussing an advanced draft with him, because it was a ‘big issue in [his] mind’.<sup>690</sup> Mr Tibaldi said that he would not have raised the problem early in the drafting process because he was concerned that the error (being the inconsistency between the flowchart and the conditions of W2 in the manual) was his, and he was waiting until his thoughts had developed on the point.<sup>691</sup>

Mr Ayre, in his statement dated 30 January 2012, said that while he was in the flood operations centre and working on the report, Mr Tibaldi had told him of his realisation from the data that the ‘criteria of W2 could not technically have been achieved’.<sup>692</sup> Mr Ayre said that he agreed with Mr Tibaldi.<sup>693</sup> He could not recall whether other flood engineers were involved in that discussion.<sup>694</sup>

In oral evidence, Mr Ayre gave more detail: he was in the flood operations centre with Mr Tibaldi and Mr Malone; Mr Tibaldi was looking at something on his computer screen and said words to the effect of ‘we didn’t implement strategy W2’.<sup>695</sup> Mr Ayre looked at what Mr Tibaldi was looking at on the screen and agreed with him.<sup>696</sup> It was, Mr Ayre said, a matter of recognising that the release at that time was in excess of the naturally occurring peak flow at Lowood and Moggill.<sup>697</sup>

Mr Malone said that he was not aware of any difficulties Mr Tibaldi had in respect of W2 in writing the report.<sup>698</sup> Mr Ruffini thought Mr Tibaldi had mainly talked through his difficulties with the concept of W2 with Mr Ayre.<sup>699</sup>

### 16.10.3 Other flood engineers’ involvement in and adoption of sections 2 and 10

The evidence of the flood engineers is that each of them knew that Mr Tibaldi was constructing the report from the data and not from personal recollections.<sup>700</sup> Additionally, they each had the opportunity to review drafts of sections 2 and 10 of the report and make comments. Mr Tibaldi said that he thought all drafts distributed to the other flood engineers would have shown the transition from strategy W1 to strategy W3 at 8.00 am on 8 January 2011;<sup>701</sup> the others were not asked to review the early drafts which said that W2 had been used during the event. Certainly, none of the drafts attached to the statements of the other three flood engineers indicated that W2 had been engaged.

None of the flood engineers raised any concern with those parts of sections 2 and 10 of the draft report that stated that the transition from W1 to W3 had been made at 8.00 am on 8 January 2011. The evidence in respect of each of them follows.

#### Mr Ayre

Mr Tibaldi said that he would have discussed with Mr Ayre the process by which he was producing the report, because Mr Ayre was a senior flood operations engineer.<sup>702</sup> Mr Ayre said in oral evidence that he was aware of the way in which Mr Tibaldi was describing which strategies were applicable in the event.<sup>703</sup> This is consistent with Mr Ayre’s seventh statement, in which he asserted that strategy labels were ‘generally only attributed after the event as part of the reporting process’.<sup>704</sup> In respect of the March flood event report, he said:<sup>705</sup>

92. The statements made in Section 10 of the Flood Event Report were made on the basis of a rigorous assessment of all available and necessary information that is relevant to make such a judgment.
93. The attribution of times at which the various strategies were applied was based upon a comprehensive set of modeling information which had been compiled for the report with corroboration of the Flood Engineer or Engineers involved.
94. It became apparent during that assessment that earlier interpretations of the attributions of the times that various strategies were applied were in error.

Mr Ayre gave evidence that the retrospective application of strategy labels was the usual practice when compiling flood event reports.<sup>706</sup>

Mr Ayre said that his practice was to make handwritten notes on hard copy drafts of the report provided to him for review and then provide verbal feedback to the draft’s author.<sup>707</sup> He received an early draft of section 2 of the report which did not cover the whole of the flood event; it ended with the period from 3.00 pm on 7 January to 2.00 pm on 8 January.<sup>708</sup> No transition out of W1 was shown in that period<sup>709</sup> or elsewhere in the draft. He made handwritten notes on a draft he received on 2 February. That draft showed a transition from W1 to W3, bypassing

W2, at 8.00 am on 8 January 2011.<sup>710</sup> Mr Ayre was able to produce two drafts of the Executive Summary and four drafts of section 2 that he had received; he also recalled reviewing sections 10 and 19.<sup>711</sup>

Mr Ayre said in evidence that he did his own ‘forensics’ on the account given of those parts of the event that he was familiar with.<sup>712</sup> He said he would have had no difficulty in expressing disagreement with any part of the report.<sup>713</sup> In the end, Mr Ayre did not dissent from the proposition put in draft reports given to him by Mr Tibaldi that the transition from W1 to W3 had taken place at 8.00 am on 8 January 2011.<sup>714</sup> He said that he was satisfied with the way the report had articulated that W2 had not been engaged during the flood event.<sup>715</sup>

Mr Ayre accepted that there was no ambiguity in the phrase ‘W3 was adopted for use’ in the March flood event report. He agreed that the report purported to be a record of what happened at the time.<sup>716</sup> He said in his first statement to the Commission,<sup>717</sup> and confirmed in his sixth<sup>718</sup> statement, that he considered the report to be an ‘accurate record’ of the January 2011 flood event. He confirmed that again in oral evidence.<sup>719</sup>

## Mr Malone

Mr Tibaldi said that he must have had some conversations with Mr Malone, who was also in the flood operations centre, about the parts of the report he, Mr Tibaldi, was writing; but he could not recall specific conversations.<sup>720</sup> Mr Malone might have seen some of his early drafts, but he could not recall.<sup>721</sup>

Mr Malone was asked about his knowledge of Mr Tibaldi’s approach to the creation of the report:

Mr Malone: He was going through the logs and everything, like trying to make sure it was all - he gleaned that was - that’s what happened.

Mr Callaghan: Well, it’s what should have happened, isn’t it?

Mr Malone: No.

Mr Callaghan: He was going back and making sure that the log read the way it should have happened?

Mr Malone: No. No, the log wasn’t changed.

Mr Callaghan: No. Well, he was writing the report to indicate that strategies were changed at a time when the manual suggested they should have been changed?

Mr Malone: No, I don’t see it that way.

Mr Callaghan: You don’t see it that way?

Mr Malone: I see it as that’s the times they were implemented.

Mr Callaghan: That’s the times that they should have been implemented?

Mr Malone: No, that’s the times they were implemented.

Mr Callaghan: Okay. Didn’t you just tell me a little while ago that you weren’t even sure at the time, no-one was really sure about when W2 or W3 was in play?

Mr Malone: That’s true.

Mr Callaghan: There’s absolutely no doubt in the March flood event report, is there, that W2 was bypassed?

Mr Malone: That’s what it says.

Mr Callaghan: Yes. That’s what the March flood event report records very clearly, but that’s not the state of mind of anyone at the time, was it?

Mr Malone: Not directly, no.<sup>722</sup>

Mr Malone said that towards the completion of the report, he took home a hard copy of the whole report to read. He identified a number of duplications and inconsistencies in the report which he discussed with Mr Tibaldi.<sup>723</sup> Nothing suggests, however, that Mr Malone raised any concern about the accuracy of those parts of the report that indicated that W2 was bypassed, and that there had been a transition from W1 to W3 at 8.00 am on 8 January 2011. That is notwithstanding that Mr Malone was not sure himself, and thought that none of the other flood engineers were sure, whether W2 or W3 was in place at that stage.<sup>724</sup>

Mr Malone said he was ‘quite happy’ with the March flood event report, and would have had no difficulty with expressing dissent had he not been.<sup>725</sup> In his first statement to the Commission, he said he had read ‘the majority’ of the report and considered it a ‘fair and reasonable reflection’ of the January 2011 flood event.<sup>726</sup> He endorsed it as an accurate account of the flood event in his evidence before the Commission.<sup>727</sup> Mr Malone denied that he would

have been party to a flood report that asserted that W3 had been in use over the weekend of 8-9 January if that were not so.<sup>728</sup> He accepted that the headings in part 10 conveyed that the strategies described were actually used in the periods referred to. The words ‘Strategy W3 was adopted for use at 08:00 on Saturday 8 January 2011’ stated ‘what occurred at the time’.<sup>729</sup>

### Mr Ruffini

Mr Tibaldi said that he imagined he would have discussed the process of producing the report with Mr Ruffini when he visited the flood operations centre, but he could not recall specific conversations.<sup>730</sup> He agreed that as a matter of logic, he would have discussed with Mr Ruffini how he was writing the report.<sup>731</sup>

Mr Ruffini said that he understood that Mr Tibaldi was looking at the available information ‘going back … to scratch’ to work out what strategies matched with it, before asking the other flood engineers to confirm that whether his work matched up with their recollections.<sup>732</sup> Mr Ruffini gave evidence that he read drafts of sections 1, 2, 10 and 19 of the March flood event report in the flood operations centre.<sup>733</sup> He said he would look at what Mr Tibaldi had written, check whether the data were right and then by reference to the manual try to remember what he was doing and thinking during the flood event to see if what Mr Tibaldi had recorded was correct.<sup>734</sup> He also said that when he reviewed what Mr Tibaldi had prepared, he would look at the spreadsheets and other things he was using at the time to come up with his own assessment of whether he believed the draft was accurate.<sup>735</sup>

Mr Ruffini told Mr Tibaldi that the draft report did match up with his recollection,<sup>736</sup> but also gave this evidence:

Mr Callaghan: Is that Mr Tibaldi asked you whether this matched your recollection and-----?

Mr Ruffini: Words to that effect, yeah. He just asked us to confirm the accuracy of what he had written and as I said, I looked at the material, I looked at, you know, the spreadsheets that I had been using and things like that and said, ‘Yeah, that matches my’ – you know, jogging my memory.<sup>737</sup>

Mr Ruffini said towards the end of the review process he had saved versions of the report from the flood operations centre computers onto a data stick to take home to review.<sup>738</sup> He annexed two such versions to his statement, one of which included track changes, which might, he thought, have been made by him.<sup>739</sup> Mr Ruffini said he reviewed and endorsed the accuracy of sections 2, 10 and 19 of the March flood event report.<sup>740</sup> He identified sections 2 and 10 of the report as ‘critical bits’; parts that he had gone through ‘pretty well’.<sup>741</sup>

## 16.11 Conclusions: the dam operations strategies

### 16.11.1 The strategies used

The situation report issued by Mr Ayre at 5.53 pm on 8 January and the note of the flood engineers’ conference at 3.30 pm on 9 January are strong contemporaneous evidence that the dam was not being operated in W3 over Saturday 8 and Sunday 9 January 2011. (See 16.7 *Objective evidence as to strategy choice on 8 and 9 January 2011*.) Taken with Mr Allen’s belief, they point to a conclusion that if any strategy was in contemplation it was W1, and that so far as the need for a higher strategy was recognised on the afternoon and evening of 9 January, the strategy initially identified was W2.

Reference has previously been made to submissions that each engineer, because he was highly experienced, knew the contents of the manual and had before him on his shifts the data about lake levels and flows, must have known at all times which strategy he was operating the dam in.<sup>742</sup> (See 16.6 *Evidence of strategy choice: the flood operations engineers*.) Effectively, the argument was that because the engineers should have known and applied the relevant strategy, they must have known and applied the relevant strategy.

But if that were so, Mr Tibaldi should not have been in such uncertainty that he produced a summary for the Minister which indicated that the transition from W1 occurred on the evening of 9 January and a draft of the March flood event report which had it happening before 3.00 pm on 7 January. Mr Ayre should not have been in any doubt about whether he was operating the dam in W2 or W3 on 8 January, since the difference in release rates between the two was said to be so marked. It should have been a moment’s work for Mr Malone in preparing the Summary of Manual to have looked at a spreadsheet and see that the flows from Wivenhoe were such relative to those from the Lockyer and Bremer that the dam could not have been operated in W2 on 8 January.

In short, the flood engineers should easily have been able to say, on this topic so integral to their role, with familiarity with the strategies so inculcated in them, which strategies they had operated the dam in on any given day; after all, on their account, only two were applicable. And for those shifts they had not themselves performed, they should have been able to establish rapidly by reference to lake level when transitions must have occurred, and by reference to respective Wivenhoe and downstream tributary flows that their colleagues had never engaged strategy W2.

The evidence, however, suggests otherwise. Mr Tibaldi wrote drafts in which a transition from strategy W1 to W2 occurred at a time when the lake level did not exceed 68.5 metres, and it took a number of drafts for him to realise that W2 should not have been engaged at all; Mr Malone and Mr Tibaldi and the creator of the Strategy Summary Log all thought W2 had been engaged when they wrote their accounts between 15 and 17 January. Mr Ayre, as he conceded in evidence, did not see any need to distinguish between strategy W2 and W3 on 8 January. None saw a need to correct references to the application of W2, either in their own documents or in Mr Cooper's report, notwithstanding that, on their version of events, that material had misrepresented the operation of the dam to Seqwater management and the responsible Minister.

The Commission has drawn its conclusions from the contemporaneous documentary evidence, the engineers' evidence given orally and by way of statement, and the attempts subsequent to the event to document strategy choices. That evidence, taken as a whole, points overwhelmingly to the findings which follow.

On 8 January, Mr Ayre made no conscious change to the strategy in which the dam had been operating when he took over his shift: strategy W1. He did contemplate the possibility of a strategy change over the following days: to strategy W2. There was no change of strategy between his shift and the engineers' conference, when the fact that the flood event was increasing in seriousness was discussed. The prospect of higher flows from the Lockyer and Bremer was recognised, as was the possibility of reducing releases from Wivenhoe to contain the flows. It was then acknowledged that the dam operations were on the cusp between W1 and W2 (not W3).

That night, though, at about 7.00 pm, it was recognised that the release rate from Wivenhoe would have to be elevated. No actual strategy change was documented; at best, it can be said that the actions taken were consistent with strategy W3.

It follows that Wivenhoe Dam was operated in breach of the manual from 8.00 am on 8 January 2011 until the evening of 9 January 2011.

### 16.11.2 The engineers' states of mind about strategy changes

In the days after the event, the engineers – or at least Mr Ayre, Mr Tibaldi and Mr Malone – remained under the impression that strategy W2 had in fact been engaged. Attempts to document the move out of strategy W1 were dogged by confusion: Mr Malone recognised in his Summary of Manual that the lake level meant there had to be a transition at 8.00 am on 8 January, but chose to record W2 as the applicable strategy for the balance of that day. Mr Ayre was involved in the creation of and circulation of the Strategy Summary Log, and must have been aware of its contents. It largely accords with what his 8 January situation report and the flood event log entry for the 9 January conference suggest: that the dam was operated in the lowest of the strategies until the engineers' conference, when strategy W2 was engaged, with recognition of a move to W3 as events developed from 7.00 pm on the night of 9 January.

Mr Tibaldi's summary for the ministerial brief also conveys no change of strategy until after the engineers' conference, but on his version the change by 7.00 pm on the evening of 9 January is to W2; it is only on the following day that the transition to W3 is recorded, as resulting from rain overnight. In preparing his first drafts for the March flood event report Mr Tibaldi continued to record the application of W2, on 7 January; consistent with either a belief that it had been engaged, or a belief that it should have been. In the first two of the drafts, he emailed to himself the change to W3 occurs on the afternoon or evening of 9 January; consistent with a recognition of how the flood event had escalated in seriousness that day. It took some days for the notation of a change of strategy at 8.00 am on 8 January to emerge, but it was, on the first iteration in evidence, to W2. The first draft showing the bypassing of W2 had the move to W3 in broad bounds: somewhere over a 23 hour period between 7 and 8 January.

It is quite clear that none of the three engineers had any belief, at the time he made his contribution to the documents referred to in the preceding paragraphs, that strategy W3 had been adopted and applied – whether as an automatic process or by conscious choice – from 8.00 am on 8 January. That formulation was a product of Mr

Tibaldi's reconstruction of what strategies should have been applied after a long and laborious process of puzzling through the data and what the manual required.

It was submitted, however, that the engineers had no intent to mislead when the March flood event report was produced and published. Counsel for Seqwater's submission was as follows. The determination of whether the flood engineers deliberately misled by way of the flood event report must rest on what they understood by the meaning of the words in the report.<sup>743</sup> All of the flood engineers honestly held the view that the manual 'dictated an automatic transition' from W1 to W3 at 8.00 am on 8 January 2011 and that the only role of the flood engineer on duty was to use that strategy, not select it. What followed was that the engineers would not have thought that the words of the flood event report were misleading. When the March flood event report said 'strategy W3 was adopted for use...' it simply meant that the flood engineer started to use W3 at that time.<sup>744</sup> That expression was to be contrasted with the use of the word 'decided' in respect of the decision to move to strategy W4 on 11 January.<sup>745</sup>

Counsel for Seqwater also relied on the evidence of the experts, Mr Apelt and Mr Shannon, to contend that it was not inappropriate or dishonest for the flood engineers to retrospectively apply strategy labels after the event.<sup>746</sup> Mr Shannon had said that he would not be too concerned if the engineer operating the dam did not have a strategy label at the front of his mind, but was concentrating on the requirements of the manual according to the lake level.<sup>747</sup> Professor Apelt gave evidence that although the flood engineers had to know the conditions they were operating in and the requirements of the manual for those conditions,<sup>748</sup> it was possible for them to apply strategy labels from the objective data after the event. On that basis, counsel submitted, Mr Tibaldi's methodology would not have been dishonest even if it had not involved any review by the other flood engineers.<sup>749</sup>

Counsel for Seqwater submitted that while the report might have been a reconstruction in the form it took when it was sent to the other flood engineers for review, it lost that character once each flood engineer had confirmed that it matched their recollections of the event; it became the record of their actual recollections.<sup>750</sup> There was no reason for Mr Tibaldi to doubt the truth of each engineers' confirmation of the draft report.<sup>751</sup> (Counsel for Mr Malone made a similar submission.<sup>752</sup>) Counsel for Mr Ruffini, Mr Allen and the State of Queensland submitted that the report was not misleading or an ex post facto reconstruction; it was a recounting of what occurred based on contemporaneous records, which refreshed the authors' memories.<sup>753</sup>

The general aspects of those submissions will be dealt with before the state of mind of each flood engineer is considered in turn. First, the meaning of the flood manual has already been discussed at length in *16.3 The manual requires a choice of strategy*: it plainly requires conscious adoption of and recognition of strategy. Second, the March flood event report, as set out in *16.5 The March flood event report: a record of strategy choice* did portray adoption of strategies. The real question is whether the flood engineers did believe, at the time the report was produced, that there had been any transition to W3 on 8 January, automatic or otherwise; and, since the report also purported to show operation of the dam in accordance with strategy W3 throughout 8 and 9 January, the engineers' respective states of mind in that regard are also in issue. The evidence of the experts cannot assist as to what those states of mind actually were.

What follows are what the Commission considers to be the only conclusions which can reasonably be drawn about each engineer's state of mind.

### 16.11.3 Engineers' states of mind

#### Mr Ayre

Mr Ayre understood that the manual required a conscious choice of strategy, requiring the exercise of judgment involving a number of factors. He was on shift when the transition to W3 should have occurred. His evidence suggested no recognition of a move to W3: he saw no reason that day to distinguish between W2 and W3. The situation report he issued at 5.53 pm indicated that he considered he had yet to move to a higher strategy, and that it would be W2. His recent invention of an elaborate explanation for that document, placing a different construction on it from that which it plainly bore, could only be consistent with a late realisation of its damaging effect. Mr Ayre was physically present at the 9 January engineers' conference. He was the senior flood engineer for the event; he must have been alive to what was being said: that the dam was operating at the higher end of W1 and on the cusp of W2, which was consistent with his perceptions of the previous day. At no stage did he seek to correct any of the accounts produced after the event which gave versions of strategy adoption contrary to that in the March flood event report.

Mr Ayre knew how the March flood event report was produced and recognised that it purported to be a record of what happened. His confirmation of Mr Tibaldi's entry as to the bypassing of strategy W2 was, on his own account, the result of checking the data, not any independent memory. In the circumstances, he could not have believed it to represent what had actually occurred. Yet he stated that he considered the report to be an 'accurate record' of the January 2011 flood event.

### **Mr Tibaldi**

Mr Tibaldi was not on duty when the supposed transition to W3 was said to have occurred. His next shift was from 7.00 pm on 8 January till 7.00 am the following morning; during it he made no record of strategy. He was not able to say what was in his mind about strategy during that shift; if he had turned his mind to it, he said, he would have been able to see that he was not operating in strategy W1 because the lake level was too high, and he was not in strategy W2 because the Wivenhoe releases were too high. But he does not seem to have been able to identify strategies from those features in the attempts he made to record strategy use after the event. According to the summary he prepared for the ministerial briefing note, he was operating the dam in W1 during his 8-9 January shift; his first drafts of the March flood event report have W2 applying. He could not have made those entries if he had any belief he was operating the dam in W3 during that shift.

Mr Tibaldi said that he would have read Mr Ayre's 5.53 pm situation report during his shift. He was on the telephone for the 3.30 pm teleconference on 9 January, at which it was said that the dam was operating at the top end of W1 and the bottom end of W2. Both of those circumstances might have alerted him to the fact that the dam was not being operated in W3 on shifts other than his own. However, it is not possible to say that he did appreciate the significance of the situation report entry, and given that he joined the conference by mobile telephone, one could not conclude with any confidence that he heard and registered the reference to the relevant strategies.

However, it is evident that it was Mr Tibaldi himself who through the reconstruction of events eventually realised that the transition to W3 should have been made at 8.00 am on 8 January. He could not sincerely have believed that Mr Ayre's adoption of his proposition that W2 had been bypassed then was the product of any actual memory which fortuitously coincided with his conclusion. On Mr Ayre's evidence, he accepted the correctness of what Mr Tibaldi said after looking at the data on Mr Tibaldi's computer screen. Sections 2 and 10 of the March flood event report were worded so as to convey that they gave an account of decisions actually made; Mr Tibaldi could have had no illusion that what he represented was such an account. Nonetheless, he gave evidence that the report was a 'fair and accurate account' of the flood event.<sup>754</sup>

### **Mr Malone**

Mr Malone was not on duty in the 36 hours between 7.00 pm on 7 January and 7.00 am on 9 January. Accordingly, he had no direct knowledge of what strategy Mr Ayre had used to operate the dam on 8 January. He accepted that he probably read Mr Ayre's 5.53 pm situation report when he received it by email, but as with Mr Tibaldi, one cannot draw the conclusion that he appreciated the significance of what was contained in the 'Forecast Scenario' section.

However, Mr Malone was physically present at the 3.30 pm conference on 9 January; importantly, it occurred on his shift at a time when the increasing severity of the conditions was becoming obvious. It is not credible that he was unaware of the observation made about the point at which the dam was then operating; and it is entirely inconsistent with any belief that at that stage of his shift it was in W3.

Mr Malone prepared the first chronology of events, in the Summary of Manual. It clearly was an educated guess. When he prepared it, Mr Malone did not think any of his colleagues had worked out that W2 had been 'skipped'. It is significant that, rather than asking them directly for their recollections, he chose to construct an account and then send it to them for comment.

Mr Malone was involved in meetings about, and provision of information for, the ministerial briefing note and very probably read Mr Tibaldi's summary for it, in draft or final form. Although it indicated that the dam was operated in W1 during his shift on 9 January, progressing to W2 at its end, he took no issue with it. Nor did he raise any concern about Mr Cooper's report, delivered on 12 January, despite its reference to the dam's having been operated in W2 'for the last day or so before yesterday's big rise'.

Mr Malone said he understood the March flood event report to represent that it was an account of strategies actually used. He knew the way Mr Tibaldi had prepared it and that different versions of strategy adoption (including his own) had previously been given. He agreed that, at least on his understanding, the part of the report that stated that W2 was bypassed was not reflective of the state of mind of anyone at the time.<sup>755</sup> He must have had, at the least, a strong suspicion that it was not a genuine account of conscious strategy choices.

### Mr Ruffini

Mr Ruffini's shift on 8 January finished just before the lake level rose to the point at which W2 or W3 had to be applied. He did not purport to have any actual recollection of recognising the pending strategy change; what he did was to offer an account of what he 'would have' been thinking by looking back at the relevant data.

Mr Ruffini was physically present at the 3.30 pm conference on 9 January at which the current operating status of the dam was raised. He has previously said that the description in the flood event log entry was consistent with his recollection of the meeting. It seems probable that he would have been attentive to the reference to W1 and W2; he was to come on shift in a couple of hours. By the time he did come back on duty, at 7.00 pm, a dramatic change in approach to the dam's operation, consistent with strategy W3, was under way.

Mr Ruffini received, attached to emails, some documents in the 15 to 17 January period which, if read, would have alerted him to the fact that there were versions of the event being given which ultimately did not accord with what was contained in the March flood event report: Mr Malone's Summary of Manual, the Strategy Summary Log, which it appears he actually forwarded to Mr Drury and Mr Allen; Mr Tibaldi's draft summary for the ministerial briefing note; and the draft briefing note itself. However, he was not himself involved in preparation of any of the documents. Mr Ruffini does not impress as a highly organised individual; the possibility certainly exists that he did not read with any attention the documents his colleagues sent him concerning summaries and briefs with which he was not directly concerned.

Mr Ruffini knew that Mr Tibaldi was preparing the draft report as a reconstruction from the data, but also understood him to be confirming with the other flood engineers the accuracy of what he had written.

The degree of probability that Mr Ruffini knew from his attendance at the 9 January flood engineers' conference that the dam had not been operated in W3 before the evening of 9 January is not such as to justify the ultimate finding that he did know that fact; or that he was aware that the March flood event report misrepresented the choices of strategy.

### 16.11.4 Knowledge of each other's actions and state of mind

The conclusion has been reached that Mr Tibaldi and Mr Ayre knew, and that Mr Malone had a basis for suspecting, that the March flood event report was misleading. This gives rise to the further question about what each knew about the others' state of mind.

The actual engagement of strategies by the flood operations centre, if there was any, was known only to the flood engineers. They worked together closely and shared a belief that they performed well during the flood event. At no stage, in any of the statements, interviews or testimony provided up until February 2012, did any of Mr Ayre, Mr Tibaldi or Mr Malone mention any aspect of the 'alternative' strategy documentation contained in the Summary of Manual document, the Strategy Summary Log, the ministerial brief or drafts of the March flood event report despite their involvement in the preparation of those documents. Indeed, there was a striking unanimous and collective collapse of memory about them. All of them supported the accuracy of the flood event report and provided an account of what they had done in the event consistent with the report. Had any one of them mentioned any of those documents or suggested in any way at any time that there was an alternative history of strategy selection, the misleading nature of that report might have been exposed.

The inference was open that the concealment of the true nature of the March flood event report was a joint effort to which each was a party: each of them<sup>756</sup> was given an opportunity to respond to it.

Counsel for Seqwater submitted that a case of collusion between the flood engineers could not be sustained unless the evidence established that Mr Tibaldi designed his methodology for the creation of the flood event report dishonestly to deceive the Commission and each of the flood engineers knew that, and knew the report was not accurate.<sup>757</sup> They submitted Mr Tibaldi honestly believed that his methodology was the most reliable approach.<sup>758</sup>

Counsel for Mr Malone put forward a number of conclusions that he said was necessary to sustain the inference of collusion between the flood engineers: that the flood engineers ignored the manual; that they were prepared to engage in serious criminal conduct to cover it up; that they executed a cover up despite having achieved a near perfect outcome and that they must not have realised the lake level had exceeded 68.5 metres for at least 31 hours.<sup>759</sup> Those conclusions, it was suggested, were so far-fetched as to militate against drawing the inference that the flood engineers colluded.

Counsel for Mr Ayre submitted that if there was a finding that there was collusion between flood engineers to mislead by way of the flood event report, it should nonetheless be found that Mr Ayre was not part of that collusion. They pointed to the facts that Mr Ayre is not employed by Seqwater; that he gave a full account of his actions in his voluntary statement in March 2011 including accounts of the 5.53 pm, 8 January situation report and the 3.30 pm, 9 January teleconference; that he provided the full event log to the Commission and included a copy of it in his supplementary statement.<sup>760</sup>

The question of motive can be dealt with at the outset. Even if it is the case that the engineers achieved a ‘near perfect outcome’,<sup>761</sup> the evidence does not suggest that they were especially confident about that at the time they presented the report; such confidence could only ever be enjoyed after reviews of the kind that have taken place. More importantly, whatever confidence they enjoyed about the manner in which releases had been managed, they must have known they were vulnerable if asked detailed questions about deployment of strategies: there was no record of such a thing. The significant efforts generated between 15 and 17 January to document such strategy selection betray an awareness that this particular aspect of compliance with the manual was something which would, after this event, be examined as never before. And they knew that in this regard, their efforts were deficient. There was, in this circumstance, an obvious motive to present something which conveyed that which would ordinarily be expected of engineers, that is, a document which was accurate and precise, and which demonstrated compliance with the manual. The March flood event report appears to be just such a document.

There are several things that may have motivated the three engineers to present the false flood report, including a wish to protect their professional reputations from the damage that would be caused by a disregard of the manual, or the maintenance of Seqwater’s immunity under the *Water Supply (Safety and Reliability) Act*.

Mr Ayre, Mr Malone and Mr Tibaldi each had a level of understanding that the report was misleading. Each of them, in his own way, contributed to acceptance of the report. It is more difficult to discern what each knew about the others’ level of understanding about the accuracy of the report. There is no direct evidence that any of the flood engineers actually discussed with any of the others their knowledge as to the truth of the flood event report or their plans to support the flood event report to the Commission. Some evidence, however, establishes links which lead to a conclusion of shared understanding between Mr Tibaldi and Mr Ayre.

## **Mr Tibaldi and Mr Ayre**

Mr Tibaldi and Mr Ayre were both involved, between 15 and 17 January, in attempts to provide an account of strategies. At the very least, each must have known at this time that the task was not straightforward. Mr Ayre gave evidence about a discussion involving all four flood engineers about the ‘errors’ in a document resembling the Strategy Summary Log.<sup>762</sup> One major difficulty, of course, was the question of W2. This very issue was the subject of conversation between Mr Tibaldi and Mr Ayre when Mr Tibaldi was drafting the report. Certainly by then, and in probability, much earlier, there was a shared understanding between these two that there was no certainty about when strategies were engaged – in particular, what happened when they moved out of W1. And by no later than this stage, Mr Ayre knew what Mr Tibaldi was doing about it: that his method was a reconstruction which would, as the drafts he later received showed, betray no confusion as to what happened when.

When Mr Tibaldi pointed out to Mr Ayre that W2 had been by-passed and Mr Ayre agreed, he did so not through any personal belief in the correctness of the proposition but as a result of looking at the data Mr Tibaldi was examining on his computer screen. It must have been obvious to both that they were engaging in a recreation of events divorced from what had actually occurred. After Mr Tibaldi had included the bypassing of strategy W2 and the transition to W3 at 8.00 am on 8 January in the draft he distributed to the other engineers, and Mr Ayre had approved that draft without raising concerns about that section, both must have shared the understanding that it was intended to present an account which indicated a precise and manufactured account of engagement of strategies.

Their continued support for the flood event report, by giving sworn evidence as to its accuracy and evidence consistent with the account given in it, assisted in the acceptance of the flood event report as such a record. Such acceptance was awarded by this Commission, Seqwater and the government. Mr Tibaldi and Mr Ayre each assisted the other's presentation of the report; if either had expressed any reservation or qualification, the façade of precision could not have been maintained.

Counsel for Mr Ayre argued that the 'full account' of his actions given in evidence pointed away from his involvement in any combined effort to produce a false flood event report. However, the accounts given up until February 2012 were not anything like 'full'. They were bereft of any hint of such ideas that strategy labels were only applied after the event, or that there might be times when there was no reason to choose between W2 and W3.

The evidence leads inevitably to the conclusion that, in addition to their own knowledge about the misleading nature of the March flood event report, Mr Tibaldi and Mr Ayre were each aware of the other's state of mind in this regard.

### Mr Malone

Mr Malone must also have known that the March flood event report represented a state of affairs that did not happen. He understood that none of the flood engineers could produce an accurate account of the flood event during the period 15 to 17 January. Beyond that state of mind, though, the evidence does not demonstrate that he must have been a party to any shared understanding of the kind which existed between Mr Tibaldi and Mr Ayre.

### 16.11.5 Referral to the Crime and Misconduct Commission

The evidence is such as to warrant a recommendation that the appropriate law enforcement agency investigate the conduct of Mr Malone, Mr Tibaldi and Mr Ayre. Given that the relevant parties were public officials at the time of the events, and given the Commission's obligations under section 38 of the *Crime and Misconduct Act 2001*,<sup>763</sup> the Crime and Misconduct Commission is the appropriate agency. The Commission makes no finding as to whether the evidence before it establishes any offence or official misconduct: it is not appropriate for it to do so for a variety of reasons, not least of which is that the Commission's Terms of Reference do not charge it with the responsibility of investigating whether any criminal offence or official misconduct has been committed in respect to matters arising out of the January 2011 flood event and Wivenhoe Dam. That the evidence before the Commission resulted in there being evidence going to the states of mind of the engineers about the accuracy of the March flood event report was merely a by-product of the Commission's seeking to ascertain what actually happened in the operation of Wivenhoe Dam during the January 2011 flood event.

### Recommendation

- 16.1 The Crime and Misconduct Commission should investigate whether the conduct of Mr Tibaldi, Mr Ayre and Mr Malone relating to:
- preparation of documents surrounding the January 2011 flood event, including the 17 January 2011 brief to the Minister, the 2 March 2011 flood event report, and statements provided to the Commission
  - oral testimony given to the Commission evidences offence/s against the Criminal Code, and/or official misconduct under the *Crime and Misconduct Act 2001* committed by any, or all, of them.

### 16.11.6 Seqwater's systems and procedures for the creation of the flood event report

The obligation to create a flood event report is imposed by the manual.<sup>764</sup> In revision 7, the version of the manual in force at the time of the January 2011 flood event, that responsibility is imposed on Seqwater.<sup>765</sup> (In previous versions the responsibility was on the Senior Flood Operations Engineers.<sup>766</sup>) The report must be submitted to

the ‘Chief Executive’, who is defined as the Director-General of the Department of Environment and Resource Management.<sup>767</sup> Because the obligation is imposed on Seqwater as a corporate entity, it is the responsibility of Seqwater management to ensure that a full, complete and accurate report is prepared. More generally, Seqwater’s board and chief executive officer are responsible for systems, processes and governance arrangements within Seqwater.<sup>768</sup>

Mr Borrows, Seqwater’s chief executive officer, acknowledged that at the time of the January 2011 flood event there was no system in place for the creation of flood event reports.<sup>769</sup> Similarly, as far as Mr Borrows was aware, there was no process for formal or informal debriefs of staff following flood events to capture their observations and lessons learned.<sup>770</sup>

Following the January 2011 flood event Seqwater management recognised that a process would have to be designed to ensure that the flood event report was produced within the time allowed:<sup>771</sup> six weeks. In the past, Seqwater had contracted the preparation of flood event reports to SunWater.<sup>772</sup> Mr Borrows noted that the report ‘took on a different form and function to...the previous ones’.<sup>773</sup> Mr Pruss, then Seqwater’s Executive General Manager – Water Delivery, commented that compared to previous reports, the report for the January 2011 flood event ‘was a wholly different beast; so we had to really develop a process on the go.’<sup>774</sup> This recognition was appropriate and important.

The main step taken by the Seqwater board and Mr Borrows to impose structure on the report’s preparation<sup>775</sup> was to remove Mr Pruss from his usual duties and dedicate him to developing a governance structure and process for the writing of the report.<sup>776</sup> In Mr Borrows’ view, Mr Pruss’ role involved, perhaps among other things:

- ensuring that the report was delivered by the mandated deadline<sup>777</sup>
- ensuring that a rigorous analysis was done of the contents<sup>778</sup>
- leading a working group with internal and external participants to develop the governance structure for the report.<sup>779</sup>

Mr Pruss explained that he volunteered for the process of organising the flood event report.<sup>780</sup> Mr Pruss understood his role as building a governance process around the writing of the flood event report. It was intended to be a facilitative and supportive role directed to ensuring that approvals were given at the right time and that interested parties could become involved.<sup>781</sup> It included managing the timetable for scoping, drafting, reviewing and editing the report.<sup>782</sup> Somewhat surprisingly, none of the processes that were devised were recorded in writing.<sup>783</sup>

Considerable resources were dedicated to Mr Pruss’ task. The overall team involved in the production of the report seems to have been sizeable. Mr Pruss was dedicated to assisting in governance processes for the report and he was assisted by a ‘small administrative and advisory team’.<sup>784</sup> Mr Pruss also involved technical experts, a legal team and a communications team.<sup>785</sup>

However, it is a matter of some concern that, while resources were dedicated to ensuring that the report would be delivered in a timely manner, relatively little support was given to the flood engineers, who were actually writing the report. Their role was, plainly, the most significant part of the report writing. Mr Pruss appears to have recognised this; he explained that he understood that:<sup>786</sup>

what the engineers were doing was collating the information, producing the report, doing the quality check, doing the data checks on the information and getting it to us in a form that we could then start to put some shape around.

Little or no thought seems to have been given to whether the engineers needed assistance with their function. When asked, Mr Pruss said he gave no thought to allocating a person to assist the flood engineers in their task.<sup>787</sup>

No consideration was given to the risk of self-bias by the engineers in their reporting – the peer reviewers were seen as a sufficient check against this possibility.<sup>788</sup> Nor does it seem to have occurred to Seqwater to review the contents of the March flood event report against advice earlier given. On any view, it is incumbent on Seqwater to inform the Queensland Government, as soon as practicable, if it has provided information that is later found to be inaccurate. At the very least, Seqwater should have been able to advise the Queensland Government, at the time that it sent the March flood event report to DERM, that it was different, in significant respects, from the briefing note provided in January 2011.

A grave concern is that Mr Pruss did not make any enquiries about the methodology being used by the engineers in preparing the report. Mr Borrows said that he was not aware that Mr Tibaldi's methodology for preparing the report was to assess the data and work out what strategies were used during the event by reference to that data.<sup>789</sup> Mr Pruss said that he did not ask any questions of Mr Tibaldi about how he was going about recording the strategies shown in the report and whether they were by reference to actual recollections or a reconstruction from the data.<sup>790</sup> It is surprising that the March flood event report did not include an explanation of the methodology used in compiling its key sections; it is alarming that methodology was not discussed at all by Seqwater management.

Measures should be put in place to ensure that proper support and oversight mechanisms are put in place around both the substantive and procedural aspects of drafting large flood event reports. Seqwater was right to recognise that the January 2011 flood event report was a different 'beast' from any previously tackled; it should have understood that this meant careful thought would need to be given not only as to how the process should be managed, but also as to how the substance of the report was going to be compiled.

The Commission is not well placed to make recommendations about precisely which mechanisms should be put in place; this is principally a matter for Seqwater management. However, there does appear to be good reason for Seqwater to consider if the mechanisms it has in place are effective. Seqwater should consider engaging consultants with expertise in the production of large reports following significant events.

## *Recommendation*

- 16.2 Seqwater should ensure that proper support and oversight mechanisms are put in place around both the substantive and procedural aspects of drafting flood event reports. Seqwater should consider engaging consultants with expertise in the production of reports following significant events to advise on these mechanisms. Measures to be considered should include:
- ensuring appropriate systems are in place to ensure the recollections of flood engineers and other parties are recorded immediately after the event, perhaps by engaging an external party to interview the flood engineers and other parties
  - ensuring that a methodology for writing the report is set out clearly in advance, in writing, and that the final report includes a statement of that methodology
  - putting in place systems to ensure that members of senior management have sufficient understanding of both the methodology and process by which the report is prepared to allow themselves to be satisfied that these are appropriate.

## 16.12 Knowledge of government officials about the March flood event report

### 16.12.1 Peter Allen, Director, Dam Safety

Mr Allen, DERM's Director, Dam Safety, reviews the flood event reports which Seqwater produces under the Wivenhoe and North Pine flood mitigation manuals.<sup>791</sup> There is no legal requirement for a review, but Mr Allen considers it part of his duties as dam safety regulator.<sup>792</sup> He gave evidence that the size of the task of reviewing the March flood event report will require him to involve others; he will remain responsible.<sup>793</sup>

Prior to the publication of that report on 2 March 2011, Mr Allen:

- had a personal understanding of the strategies which had been employed during the event (see 16.7 *Objective evidence as to strategy choice on 8 and 9 January 2011*)<sup>794</sup>
- knew that Mr Cooper had indicated in his review that the strategies used included W2, prior to the triggering of W4<sup>795</sup>
- knew that an account of the strategies used during the flood event had been given to the Minister as part of a ministerial briefing note on 16 or 17 January 2011<sup>796</sup>

- knew that there was, in the Strategy Summary Log, an account of the strategies used during the flood event<sup>797</sup>
- knew that there was, in the Summary of Manual document prepared by Mr Malone, an account of the strategies used.<sup>798</sup>

### Awareness of the methodology for the March flood event report

Mr Allen did not see, and was not involved in preparing, the drafts of the March flood event report; he first saw the report itself when it was provided to DERM in March 2011.<sup>799</sup> He gave evidence that he might have visited the flood operations centre ‘on the odd occasion’ while Mr Tibaldi was writing the report.<sup>800</sup>

When asked whether he was aware that Mr Tibaldi was looking back at the data to work out which strategies had been used, Mr Allen said he ‘expected’ him to do so in order to write the report, since there was no time to record strategies during the event;<sup>801</sup> but he did not believe he was ever told that by Mr Tibaldi.<sup>802</sup>

Mr Tibaldi’s evidence was that he had spoken to Mr Allen in general terms about the ‘dilemma’ he was in, in relation to whether the flowchart in the manual had been complied with if the flood engineers had bypassed strategy W2 upon transitioning out of W1.<sup>803</sup> (See *16.10.2 Mr Tibaldi’s methodology*.) Mr Allen did not recall that discussion, although he accepted it was possible that it occurred.<sup>804</sup> The Commission finds that it did.

Mr Allen was aware of the practice of retrospectively applying strategy labels when producing an account of a flood event; it was the process followed in the past.<sup>805</sup> He said that he had ‘no issue’ with that process because ‘the data is there on record’.<sup>806</sup> He agreed that the process of the retrospective application of strategy labels meant that the report would be an account of what the primary consideration of the engineer ‘ought to have been’ rather than what it was.<sup>807</sup> Mr Allen said that it was inevitable that a report would be that, unless the flood engineers wrote down their primary consideration at the time.<sup>808</sup>

### Awareness of inconsistent accounts

The report was delivered to DERM on 2 March 2011. Mr Allen had not, by the time he gave evidence on 10 February 2012, read the report in full, but he had read ‘the bulk’ of it.<sup>809</sup> It was apparent to him that the report suggested that strategy W2 was bypassed and strategy W3 adopted at 8.00 am on 8 January 2011.<sup>810</sup> He agreed that he was aware that the March flood event report would be relied on as a record of what actually happened.<sup>811</sup>

Mr Allen said he did not do a comparison between his prior knowledge of the strategies used, as communicated by him to Mr Cooper, and what appeared in the March flood event report.<sup>812</sup> He gave evidence that he did not cross-check the March flood event report against the brief to the Minister, the Strategy Summary Log or the Summary of Manual document, but considered he would have to do so when he was making an assessment of the report.<sup>813</sup> He said he would reconcile the differences by going through the documents in detail and discussing them with others,<sup>814</sup> and would raise them in his report and with his Director-General now that the issue had been raised with him.<sup>815</sup>

Mr Allen has had significant experience in the operation of Wivenhoe Dam and with the manual. After he had expressed a belief that W2 was used during the event, and had seen three earlier accounts that said the same, it is not credible that he did not appreciate the significance of a report which indicated that it was bypassed. He must have realised that the strategies documented were not consonant with his own previous understanding of what strategies were used, Mr Cooper’s report or the various accounts he had seen between 15 and 17 January 2011. Notwithstanding, he did nothing to bring the discrepancies to the attention of his superiors at DERM or the responsible Minister.

### Delay in review of flood event report

Mr Allen said in his statements to the Commission that he expected the review of the March flood event report to be finalised by June 2012.<sup>816</sup> He had not had sufficient time to devote to a detailed review of the report as a result of his continuing dealings with the Commission and his implementing the recommendations contained in its interim report.<sup>817</sup> When it was put to him that the Commission had not required anything of him between 17 May and 1 August 2011, he said that he was doing modelling to try and understand the event.<sup>818</sup> Asked about his time between September and November 2011, he said he had been busy with the Wivenhoe Dam and Somerset Dam Optimisation Study.<sup>819</sup>

Counsel for the State and Mr Allen submitted that it was reasonable for Mr Allen to have delayed his review until after the Commission's final report was published.<sup>820</sup> They pointed to a letter from Mr John Bradley, then Director-General of DERM, to the Commission dated 2 March 2011 stating that DERM did not intend to proceed with the review until after the Commission's interim report and asking for the Commission's confirmation that that approach was acceptable.<sup>821</sup> But DERM was advised by the Commission in response that it was 'entirely a matter for the Department as to what course it [took] in relation to its review'.<sup>822</sup> It was Mr Allen's, and DERM's, decision not to complete the review before the 2011/2012 wet season.

The decision by Mr Allen to delay the review until after the Commission's final report, and the acquiescence of his superiors at DERM to that course, is unfortunate. It has meant, as Mr Allen accepted in cross-examination, that any dam safety issues which arise from the review will not be dealt with before the end of the 2011/2012 wet season.<sup>823</sup>

### Independence from flood engineers

In his evidence, given in Commission hearings in May 2011 and in February 2012, Mr Allen said that he felt he was able to independently review the flood event report.<sup>824</sup> Against Mr Allen's view is the evidence that:

- He knows all of the flood engineers fairly well;<sup>825</sup> he considers them all friends or acquaintances.<sup>826</sup>
- He operated the dam with some of them in flood events in the 1990s.<sup>827</sup>
- He received situation reports from, and had telephone contact with, the flood engineers during the event. From that contact, Mr Allen developed views of what was occurring during the flood event, as he indicated in his email to Mr Cooper.<sup>828</sup>
- He has acquiesced over many years to the production of flood event reports which retrospectively applied strategy labels to what occurred.<sup>829</sup>
- He has done nothing to act upon the inconsistency between the March flood event report and other accounts, of which he must have been aware shortly after he received the March report.

Counsel for Mr Allen urged against a finding that he could not independently review the flood event report. They pointed to his reporting of concerns about the flood capacity of North Pine Dam<sup>830</sup> as evidence that he has previously reported issues relating to dams which the flood engineers operated.<sup>831</sup> The focus in performing the review, they submitted, is dam safety,<sup>832</sup> which entails an examination of the operation and performance of the dam during a flood event.<sup>833</sup> That assessment is founded on the objective data; it does not involve the application of strategy labels or issues of credit.<sup>834</sup>

The point made about the focus of the review to be undertaken is accepted. Notwithstanding, the consideration of how the dam was operated must involve an examination of how the flood engineers exercised their powers; and a failure to appreciate what those powers were (because of a failure to recognise the appropriate strategy) must be relevant in that regard. Given his involvement to date and his relationship with the four flood engineers, it would not be appropriate for Mr Allen to undertake the task.

### *Recommendation*

- 16.3 The Department of Environment and Resource Management should ensure that an independent and appropriately qualified person immediately starts the task of reviewing the March flood event report to ensure that the review is completed before the start of the 2012/2013 wet season.

### 16.12.2 Knowledge of Seqwater management

Mr Borrows, Seqwater's chief executive officer, has ultimate responsibility for the management of Seqwater's operations,<sup>835</sup> a role that includes risk management.<sup>836</sup> Mr Pruss, who in January 2011 was Seqwater's Executive General Manager – Water Delivery, had overall management responsibility for the operation of Wivenhoe and Somerset dams.<sup>837</sup>

Mr Borrows and Mr Pruss both received copies of conflicting accounts of the strategies used in the January 2011 flood event. They each received<sup>838</sup> and read<sup>839</sup> copies of the brief to the Minister on 16 January 2011; Mr Borrows attended the meeting with the Minister to discuss the brief.<sup>840</sup> Neither identified the discrepancies between the account of strategies used in the Minister's brief and the March flood event report, or between the report and any other account with which they had been provided.

It is unfortunate that neither identified these discrepancies. Both had a sufficient level of knowledge and closeness to the operations such that it is reasonable to think they might have noticed them. Mr Borrows was generally familiar with the W strategies and had read the manual prior to the January 2011 flood event.<sup>841</sup> Mr Pruss was responsible for overseeing the drafting of the March flood event report; the account of the strategies used and how they complied with the manual must have been regarded as a critical part of that report.

On balance, their failure to identify the differences should not be characterised as anything more than unfortunate. Neither Mr Pruss nor Mr Borrows was an expert in dam operations,<sup>842</sup> nor did they profess to be closely involved with the substance of the March flood event report. To the extent they bear any responsibility for the different accounts not being identified, it is because of the deficiencies in the processes for which they were responsible, rather than the adequacy of their personal reviews of the documents (as to which, see *16.10 The March 2011 flood event report* and *16.13 Peer reviews of the March report*).

### **16.12.3 Knowledge of the Premier, the responsible Minister and the Directors-General**

#### **The Premier and the Director-General of the Premier and Cabinet**

The Honourable Anna Bligh MP was the Premier of Queensland during the January 2011 flood event. Mr Ken Smith was the Director-General of the Department of the Premier and Cabinet, the department responsible for providing support and advice to the Premier and her Cabinet.<sup>843</sup> Mr Smith, as the Director-General of the Department of the Premier and Cabinet, was also the chair of the State Disaster Management Group in December 2010 and January 2011.<sup>844</sup>

The Premier and Mr Smith both provided statements to the Commission in response to Requirements obliging them to explain their understandings of the strategies in use at Wivenhoe Dam during the January 2011 flood event and of the subsequent accounts of the strategies used.<sup>845</sup> Both attached over 300 pages of contemporaneous documents relevant to the January 2011 flood event to their statements. Mr Smith gave oral evidence to the Commission on 10 February 2012.<sup>846</sup>

Among the documents the Premier and Mr Smith each received in January 2011 were a small number that expressly referred to the choice of strategies or changes in the primary objectives at Wivenhoe dam during the flood event.

- At 11.07 pm on 9 January 2011, Mr Smith received an email from Mr Spiller that said the primary objective of the dam operations was changing from the inundation of bridges to minimizing the risk of urban inundation.<sup>847</sup> At 5.44 am on 10 January 2011 Mr Smith forwarded that email to a number of people, including the Premier.<sup>848</sup> The language of the email can be read as suggesting a change in strategy at that time to strategy W3. (See *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*.)
- At 9.46 am on 10 January 2011, Mr Smith received an email from Mr Spiller that referred to strategy W2's being in use.<sup>849</sup> The Premier and Mr Smith also received emails and a diary icon that included text drawn from that email, including the reference to W2.<sup>850</sup>
- On 13 January 2011, Mr Smith received a copy of a report prepared by Mr Brian Cooper, dated 13 January 2011.<sup>851</sup> The Premier also received a copy of that report.<sup>852</sup> Mr Cooper's report said that:

Until the last day or so, Wivenhoe Dam... would be operating under Strategy W1.

[and]

... for the last day or so before yesterday's big rise, Strategy W2 would be in place.

The Premier and Mr Smith had access to the March flood event report and to the Commission's interim report, both of which recorded that strategy W2 had not been engaged. They were, therefore, in a position where they had an opportunity to identify the discrepancies between these accounts and the reports they had received in January 2011.

Mr Smith said that he did not identify the differences in the accounts.<sup>853</sup> While, in January 2011, he was aware that the manual existed, he did not understand it in sufficient detail to know that it referred to operational strategies W1 to W4.<sup>854</sup> He said that he did not read the March flood event report in ‘great detail’.<sup>855</sup> He said that he did read the Commission’s interim report, including the description of strategy changes.<sup>856</sup> When asked, Mr Smith accepted that there were differences in the accounts he had received, but said that he had not crosschecked the contents of the interim report against previous accounts he had seen.<sup>857</sup>

The Premier said she had been aware that ‘alternative views and questions’ were raised in the media about the operation of the dam from as early as 12 January 2011.<sup>858</sup> She did not refer to any discrepancies she had identified from a comparison of different accounts she had seen, although she said that her understanding of the flood operations strategies in use in January 2011 had been ‘further informed’ by the Commission’s interim report.<sup>859</sup> The Premier does not appear to have been aware of the discrepancies between different accounts aside from those raised in the media.

It is unsurprising that the Premier and Mr Smith did not identify the discrepancies. Their positions did not require any sophisticated level of knowledge of the manual. They each received large volumes of material relating to the December 2010/January 2011 floods, most of which was unrelated to the choice of operational strategy at Wivenhoe Dam. They depended upon receiving accurate information from others, and could not reasonably have been expected to scrutinise the different documents they received for inconsistencies.

## **The responsible Minister and the Directors-General of DERM**

The Honourable Stephen Robertson MP was the Minister for Natural Resources, Mines and Energy at the time of the January 2011 flood event. Through the course of the January 2011 flood event, three different people acted as the Director-General of DERM:

- Mr John Bradley was the Director-General of DERM in January 2011. He was on leave from 25 December 2010 until the afternoon of 11 January 2011.<sup>860</sup>
- Ms Debbie Best, a Deputy Director-General within DERM, was acting Director-General from the time Mr Bradley went on leave on 25 December 2010 until Mr Wall returned from leave on the morning of 10 January 2011.<sup>861</sup>
- Mr Terry Wall, Associate Director-General of DERM, was on leave until 10 January 2011. He was acting Director-General of DERM from his return on 10 January 2011 until midday on 11 January 2011 when Mr Bradley returned.<sup>862</sup>

Mr James Reeves is the current Director-General of DERM. He took up this role on 29 August 2011.<sup>863</sup>

Mr Robertson, Mr Bradley, Ms Best, Mr Wall and Mr Reeves all provided statements to the Commission in response to requirements obliging them to explain their understandings of the strategies in use at Wivenhoe Dam during the January 2011 flood event and of the subsequent accounts of those strategies.<sup>864</sup> Mr Robertson gave oral evidence to the Commission on 9 February 2012.<sup>865</sup>

Mr Robertson said that his understanding of the strategies in use at Wivenhoe dam during the January 2011 flood event was based on the documents he received in January 2011.<sup>866</sup> At the time, he appreciated that the manual contained four W strategies and, in general terms, that these strategies were triggered in different circumstances and had different primary objectives.<sup>867</sup>

Mr Robertson received a number of documents that referred to the strategies used at Wivenhoe Dam during the January 2011 flood event:

- At 11.07 pm on 9 January 2011 Mr Robertson received an email from Mr Spiller that referred to the primary objective of the dam operations changing from preventing the inundation of bridges to minimizing the risk of urban inundation.<sup>868</sup> Mr Robertson explained in oral evidence that he did not connect the change described in that email to a change in terms of the W strategies.<sup>869</sup>
- At 9.46 am on 10 January 2011, Mr Robertson received an email from Mr Spiller that referred to strategy W2’s being in use.<sup>870</sup> Mr Robertson also received other emails around this time that used the same language as Mr Spiller’s email, including the reference to W2.<sup>871</sup> Mr Robertson said that, at the time, he would have understood, on the basis of these emails, that Wivenhoe Dam was operating in strategy W2.<sup>872</sup>

- On or around 13 January 2011, Mr Robertson read a copy of Mr Cooper's report.<sup>873</sup> That report said:
 

Until the last day or so, Wivenhoe Dam....would be operating under Strategy W1.  
   [and]  
   ... for the last day or so before yesterday's big rise, Strategy W2 would be in place.
- On 17 January 2011, Seqwater and SEQ Water Grid Manager presented a briefing note to the Minister.<sup>874</sup> As set out in *16.8.3 The brief for the Minister*, an attachment to the brief provided an account of strategy changes that conflicts with that given in the March 2011 flood event report.
- On or around 2 March 2011, Mr Robertson received a copy of the March flood event report.<sup>875</sup>

Mr Robertson said that he did not notice the differences between the accounts he received.<sup>876</sup> He assumed the information in the brief he received on 17 January 2011 was correct, but commented that, if he had turned his mind to it at the time, he would not have been surprised if that information differed from what ultimately appeared in the March flood event report. In his experience, initial information given in briefing notes quite regularly changed upon a more detailed review.<sup>877</sup>

Mr Robertson explained:

I didn't cross-reference this document with previous documents that - I think you need to appreciate that by the time these documents get to me as minister they pass through numerous hands, so my expectation is that by the time a document is provided to me it has gone through appropriate quality control at the various levels of the organisations or the department. So to think that I would then sit down and cross-reference this document against previous briefings, that's just not the way it happens.<sup>878</sup>

Mr Bradley said his understanding, in January 2011, of the strategies in use at Wivenhoe Dam was based entirely on the documents he received, such as technical situation reports.<sup>879</sup> A number of documents that he received referred to the strategies used:

- On 12 January 2011 Mr Bradley received a copy of a preliminary version of a report by Mr Cooper.<sup>880</sup> That report said:
 

Until the last day or so, Wivenhoe Dam... would be operating under Strategy W1.<sup>881</sup>
- On 13 January 2011 Mr Bradley received the final version of Mr Cooper's report.<sup>882</sup> That report said:
 

Until the last day or so, Wivenhoe Dam... would be operating under Strategy W1.  
   [and]  
   ... for the last day or so before yesterday's big rise, Strategy W2 would be in place.
- Mr Bradley was involved in co-ordinating the drafting of the brief to the Minister that was tabled on 17 January 2011.<sup>883</sup> As set out in *16.8.3 The brief for the Minister*, an attachment to the brief provided an account of strategy changes that conflicts with that given in the March flood event report.

Mr Bradley said he had received a copy of the March flood event report<sup>884</sup> and was aware of the Commission's interim report.<sup>885</sup> He was, therefore, in a position where he had an opportunity to identify the discrepancies between these accounts. Mr Bradley explained in his statement that, until he saw media reports on 23 January 2012, he was not aware of any contention that the March report (and by, implication, the Commission's interim report) might not be factually accurate or that it contradicted the information provided to the Minister in the brief.<sup>886</sup>

Ms Best said that she understood in January 2011 that the manual contained a range of strategies and that the strategies 'escalated in level of response'.<sup>887</sup> A number of documents she received referred to the strategies used:

- At 11.07 pm on 9 January 2011 Ms Best received an email from Mr Spiller that referred to the primary objective of the dam operations changing from the inundation of bridges to minimising the risk of urban inundation.<sup>888</sup> This language might be taken to be suggestive of a change in strategy at that time to strategy W3. (See *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*.)
- At 9.46 am on 10 January 2011 Ms Best received an email from Mr Spiller that referred to strategy W2's being in use.<sup>889</sup> Ms Best also received other emails around this time that used the same language as Mr Spiller's email, including the reference to W2.<sup>890</sup>

- On 14 January 2011 Ms Best was forwarded a copy of the final version of Mr Cooper's report.<sup>891</sup> That report said:

Until the last day or so, Wivenhoe Dam....would be operating under Strategy W1.

[and]

... for the last day or so before yesterday's big rise, Strategy W2 would be in place.

Ms Best said in her statement that she had peripheral involvement with the briefing note prepared for the Minister, which consisted of assisting a colleague to obtain a copy of the attachments to the report.<sup>892</sup> The attachment Ms Best provided in evidence related to Mr Cooper's report, suggesting that she may have thought this was the briefing note. However, it is clear from other material that Ms Best did in fact receive at least a draft copy of the brief to the Minister.<sup>893</sup> Ms Best said that she did not have a detailed knowledge of either the brief for the Minister or the March flood event report.<sup>894</sup> She said she did not become aware of any differences between these documents until 31 January 2012 when she was asked to prepare her statement in response to the Requirement from the Commission, and had been aware of possible differences only since she saw media reports on 23 January 2012.<sup>895</sup>

Mr Wall was only acting as Director-General for a short period of time during the flood event. He said his understanding of the strategies used in January 2011 was based entirely on the documents he received, only one of which contained an express reference to a strategy (a Technical Situation Report W39 that referred to strategy W4).<sup>896</sup> Mr Wall subsequently read the Commission's interim report.<sup>897</sup> He did not become aware of any suggestion that that account might not be accurate until he saw media reports on 23 January 2012.<sup>898</sup>

Mr Reeves explained he had no understanding of which flood operations strategies were used at Wivenhoe Dam during the flood event until he read the Commission's interim report.<sup>899</sup> He first became aware of allegations of inconsistencies of accounts as to the choice of strategies in media reports on 23 January 2012.<sup>900</sup>

It is unremarkable, for the same reasons given in relation to the Premier and Mr Smith, that none of Mr Robertson, Mr Bradley, Ms Best, Mr Wall or Mr Reeves identified the discrepancies between the accounts of the strategies used in the January 2011 flood event. While some of them, particularly Mr Robertson and Mr Bradley, did have access to a number of different accounts that meant they had the opportunity to identify the discrepancies, it is unreasonable to expect that they should have.

#### 16.12.4 Knowledge of officers of the SEQ Water Grid Manager

The South East Queensland Water Grid Manager is a statutory body that is responsible for the management of the water grid – the infrastructure that supplies bulk water – in South East Queensland.<sup>901</sup> The South East Queensland Water Grid Manager was responsible for co-ordinating communications relating to floodwater releases during the January 2011 flood event.<sup>902</sup> One aspect of this function was to distribute Technical Situation Reports, which were provided to it by Seqwater.<sup>903</sup> These Technical Situation Reports were distributed to a number of interested parties, including state government ministers, directors-general of government departments and members of disaster management groups.<sup>904</sup>

Mr Barry Dennien is the chief executive officer of the South East Queensland Water Grid Manager. He held this position at the time of the January 2011 flood event, but was on leave from 25 December 2010 to 9 January 2011.<sup>905</sup> Mr Daniel Spiller was the Director of Operations from 7 to 12 January 2011, and was acting chief executive officer in the period that Mr Dennien was on leave.<sup>906</sup>

Mr Dennien and Mr Spiller each provided statements to the Commission in response to Requirements that obliged them to detail their understanding of the strategies in use during the January 2011 flood event.<sup>907</sup> Mr Dennien said he understood that:<sup>908</sup>

- the transition from strategy W1 to strategy W2 occurred on the evening of 9 January 2011
- the transition from strategy W2 to strategy W3 occurred sometime in the afternoon or evening of 10 January 2011
- the transition from strategy W3 to strategy W4 occurred on the morning of 11 January 2011.

Mr Spiller said he understood:<sup>909</sup>

- the transition from strategy W1 to strategy W2 occurred on the evening of 9 January 2011

- the transition from strategy W2 to strategy W3 occurred around midday on 10 January 2011
- the transition from strategy W3 to strategy W4 around midday on 11 January 2011.

Mr Dennien and Mr Spiller emphasised that their understanding of the strategies used was based on less information than they considered necessary to make a proper assessment of the strategies.<sup>910</sup> Mr Dennien's understanding of the strategies used was primarily derived from the descriptions of the objectives given in the technical situation reports;<sup>911</sup> Mr Spiller's was based on a mixture of the technical situation reports and email and telephone communications.<sup>912</sup> Neither of them had any direct communication with the flood operations centre during the flood event,<sup>913</sup> except in relation to drafting the briefing note for the Minister.<sup>914</sup>

Mr Spiller and Mr Dennien would sometimes seek clarification from Seqwater personnel, such as Mr Drury, on how to interpret the information in the technical situation reports.<sup>915</sup> Mr Spiller explained that the further detail sought was generally about release strategies rather than the W strategies.<sup>916</sup> On one occasion, in an email sent at 8.13 am on 10 January 2011, Mr Spiller asked Mr Drury whether release strategy W2 or W3 was in place; Mr Drury replied that it was W2.<sup>917</sup> (See *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*.)

Mr Dennien and Mr Spiller both took part in a teleconference at 8.30 am on 10 January 2011 in which strategies W2 and W3 were raised. Mr Spiller recalled that strategies W2 and W3 were spoken about by Mr Drury and Mr Borrows and that the meeting proceeded on the basis that the dam was being operated in strategy W2 at that time, but was unable to recall any further detail.<sup>918</sup> Mr Dennien said (not necessarily very logically) that the strategies were discussed in connection with release rates.<sup>919</sup> (See *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*.)

It is clear, both from their statements and their oral evidence, that Mr Dennien's and Mr Spiller's accounts of the strategies in use at Wivenhoe are educated interpretations of the descriptions of the dam operations given by others; they are not based on any first hand knowledge. Their interpretations do not assist the Commission in understanding the strategies that were actually in use beyond what the documents relied on by Mr Dennien and Mr Spiller show.

However, because Mr Dennien and Mr Spiller each had a relatively clear perception of what was occurring, they each had some opportunity to identify that other accounts – including the brief to the Minister, the March flood event report and the Commission's interim report – diverged from their own understanding.

Mr Dennien said that he 'skimmed' the table of event decision making in the Seqwater section of the briefing note but did not read it in any detail.<sup>920</sup> His evidence on 8 February 2012 was that he had only read the March flood event report 'a couple of weeks ago'.<sup>921</sup> He had read the Commission's interim report but did not look in detail at the sequence of events in relation to strategy adoption set out in that report.<sup>922</sup>

Mr Spiller formed a view from the information he received during the flood event about the strategies that were employed at the dam (see *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*). That understanding was different from the account given in the ministerial briefing note.<sup>923</sup> Mr Spiller said that he was confident that he would have read the entire briefing note prepared for the Minister.<sup>924</sup> He did not notice the discrepancy between the strategy changes recorded in the briefing note and the understanding he formed during the event.<sup>925</sup> His evidence was that he 'had a very cursory view of the March report'.<sup>926</sup> He could not specifically recall having read the part of the March report that recorded a change to W3 at 8.00 am on 8 January 2011.<sup>927</sup> His evidence was that he had noticed some inconsistency between the findings in the Commission's interim report and his understanding as to strategy changes.<sup>928</sup> However, he had attributed this inconsistency to his lack of specific knowledge, and thought in any event that the interim report had highlighted ambiguity about the transition to W3.<sup>929</sup>

There is no evidence that Mr Dennien had any real appreciation of the discrepancy between the information about strategy which was emerging from some quarters of Seqwater during the January 2011 flood event and what appeared in the final report. Mr Spiller had, evidently, paid greater attention to what Seqwater was communicating during the flood event and to the March flood event report. He did recognise a discrepancy between the two, but had not sufficient confidence in his own perception to raise any issue. That is not remarkable. His expertise was not in dam operation, his knowledge of the manual strategies was relatively superficial, and, most importantly, it was not the role of Water Grid Manager personnel to supervise Seqwater. Neither man should be criticised for failing to detect (in Mr Dennien's case) or act on (in Mr Spiller's case) the inconsistencies between Seqwater's accounts.

## 16.13 Peer reviews of the March report

In its first submission to the Commission, Seqwater advised that it had engaged four experts to review the operational decisions made during the January 2011 flood event.<sup>930</sup> Three of those reviewers' reports (those prepared by Professor Colin Apelt, Mr Greg Roads and Mr Leonard McDonald) were then provided;<sup>931</sup> a fourth, by Mr Brian Shannon, was forwarded on 4 April 2011 with a supplementary submission.<sup>932</sup>

The peer reviewers addressed two questions:

1. Were the releases of water from Wivenhoe Dam and Somerset Dam during the January 2011 Flood Event in accordance with the Wivenhoe manual?
2. Based on the information contained in the March report, were there any aspects relating to the operation of Wivenhoe Dam and the operation of Somerset Dam during the January 2011 Flood Event not in accordance with the manual?

Each of the experts concluded that the operation of the dam complied with the manual,<sup>933</sup> although two of them raised some possible issues of non-compliance.<sup>934</sup> These depended, however, on particular interpretations of the manual.

Mr Babister, asked by the Commission to review the March flood event report and the reports of the peer reviewers, other than Mr Shannon's, noted that the reviews had found that the dam releases did accord with the manual, and that the possible non-compliance issues were attributable to ambiguity in the manual.<sup>935</sup> He did not take issue with the reviewers' opinions.

The four peer reviewers' reports became evidence and the Commission accepted the opinions expressed in them. Given the questions raised as to the veracity of the March flood event report, the Commission has had occasion to examine the process by which those opinions were formed.

Seqwater had no established process for obtaining peer reviews, or at least none of which Mr Borrows was aware.<sup>936</sup> Instead, it was an aspect of the process put in place for the production of the March flood event report, for which Mr Pruss had responsibility (see section 16.11.6 *Seqwater's systems and procedures for the creation of the flood event report*). Mr Pruss also facilitated the peer review process. The Commission's examination of the process revealed a number of deficiencies in it.

The reviews were completed in a short time period so that Seqwater could present the results to the Commission within its timeframe for submissions.<sup>937</sup> Professor Apelt, Mr Roads and Mr Shannon were given about a month to complete their reviews. They did the bulk of their work on draft versions of the March flood event report, which was published on 2 March 2011. Seqwater had requested the reviewers' reports by 10 March 2011. Mr McDonald only received a copy of the final report on 4 March 2011, but he said he found the task 'reasonably tractable'.<sup>938</sup> He met the 10 March 2011 deadline.

The time constraints meant that the reviewers were unable to review all relevant material. Mr Roads said Mr Tibaldi indicated to him that it would not be possible to review the entire report in the time available and that he should review only certain sections of the report (which he did).<sup>939</sup> Mr McDonald did not closely consider the appendices because of the limited time available.<sup>940</sup>

The methodology by which Mr Tibaldi prepared the Seqwater report – and concluded that the transition to W3 occurred at 8.00 am on 8 January 2011 – was not explained to the peer reviewers.<sup>941</sup> It is evident that it should have been.

Each of the peer reviewers proceeded on the premise that there was a transition to strategy W3 at 8.00 am on 8 January 2011.<sup>942</sup> Mr McDonald said that he worked on the basis that the statements in the March report, particularly those in section 2, were accurate and matched the content in the appendices.<sup>943</sup> He did not attempt to compare them.<sup>944</sup>

The question with which the Commission is now concerned – whether the flood engineers operated the dam in strategy W3 from 8.00 am on 8 January 2011 – was not considered by the peer reviewers. As Mr Roads put it:

the expert reviewers were asked to determine whether 'the release of water from Wivenhoe Dam and Somerset Dam during the January 2011 flood [event] was in accordance with the Manual...' We were not asked to determine whether the documentation or even whether the flood operators' mindset was in compliance.<sup>945</sup>

The peer reviewers were not briefed with all relevant information. They were not given the situation report sent on 8 January 2011 at 5.53 pm, which was omitted from the March flood event report. Professor Apelt and Mr Roads received draft versions of the report which did not contain the flood event log entry on 9 January 2011 for the flood engineers' conference at 3.30 pm; the entry does appear in Appendix M of the March report. Because Mr Shannon disposed of the draft he received when he was given the final report, it is not known whether it also omitted the log entry. It is likely, though, that he received the same draft material as Professor Apelt and Mr Roads.

The omission of that information, although curious, appears to have occurred through inadvertence; the result of administrative error.<sup>946</sup> It may not point to systemic weakness, but a lack of rigour in providing all relevant documents has the potential to compromise any review process as a whole.

Mr Shannon and Mr Roads said that they did not have any regard to the flood event log in Appendix M, or to the situation reports in Appendix E.<sup>947</sup> Mr Roads focussed on the modelling in Appendix A and sections 2, 9 and 10 of the report.<sup>948</sup> Mr Shannon assumed that the information in the appendices was reflected in the body of the report;<sup>949</sup> he did not look at the appendices in any detail.<sup>950</sup> Professor Apelt did refer to the situation reports and flood event log, but focussed mainly on the model results,<sup>951</sup> the executive summary and sections 2, 9, 10 and 19.<sup>952</sup> Mr McDonald, who only got a copy of the final report, did not closely examine the appendices because of the limited time he had to complete his review.<sup>953</sup> He read and studied the executive summary and sections 1 to 5, 9, 10 and 11.<sup>954</sup> He did not notice the 9 January entry for the flood engineers' conference in the flood event log in Appendix M; none of the reviewers did.

When the final report was released on 2 March 2011, Seqwater did not bring to the attention of the experts any differences between the drafts and the final report, such as the inclusion of the log entry on 9 January 2011.<sup>955</sup> Mr Shannon said that he reviewed the final report when he was given it and satisfied himself that there was no material difference between it and the draft on which he had relied; but he had only a cursory look at the appendices.<sup>956</sup> Professor Apelt similarly said that he looked at the published report to see if it altered his assessment, and satisfied himself that the contents were 'essentially the same'.<sup>957</sup>

Three of the peer reviewers said that had they seen one or both of the situation reports and the entry about the flood engineers' conference in the course of their reviews, that material would, given the apparent inconsistency with the proposition that the dam was operated in strategy W3 from 8.00 am on 8 January 2011, have caused them to ask further questions of Seqwater.<sup>958</sup> Mr Roads said he would have sought clarification about the entry for the conference,<sup>959</sup> but – because of his view of the proper interpretation of the manual (with which the Commission does not agree) – he did not regard it or the situation report as relevant to the question of compliance.<sup>960</sup>

Each of the peer reviewers has maintained his view that the releases made from the dam were appropriate in the circumstances the flood engineers faced.<sup>961</sup> While important, that is not to the point now being considered. The releases,<sup>962</sup> even if appropriate, do not of themselves determine the strategy under which the dam was being operated;<sup>963</sup> and those made on 8 and 9 January 2011 were consistent with the operation of the dam under either of strategy W1 or W3.<sup>964</sup>

Independence is essential to a credible review process. There are real concerns about Seqwater's approach in this case. Mr Borrows and Mr Pruss appeared to regard the peer reviewers as one of the external resources made available to assist in drafting the March flood event report.<sup>965</sup> In some instances, no clear distinction was made between the report's preparation and its review. Two of the peer reviewers attended meetings about the production of the report. Professor Apelt was present at the first meeting that was held about the preparation of the report (on 3 February 2011).<sup>966</sup> He said he attended as an observer only, so that he could be brought up to speed.<sup>967</sup> There is no record of what was discussed at the meeting, but Mr Pruss indicated that it was a planning meeting for the completion of the report.<sup>968</sup> It appears that issues relating to the content of the report were discussed at a second meeting Professor Apelt attended (on 8 February 2011).<sup>969</sup> Professor Apelt said he was there again as an observer.<sup>970</sup> Again, there is no record of what was discussed at this meeting, but a note Mr Ayre took indicates that there was some discussion about the flood event summary in section 2 of the report, and the need to show that the flood engineers had satisfied the Wivenhoe manual.<sup>971</sup>

The content of the report was evidently discussed at a meeting Mr Shannon attended on 18 February 2011. Mr Shannon raised an issue about the exercise of discretion and compliance with the manual.<sup>972</sup> A note of the meeting indicates that Mr Shannon made a suggestion to the effect of 'if you did step outside [the] manual, show you did what was necessary'.<sup>973</sup> Mr Pruss said he was 'comfortable' that Mr Shannon was 'challenging' the flood engineers in

this way.<sup>974</sup> That might have been useful, but it raises the possibility that Mr Shannon may have been contributing – even if only in an indirect way – to a report he was engaged to review. It does not appear that any thought was given to the risk that the value of an independent peer review might thus be weakened.

Mr Pruss did not recognise the problems associated with the merging of the process of production of the report and the process of reviewing it. He and Professor Apelt differed as to the scope of the latter's role. Both were asked, in evidence, to comment on an email Mr Pruss's assistant had sent Professor Apelt (on 7 February 2011) thanking him for his availability to 'assist Seqwater with the report and submission for the Commission of [Inquiry].'<sup>975</sup> Professor Apelt had no doubt in his mind. He denied that he had given that assistance to Seqwater; he said, 'it would be quite ridiculous for me to help construct [the report] and then review it'.<sup>976</sup> Mr Pruss, on the other hand, had a different view. He said the email was consistent with his general understanding of Professor Apelt's engagement.<sup>977</sup> There was, it seems, some lack of clarity, at least from Seqwater's perspective, as to Professor Apelt's role in the process.

An exchange of emails between Mr Roads and Mr Malone (to which the other flood engineers were party) on 17 January 2011, before he was engaged by Seqwater, is also relevant in examining Seqwater's approach to the independence of the review. Mr Malone sent Mr Roads an email thanking him for his 'supportive comments' reported in *The Australian* newspaper.<sup>978</sup>

The article reported Mr Roads as saying that 'the experts operating Wivenhoe Dam were among the best in Australia and would have done everything by the book'; that while he agreed earlier releases of water would have created more capacity for flood storage in Wivenhoe and a lower river peak in Brisbane, the flood engineers had no way of anticipating the severity of the weather; and that he agreed that the questions about the dam's performance should be examined and the subject of an inquiry.<sup>979</sup>

In his reply to Mr Malone's email, Mr Roads said the journalist was 'very selective' in his reporting of Mr Roads' comments; it looked to him as though the flood engineers had done 'a great job'. He also said in the email:<sup>980</sup> 'I advised Barton [Maher]<sup>981</sup> yesterday that you guys will need to get on the front foot with [the journalist]. It shouldn't be me!'

The Commission does not suggest that Mr Roads' approach to the review was anything other than professional or objective. But it does raise a question as to the wisdom of Seqwater's engaging for the review process someone who had already expressed a view on the operation of the dams.

## Recommendation

16.4 Seqwater should ensure that any future peer review process:

- is co-ordinated by someone independent of those who wrote the report
- entails the provision of all relevant information to the peer reviewers
- permits sufficient time for the review
- documents all contact between those whose actions are under review and the reviewers.

## 16.14 The effect of releases from Wivenhoe Dam on flooding in the Brisbane River

The consequences of the operation of Wivenhoe and Somerset dams were not able to be examined fully by the time of publication of the Commission's interim report: see section 2.9.2 of that report. The Commission had engaged Mr Mark Babister of WMAwater, a firm of consultant water engineers, to review and assess a hydrodynamic model of the Brisbane River prepared by Sinclair Knight Merz, another firm of engineering consultants, on behalf of Seqwater. The model was then used by Mr Babister to assess the effect of releases of water from Wivenhoe Dam during the January 2011 flood event and to identify the likely effect of different release strategies. The results of this work by Mr Babister were received by the Commission shortly before the printing of the interim report; they could not be analysed in detail in that report.<sup>982</sup>

Mr Babister's report<sup>983</sup> on the modelling was published on the Commission's website and written submissions from any interested party were invited in response. Seven substantive submissions were received.<sup>984</sup> At the request of the Commission, Mr Babister prepared a response to these submissions, which was provided to the interested parties<sup>985</sup>

along with a supplementary report prepared by Mr Babister responding to additional questions raised by the Commission.<sup>986</sup> Three further submissions in reply were provided to the Commission.<sup>987</sup>

When the Commission's additional hearings were convened in February 2012, the Commission asked Mr Babister to undertake additional modelling. The part of the Wivenhoe manual with which the Commission was concerned in these hearings was that which demands the selection of an overall strategy. Each strategy contains a 'primary consideration' and sets an upper limit for the amount of water that may be released while that strategy is in place. The primary consideration informs the considerable discretion of the flood engineers in choosing the amount of water to be released from the dams.<sup>988</sup> The exercise of that discretion will involve judgment calls.<sup>989</sup> Mr Babister prepared a report<sup>990</sup> expanding on the work he had previously done to focus on the likely effect of different applications of strategy W3. He was called as a witness and cross-examined on his modelling.<sup>991</sup>

The modelling has allowed the Commission to come to some conclusions as to the mitigatory effect of the dams, the contribution of Wivenhoe Dam releases to flooding in Brisbane and the possible consequences had the flood engineers adhered to the operating strategies in the manual.

### 16.14.1 Modelling work done for the Commission

The Sinclair Knight Merz model was calibrated<sup>992</sup> against the flood heights actually recorded in the January 2011 flood.<sup>993</sup> Mr Babister concluded that, subject to certain limitations, it was fit for purpose to address the questions posed to him by the Commission.<sup>994</sup>

It is important to note that, like any model, while the Sinclair Knight Merz model is a useful tool for understanding real-world events, it does not depict exactly what would occur during a flood. For example, the model has not been calibrated for the parts of the river upstream of the Mt Crosby Weir and treats all tributary inputs above this point as a single aggregated value into the model.<sup>995</sup> Limitations in the model need to be recognised and the results interpreted in light of them.

One significant issue relevant to the calibration of the model, and therefore its accuracy, was a discrepancy between the two gauges located on opposite sides of the Brisbane River at the Port Office. The maximum river height recorded in January 2011 by the gauge operated by Seqwater was 4.46 metres Australian Height Datum,<sup>996</sup> whereas the gauge operated by Maritime Safety Queensland recorded a maximum river height of 4.27 metres.<sup>997</sup>

Seqwater made enquiries about the reasons for the discrepancy and concluded that its gauge reading was correct.<sup>998</sup> Mr Babister concluded that the reading at the Seqwater gauge should be preferred for the purposes of calibrating the model, on the basis that it was verified by manual inspection of the gauge during the flood.<sup>999</sup> The Commission agrees that this was the appropriate figure to use for the purpose of the modelling. It is worth noting that using the other gauge for calibration might affect the results of the modelling. It is undesirable that such a discrepancy exists between data points that could be used in the modelling of this historic event; it should be conclusively resolved.

### *Recommendation*

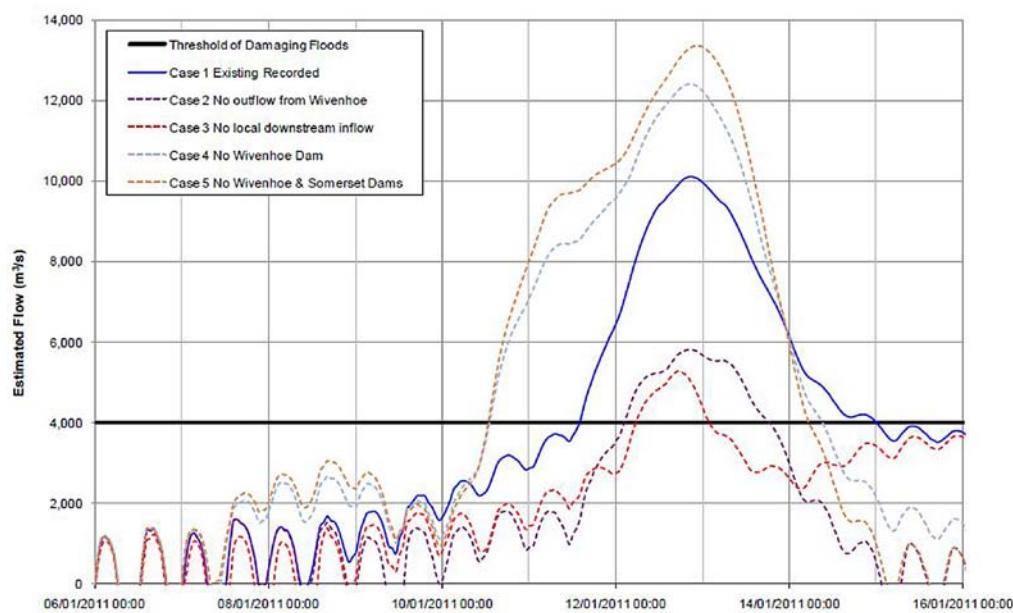
- 16.5 The Queensland Government should resolve the discrepancy in recorded peak river height for the January 2011 flood of the Brisbane River between the Brisbane City and Port Office gauges.

### 16.14.2 The effect of the operation of Wivenhoe Dam in January 2011

#### Mitigatory effect of the dams

Sinclair Knight Merz, commissioned by Seqwater, modelled the effects on both flow and river height of the flood at the Brisbane Port Office gauge if Wivenhoe Dam had not been built, and if both Wivenhoe and Somerset dams had not been built. The results of modelling those scenarios are indicated by case 4 and 5, respectively, on the graphs of peak flow and peak river height at the Port Office gauge.

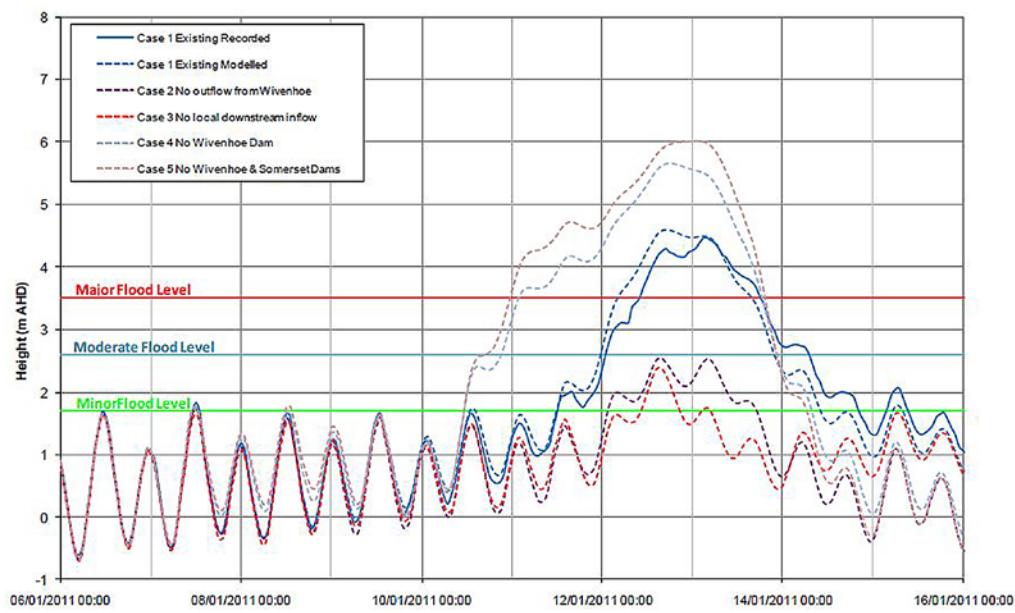
Figure 16(d)



Comparison of flow hydrographs for the January 2011 event at the Brisbane Port Office under different scenarios

*Source:* Sinclair Knight Merz, Joint Calibration of a Hydrologic and Hydrodynamic Model of the Lower Brisbane River, Version 3, 5 August 2011 [p59].

Figure 16(e)



Comparison of level hydrographs for the January 2011 event at the Brisbane Port Office under different scenarios

*Source:* Sinclair Knight Merz, Joint Calibration of a Hydrologic and Hydrodynamic Model of the Lower Brisbane River, Version 3, 5 August 2011 [p59].

The graphs show that the presence of Wivenhoe and Somerset dams had a mitigatory effect on the January 2011 flood of the Brisbane River;<sup>1000</sup> the flood would have been worse in Brisbane if there were no dams.

## Relative contribution of dam releases and other sources of floodwater to flooding in Brisbane

While flooding would have been worse in the absence of the dams, it is not disputed by any party that releases from Wivenhoe Dam contributed significantly to flooding downstream of Wivenhoe, in combination with tributary inflows from Lockyer Creek, the Bremer River and other catchments. The Commission asked Mr Babister to use the Sinclair Knight Merz model to analyse the extent to which flooding in the Brisbane River was caused by releases from Wivenhoe and Somerset dams.

Quantifying the relative contributions of the different sources to the flooding in the Brisbane River is complicated. The flows from different sources interact at the point they converge and are affected by the relative timing of peak flows and backwatering effects.<sup>1001</sup> The difficulty in modelling this interaction accurately is a limitation of the model.<sup>1002</sup> A precise measure of the contribution of dam releases to the river height, volume or flow can only be made by reference to a particular time and location.<sup>1003</sup>

Peak flow is the value with the most direct bearing on peak river height.<sup>1004</sup> Subject to considerable qualification, Mr Babister's modelling concludes that the flows from the Wivenhoe Dam and non-Wivenhoe Dam sources were roughly equivalent contributors to the peak flow in the Brisbane River from Moggill to Brisbane in January 2011.<sup>1005</sup>

The modelling also considered the relative contributions of different sources to flood volume. For the period between 9.00 am on 6 January 2011 and 3.00 am on 13 January 2011 (the time of the peak recorded at the Port Office gauge) releases from Wivenhoe Dam made up approximately half of the total flood volume at the Port Office.<sup>1006</sup> This figure does not imply that half of the flooding in Brisbane was caused by Wivenhoe releases; it is useful only to indicate the relative contribution of one source of water at a particular location and at a particular time.<sup>1007</sup> By 19 January 2011, releases of water from Wivenhoe Dam amounted to approximately 65 per cent of the total flood volume at the Port Office.<sup>1008</sup> The larger part of the water released from Wivenhoe Dam was released after the flood peak at the Port Office; this figure indicates only the total contribution to flood volume, not to the flood peak.<sup>1009</sup>

### Dam releases and flooding in the Bremer River

The Commission also asked Mr Babister to use the Sinclair Knight Merz model to consider the extent to which water released from Somerset and Wivenhoe dams coincided with peak flows from the Bremer River. Mr Babister's report concludes that the peak flow from Wivenhoe Dam releases at the confluence of the Brisbane and Bremer rivers occurred almost simultaneously with the Bremer River peak flow.<sup>1010</sup> Significant backwatering occurred within the lower Bremer River to a distance of approximately 15 kilometres upstream of the confluence of the Brisbane River. (See 2.3.2, part 5 of this report for more detail on the backwater effects of the Brisbane River on the Bremer River.) Ipswich flood behaviour is sensitive to this backwatering and it is likely that this effect and the coincidence of flood peaks contributed to the flooding that occurred at Ipswich. The exact additional flood height at Ipswich due to dam releases could not be calculated using the Sinclair Knight Merz model.<sup>1011</sup>

### 16.14.3 Effects of different release strategies

#### Modelling of the effects of implementing different release strategies

The Commission asked Mr Babister to model the effects of a number of different gate opening strategies and show the effect such strategies would have on the maximum river heights in the Brisbane River relative to the way in which the dam was operated during January 2011.

Mr Babister concluded, in light of the information available at the time, that, allowing for the limits of the strategies in the Wivenhoe manual, the flood engineers achieved close to the best possible flood mitigation result for the January 2011 flood event.<sup>1012</sup>

Seven modelled scenarios and their effects relative to a modelled version of the events of January 2011 are set out in Figure 16(f) below. A negative value indicates a lower river height, a positive value a higher river height. The locations shown are four river height gauges located on the Brisbane River.

Figure 16(f)

#	Scenario	Moggill	Jindalee	Oxley	Brisbane
<b>Jan 2011</b>	The modelled maximum river heights of the January 2011 flood that actually occurred, calibrated against the measurements actually recorded (although the results are not identical to the recorded measurements). This is the base scenario against which all other scenarios were compared. <sup>1013</sup>	17.6m	13.1m	8.3m	4.6m
1	The transition to strategy W4 at Wivenhoe Dam occurred at 8.00 pm on 9 January 2011, rather than at 8.00 am 11 January 2011. (8.00 pm on 9 January 2011 was the first time that the real time flood model used by the operators of Wivenhoe Dam predicted, including forecast rainfall, that the level of Wivenhoe lake would exceed 74.0 metres, the trigger point for Strategy W4 being implemented. <sup>1014</sup> ) This scenario assumed that the gates were opened quickly until the storage level of the dam began to fall. <sup>1015</sup>	+0.3m	+0.3m	+0.3m	+0.2m
2	The transition to strategy W4 at Wivenhoe Dam occurred at 8.00 pm on 9 January 2011, rather than at 8.00 am 11 January 2011. This scenario assumes dam releases were quickly increased to between 3500 m <sup>3</sup> /s to 4000 m <sup>3</sup> /s, but the lake level was allowed to continue to rise until it reached 74.0 metres, at which point the gates were opened until the storage level of the dam began to fall. <sup>1016</sup>	-0.9m	-0.8m	-0.5m	-0.3m
3	The storage level in Wivenhoe Dam was 75% of full supply level prior to the onset of the flood and the manual in force in January 2011 applied. <sup>1017</sup>	-0.7m	-0.6m	-0.5m	-0.3m
4	The storage level in Wivenhoe Dam was 75% of full supply level prior to the onset of the flood and the manual in force in January 2011 was amended so that the trigger levels for Strategies W1, W2 and W3 were reduced by 25%. Strategy W4 was still triggered at 74.0 metres. <sup>1018</sup>	-1.3m	-1.2m	-0.9m	-0.6m
5	The storage level in Wivenhoe Dam was 75% of full supply level prior to the onset of the flood and the manual was amended so that the trigger levels for Strategies W1, W2 and W3 were reduced by 25%. W4 was not triggered at 74.0 metres: outflows were only slightly increased to make use of additional storage space. <sup>1019</sup>	-1.8m	-1.6m	-1.3m	-0.8m
6	The releases from Wivenhoe Dam were increased to the upper allowable limit of Strategy W3 as soon as it was triggered and the manual in force in January 2011 applied. <sup>1020</sup>	-0.7m	-0.6m	-0.5m	-0.3m
7	Strategy W3 was invoked at 8.00 am on 8 January 2011 and the gates were opened as fast as permitted by the manual to produce a dam release to produce a predicted total flow at Moggill of 4000 m <sup>3</sup> /s, excluding forecast rainfall, using only information available at the time. <sup>1021</sup>	-1.3m	-1.3m	-0.9m	-0.6m

#	Scenario	Moggill	Jindalee	Oxley	Brisbane
8	Strategy W3 was invoked at 8.00 am on 8 January 2011 and the gates were opened as fast as permitted by the manual to maintain a dam release of 4000 m <sup>3</sup> /s. <sup>1022</sup>	-1.0m	-0.8m	-0.6m	-0.3m
9	An optimised release strategy, assuming complete foreknowledge of all inflows into the dam and ignoring the restriction imposed by the manual in force in January 2011 on the maximum flow permitted in Strategy W3. <sup>1023</sup>	-0.9m	-0.8m	-0.6m	-0.4m

All except one of these scenarios show a reduction in the river height relative to what happened in January 2011. A strategy that might provide flood mitigation in one flood may not work in different conditions, so this cannot be used as a firm guide for how future floods should be approached.<sup>1024</sup> For example, a strategy that might be effective during a flood large enough to trigger the W4 strategy may be detrimental in moderate sized floods.<sup>1025</sup>

In any event, these scenarios are not realistic as possible outcomes of the January 2011 flood event. By way of illustrating that point, scenarios 1 and 2 rely on the use of forecast rainfall and, as this Commission found in its interim report, it is not possible to articulate a method by which lake levels could be predicted with any precision or strategies confidently changed on the basis of rainfall forecasts;<sup>1026</sup> scenarios 3, 4 and 5 assume the dam was at 75 per cent of full supply level; scenarios 6, 7, 8 and 9 would only have been implemented with a level of information that was not available at the time of the floods. A number of the scenarios assume that the manual then in force, version 7, was ignored. That manual has since been amended and is presently the subject of a long term review: see section 17.1 below. (A number of other scenarios modelled by Mr Babister are not shown above because they were based on different conditions to those experienced in the January 2011 flood event or are further examples of scenarios that could only be achieved with an unrealistic level of foresight or without regard to the manual then in force.)

The modelling indicates, however, that even without changes to the Wivenhoe manual, a reduction in lake level to 75 per cent of full supply level would have meant that peak river heights were lower than experienced in the January 2011 flood event: 70 centimetres lower at the Moggill gauge, 30 centimetres lower at the Port Office gauge.<sup>1027</sup> If the operating strategies in the manual had also been amended, as shown in scenario 4 above, it is likely that peak river heights would have been even less: 130 centimetres lower at the Moggill gauge, 60 centimetres lower at the Port Office gauge. They may have been still lower if other assumptions also changed as, for example, in scenario 5. The modelling clearly indicates that the application of the W strategies is material to the outcome of most scenarios.

It is important to note that even at these lower river heights, major flooding would still have been experienced in Brisbane. The Bureau of Meteorology defines a major flood as one which peaks above 15.5 metres at Moggill and 3.5 metres at Brisbane city<sup>1028</sup> (the Port Office gauge). Scenario 4, which involved an initial lake level of 75 per cent of full supply level and W strategy trigger levels reduced by 25 per cent, resulted in a modelled height of 16.3 metres at Moggill and 4.0 metres at the Port Office.

Modelling was also conducted to approximate what would have occurred if the present version of the Wivenhoe manual, Revision 9, had been in force during the January 2011 flood event and the initial lake level had been 75 per cent of full supply level.<sup>1029</sup> This indicated that the result would not have been significantly different from the results of scenario 3.

## The scenarios of maximum release under W3 from 8.00 am on 8 January 2011

Scenarios 7 and 8 were prepared by Mr Babister in his February 2012 report. They represent the outer limit of what the flood engineers could have done had they been in W3 from 8.00 am on 8 January 2011 and immediately increased releases to the maximum allowable under that strategy.<sup>1030</sup>

As may be expected, both of those scenarios show some decrease in flood heights downstream: 130 centimetres at the Moggill gauge and 60 centimetres at the Port Office gauge in scenario 7; 100 centimetres at the Moggill gauge and 30 centimetres at the Port Office gauge in scenario 8. However, as also may be expected with outer limit scenarios, neither scenario is realistic.<sup>1031</sup> The new scenarios entail releasing water from the dam and substantially raising flood levels long before it was known that there was going to be a major flood.<sup>1032</sup> Between

11.00 am on 8 January 2011 and 1.00 pm on 9 January 2011, both of these strategies would have involved dam outflows almost double the peak dam inflow observed until that point. That, as Mr Babister observed, would have entailed Wivenhoe Dam operating as a flood amplification dam rather than a flood mitigation dam.<sup>1033</sup> Mr Babister concluded that the two scenarios were not practical; indeed they were highly risky.<sup>1034</sup> If, for example, further rainfall did not eventuate, the early release of such large quantities of water would have made the flooding significantly worse.

The results of the modelling must be taken in context with Mr Babister's acknowledgment that the 'models do have some uncertainty in them'.<sup>1035</sup> The model results are purely illustrative. They do not demonstrate the outcomes for the infinite range of possibilities that exist.<sup>1036</sup>

### **The consequences of the failure to engage W3 from 8.00 am on 8 January 2011**

It is unfortunate that there has been a conflation in some media reporting of two separate issues: whether there was non-compliance with the manual strategies and whether it caused unnecessary flooding. The Commission has found the first (see *16.11 Conclusions: the dam operations strategies*.) As to the second, Mr Babister's perception was that the flood engineers managed Wivenhoe Dam so that its flood mitigation effect was 'very close' to the maximum achievable within the constraints of the manual.<sup>1037</sup> That may well be right. The problem is that the possibility exists that because the engineers failed to consider the releases open to them within the parameters of the correct W strategy, an opportunity may have been lost for earlier releases.

The evidence was uniformly to the effect that the pattern of releases adopted on Saturday 8 January was appropriate: the lake level was only just over 68.5 metres and showed every sign of dropping; higher releases would have been risky and unwarranted. The picture is not so clear for Sunday 9 January, when the rainfall returned. Mr Tibaldi described how conditions that day developed. Referring to the 'massive amount of rainfall', particularly in the Stanley River catchment, he explained that its imminence was not obvious at the start of the day:

So what you've got to realise is you don't have that snapshot at 8 a.m. all you've got is, well, it's raining and I've got a 30 to 50 millimetre forecast. But as it progresses through the day, you know, you become aware that this is getting big and, you know, you just come to that – you're in transition. You are thinking about the bridges but then all of a sudden as you progress through the day you see, well, this just can't continue. We've got to ramp up releases.

The real question is whether the steps taken to do so would have come sooner had the engineers had a clear appreciation that they were operating in W3, and whether they should on that day have been moving earlier to minimise urban inundation rather than continuing to operate so as to keep the bridges open until the evening of 9 January 2011.

The possibility that the engineers moved too late was acknowledged by Mr Roads, who said that while on Sunday morning, 9 January 2011, the flood engineers were 'pretty much releasing what they should have been', by Sunday afternoon 'it's starting to get touch and go really... in hindsight you look back at it and say Sunday afternoon maybe [they] should have taken down the bridges a bit earlier'.<sup>1038</sup>

Mr Babister initially said that 'the more practical or realistic options if you were going to have higher releases, is to start some time after midday or somewhere between midday and 1600 hours. That's when it would be realistic on the 9th to increase flows above what was released';<sup>1039</sup> although he subsequently modified that view to say that the 'only area' that there was 'some argument they probably could have released slightly higher flows' was after 4.00 pm that afternoon.<sup>1040</sup> The scenario of higher releases on the afternoon of 9 January, Mr Babister said, was most closely reflected in scenario 9 of Figure 16.1; but it was 'an adventurous risk-taking approach' because it relied on confidence in the rainfall forecast.<sup>1041</sup>

Mr Shannon's view was that given the 'frightening' inflow by 2.00 pm on 9 January and the predicted lake level it would be 'extraordinary' not to have put the closure of the bridges in train by then, in accordance with the intention of W3.<sup>1042</sup> And Mr Tibaldi volunteered in evidence that 'decid[ing] to ramp up earlier for this event... would have reduced flood damage'.<sup>1043</sup> Mr Ayre agreed.<sup>1044</sup>

There is, it is obvious, plenty of scope for argument about whether adherence to the manual strategies would have made a difference to the way in which the flood engineers actually operated the dam; but the possibility certainly exists that they would have responded more quickly to the developing conditions of 9 January had their mindset

been one of applying strategy W3. Ascertaining the practical result of acting more quickly also is subject to the uncertainties inherent in the modelling; but again, the possibility exists of at least some improvement in the flooding outcome for Brisbane and Ipswich.

## (Endnotes)

- 1 Term of Reference 2(f). See Appendix 1 for the Commission's full terms of reference.
- 2 GHD, Report for Investigation of Options to increase the flood mitigation performance of Wivenhoe Dam, December 2011.
- 3 Exhibit 24, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam, 2 March 2011.
- 4 Exhibit 51, Statement of John Tibaldi, 25 March 2011 [p5: para 21]; Exhibit 1078, Statement of John Ruffini, 30 January 2012 [p3: para 19; p4: para 25; p4: para 29]; Transcript, John Ruffini, 6 February 2012, Brisbane [p5450: line 11]; Exhibit 17, Statement of Robert Ayre, 23 March 2011 [p31: para 154]; Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p5: para 29]; Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p18: para 95]; Transcript, Robert Ayre, 4 February 2012, Brisbane [p5292: line 49]; Exhibit 45, Statement of Terrence Malone, 25 March 2011 [p7: para 25]; Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: line 20-38].
- 5 Submission of Seqwater, 11 March 2011 [para 188].
- 6 Submission of Seqwater, 11 March 2011, Attachment 29.
- 7 Exhibit 407, WMA Water, Report to the Queensland Flood Commission of Inquiry, Final Report, May 2011 [p1].
- 8 Exhibit 407, WMA Water, Report to the Queensland Flood Commission of Inquiry, Final Report, May 2011 [p48: para 167].
- 9 Hedley Thomas, 'What the floods inquiry didn't hear: Wivenhoe 'breached the manual', The Australian, 23 January 2012, online edition available at: [www.theaustralian.com.au/national-affairs/what-the-floods-inquiry-didnt-hear-wivenhoe-breached-the-manual/story-fn59niix-1226250814487](http://www.theaustralian.com.au/national-affairs/what-the-floods-inquiry-didnt-hear-wivenhoe-breached-the-manual/story-fn59niix-1226250814487).
- 10 Exhibit 1034, Queensland Government Gazette, Volume 359, Number 15, Commissions of Inquiry Amendment Order (No.1) 2012, 25 January 2012.
- 11 Closing submissions on behalf of Seqwater, 17 February 2012 [p20: para 164]; Closing submissions on behalf of John Tibaldi, 16 February 2012 [p5: para 2.10].
- 12 Closing submissions on behalf of Seqwater, 17 February 2012 [p20: para 164].
- 13 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009.
- 14 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p3: para 1.4].
- 15 See 17.1 Longer term review of the Wivenhoe and North Pine manuals and 17.2 Review and approval of flood mitigation manuals.
- 16 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p3: para 1.3].
- 17 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p3: para 1.3].
- 18 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p10: para 3.3].
- 19 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p4: section 1.7].
- 20 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p18: para 46].
- 21 Closing submissions on behalf of Seqwater, 17 February 2012 [p10: para 28-29; p12: para 32].
- 22 Closing submissions on behalf of Mr Tibaldi, 16 February 2012 [p7: para 3.1 – p8: para 3.7].
- 23 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p5: para 13].
- 24 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p24: para 86-87].

- 25 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009, [p1: para 1.1].
- 26 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p4: para 1.7].
- 27 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p1: para 1.1].
- 28 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p9: para.3.1].
- 29 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p13: para 5.2].
- 30 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p5].
- 31 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p6].
- 32 See, for example, the evidence of Mr Tibaldi, Transcript, 15 April 2011, Brisbane [p440: lines 33-53, p449: lines 20-30]; Transcript, Robert Ayre, 12 April 2011, Brisbane [p163: lines 1-20]; Transcript, Robert Ayre 13 April 2011, Brisbane [p245: line 50 – p246 line 15]; Transcript, John Ruffini 14 April 2011, Brisbane [p350: lines 40-55]; Transcript, Terrance Malone, 15 April 2011, Brisbane [p384: lines 33-45].
- 33 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p23: para 8.4].
- 34 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p23].
- 35 Transcript, John Tibaldi, 15 April 2011, Brisbane [p441: lines 13-33].
- 36 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p24].
- 37 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p26-27].
- 38 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p27].
- 39 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p28].
- 40 Closing submissions on behalf of Seqwater, 17 February 2012 [p17: para 41-42].
- 41 John Tibaldi, Transcript, 2 February 2012, Brisbane [p5052: line 57 – p5053: line5].
- 42 John Tibaldi, Transcript, 2 February 2012, Brisbane [p5055: line 28-30].
- 43 John Tibaldi, Transcript, 2 February 2012, Brisbane [p5107: line 45 – p5108: line 2].
- 44 John Tibaldi, Transcript, 2 February 2012, Brisbane [p5114: line 20-30].
- 45 John Tibaldi, Transcript, 2 February 2012, Brisbane [p5154: lines 20-30].
- 46 Robert Ayre, Transcript, 3 February 2012, Brisbane [p5250: line 58 – p5251: line 12].
- 47 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5220: lines 36- 37].
- 48 Robert Ayre, Transcript, 3 February 2012, Brisbane [p5209: lines 42-45].
- 49 Robert Ayre, Transcript, 3 February 2012, Brisbane [p5289: lines 30-45].
- 50 Robert Ayre, Transcript, 4 February 2012, Brisbane [p5210: lines 10-15].
- 51 Terence Malone, Transcript, 5 February 2012, Brisbane [p5374: lines 1-10].
- 52 John Ruffini, Transcript, 6 February 2012, Brisbane [p5443: line 30-40].
- 53 John Ruffini, Transcript, 6 February 2012, Brisbane [p5443: line 40 – p5445: line 8].
- 54 John Ruffini, Transcript, 6 February 2012, Brisbane [p6089: line 35 – p6090: line 15].
- 55 Colin Apelt, Transcript, 8 February 2012, Brisbane [p5734: lines 15-35].
- 56 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5767: line 35 – p5768: line 15].
- 57 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5777: lines 1-10].
- 58 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5778: lines 1-10].

- 59 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5797: lines 20-24].
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- 60 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5797: line 45 – p5798: line 55].
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- 61 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5819: line 26].
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- 62 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5839: lines 35-45].
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- 63 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5839: line 55 – p5840: line 7].
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- 64 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5841: lines 10-46].
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- 65 Mark Babister, Transcript, 9 February 2012, Brisbane [p5839: lines 35-45].
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- 66 Leonard McDonald, Transcript, 7 February 2012, Brisbane [p5561: lines 25-38].
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- 67 Closing submissions on behalf of Seqwater, 17 February 2012 [p10: para 29].
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- 68 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p22: para 8.4].
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- 69 Closing submissions on behalf of Seqwater, 17 February 2012 [p12: para 33 – p13: para 37].
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- 70 Closing submissions on behalf of Seqwater, 17 February 2012 [p9: para 23].
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- 71 Colin Apelt, Transcript, 8 February 2012, Brisbane [p5732: line53 – p5733: line 2].
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- 72 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5768: lines 25-26 and 48-50; p5771: lines 13-15 – p5733: line 2].
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- 73 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5775: lines 21-23].
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- 74 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5805: lines 7-9].
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- 75 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5824: lines 36-38].
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- 76 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5825: lines 6-10].
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- 77 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5825: lines 15-20].
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- 78 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5848: lines 24-35].
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- 79 Leonard McDonald, Transcript, 7 February 2012, Brisbane [p5562: lines 47-50].
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- 80 Leonard McDonald, Transcript, 7 February 2012, Brisbane [p5563: lines 2-13].
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- 81 Closing submissions on behalf of Seqwater, 17 February 2012 [p9: para 24].
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- 82 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5069: line 31]. See also [p5072: line 9]; [p5068: line 11], although, his view given in evidence, is that there was no requirement for the engineer operating the dam to actually turn their mind to the strategy which was applicable at any given time: [p5079: line 45].
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- 83 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5070: lines 18-48].
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- 84 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5072: lines 9-12].
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- 85 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5077: line 18].
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- 86 Transcript, John Tibaldi, 15 April 2011, Brisbane [p440: lines 13-33].
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- 87 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5213: line 12]. See also [p5214: line 57] where Mr Ayre accepted that the manual requires the adoption of a strategy at the time of the event so there could be no mistake as to what the primary consideration was.
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- 88 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5213: line11].
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- 89 Exhibit 17, Statement of Robert Ayre, 23 March 2011 [para 316].
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- 90 Transcript, Robert Ayre, 13 April 2011, Brisbane [p205: line 1].
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- 91 Transcript, Robert Ayre, 13 April 2011, Brisbane [p230: lines 19-25].
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- 92 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [para 28-29].
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- 93 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5296: lines 39-59].
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- 94 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5297: lines 12-15].
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- 95 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5374: lines 1-18].
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- 96 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5329: lines 43-44].
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- 97 Transcript, John Ruffini, 6 February 2012, Brisbane [p5422: lines 3-27].
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- 98 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009, section 2.9 [p8].
- 99 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009, section 2.9 [p8].
- 100 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Wivenhoe Dam and Somerset Dam*, 2 March 2011.
- 101 Submission of Seqwater, 11 March 2011 [p48: para 187].
- 102 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p iii].
- 103 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p223].
- 104 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p iv].
- 105 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p iv].
- 106 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p9].
- 107 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p9].
- 108 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p41].
- 109 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p186].
- 110 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p187-195].
- 111 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p217].
- 112 Exhibit 51, Statement of John Tibaldi, 25 March 2011 [p1: para 4].
- 113 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5077: line 50 – p5078: line 15].
- 114 Exhibit 42, Statement of John Ruffini, 24 March 2011 [p12: para 63].
- 115 Exhibit 43, Transcript of Interview of John Ruffini 29 March 2011 [p45: lines 9-16].
- 116 Transcript, John Ruffini, 6 February 2012, Brisbane [p5413: lines 25-45].
- 117 Transcript, John Ruffini, 5 February 2012, Brisbane [p5385: line 50].
- 118 Transcript, John Ruffini, 6 February 2012, Brisbane [p5390: lines 30-50].
- 119 Transcript, John Ruffini, 6 February 2012, Brisbane [p5391: lines 8-40].
- 120 Transcript, John Ruffini, 6 February 2012, Brisbane [p5392: line 10 – p5393: line 5].
- 121 Transcript, John Ruffini, 6 February 2012, Brisbane, [p5393: line 55; p5394: lines 1-10; p5394: lines 15-17; p5394: lines 25-30; p5394: lines 35-48; p5395: lines 17-20; and p5395: lines 43-50].
- 122 Transcript, John Ruffini, 6 February 2012, Brisbane [p5394: lines 4-25].
- 123 Transcript, John Ruffini, 6 February 2012, Brisbane [p5394: line 48 – p5395: line 30].
- 124 Transcript, John Ruffini, 6 February 2012, Brisbane [p5395: line 49 – p5396: line 5].
- 125 Transcript, John Ruffini, 6 February 2012, Brisbane [p5396: lines 46-58].
- 126 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p9: para 19]. Closing submissions on behalf of Seqwater, 17 February 2012 [p17: para 41-42].
- 127 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p12: para 33].
- 128 Email 3 February 2012, attachment to Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p24: para 86-87].
- 129 Transcript, John Ruffini, 6 February 2012, Brisbane [p5457: lines 25-45].
- 130 Transcript, John Ruffini, 6 February 2012, Brisbane [p5398: lines 18-20].
- 131 Transcript, John Ruffini, 6 February 2012, Brisbane [p5446: line 42].

- 132 Transcript, John Ruffini, 6 February 2012, Brisbane [p5449: lines 15-25].
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- 133 Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: lines 1-4].
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- 134 Transcript, John Ruffini, 6 February 2012, Brisbane [p5399: lines 1-25].
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- 135 Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: lines 29-47].
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- 136 Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: line 58 – p5415 line 10].
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- 137 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5183: lines 7-15].
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- 138 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5265: lines 16-21].
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- 139 Exhibit 1035, Seqwater Flood Procedure Manual, January 2010.
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- 140 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5179: lines 45-50].
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- 141 Exhibit 17, Statement of Robert Ayre, 23 March 2011 [p84: para 384].
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- 142 Exhibit 20, Statement of Robert Ayre, 11 April 2011 [p25: para 120].
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- 143 Exhibit 18, Statement of Robert Ayre, 29 March 2011 [p12: para 34].
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- 144 Exhibit 18, Statement of Robert Ayre, 29 March 2011 [p12: para 35].
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- 145 Transcript, Robert Ayre, 12 April 2011, Brisbane [p155: lines 32-49].
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- 146 Transcript, Robert Ayre, 12 April 2011, Brisbane [p156: lines 2-20].
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- 147 Transcript, Robert Ayre, 13 April 2011, Brisbane [p201: lines 31-39].
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- 148 Transcript, Robert Ayre, 11 April 2011, Brisbane [p81: lines 38-44].
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- 149 Transcript, Robert Ayre, 13 April 2011, Brisbane [p193: lines 7-12].
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- 150 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p7: para 44].
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- 151 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p8: para 53].
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- 152 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5183: lines 17-21].
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- 153 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5209: lines 42-46].
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- 154 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5210: lines 10-21].
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- 155 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5220: lines 50-55].
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- 156 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5190: lines 19-32].
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- 157 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5273: lines 50-60].
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- 158 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5207: lines 48-60].
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- 159 Robert Ayre, 3 February 2012, Brisbane [p5208: lines 2-6].
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- 160 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5220: lines 10-21].
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- 161 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5266: line 47 – p5267: line 23].
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- 162 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p5: para 28].
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- 163 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p26: para 12].
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- 164 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p10: para 34]; Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p22: para 77]; Closing submissions on behalf of Seqwater, 17 February 2012 [p16: para 38(l)]; Closing submissions on behalf of John Tibaldi, 17 February 2012 [p16: para 4.36].
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- 165 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5208: lines 14-19].
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- 166 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6099: lines 38-43].
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- 167 Exhibit 1146, Seqwater October-December 2010 Flood Events, report on the operation of Somerset and Wivenhoe Dam [p119, 121]
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- 168 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5050: line 39-53].
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- 169 Exhibit 51, Statement of John Tibaldi, 25 March 2011 [p8: para 34].
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- 170 Exhibit 51, Statement of John Tibaldi, 25 March 2011 [p11: para 62].
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- 171 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5072: line 21 – p5073: line 45; p5074: lines 45-48].
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- 172 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5072: line 47].
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- 173 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5051: lines 22-23].
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- 174 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5051: line 54 – p5052: line 3].
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- 175 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5052: lines 7-22].
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- 176 Transcript, Terrence Malone, 15 April 2011, Brisbane [p379: lines 45-55].
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- 177 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5299: line 5].
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- 178 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5355: line 55 – p5356: line 2].
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- 179 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5300: lines 28-38].
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- 180 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5309: line 55 – p5310: line 6].
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- 181 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5329: lines 20-25].
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- 182 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6095: line 5 – p6096: line 35].
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- 183 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: lines 35-40].
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- 184 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6099: lines 1-10, 45]; Transcript, Terrence Malone, 11 February 2012, Brisbane [p6100: line 20].
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- 185 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5049: line 19].
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- 186 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5049: line 28].
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- 187 This situation report appears in Exhibit 1046 only by way of a flood event log entry signalling it was sent. The actual situation report was not included in the batch of situation reports attached to the report in Appendix E.
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- 188 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011, Appendix E [p13-14].
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- 189 Closing submissions on behalf of Seqwater, 17 February 2012 [p26: para 84].
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- 190 Closing submissions on behalf of Seqwater, 17 February 2012 [p30: para 100].
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- 191 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011, Appendix E, [p17-18].
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- 192 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011, Appendix E, [p19-20].
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- 193 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011, Appendix E [p21-22].
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- 194 Closing submissions on behalf of Fernvale Residents, 16 February 2012 [p9: para 41 – p12: para 43].
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- 195 In fact, counsel was in error: the situation report of 9.04pm, 9 January describes the current objective as to minimise the impact of urban flooding in areas downstream of the dam. The point made – that there was no specification of that objective in earlier situation reports over the weekend of 8/9 January – is, however, unaffected.
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- 196 This point was also made in Submission of the Fernvale Residents to the Queensland Floods Commission of Inquiry, 28 June 2011 [p10: para 48].
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- 197 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p9: para 28].
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- 198 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p50: para 147].
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- 199 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p51: para 148(c)].
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- 200 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p50-52: para 148].
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- 201 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p23: para 83; p25: para 89].
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- 202 Closing submissions on behalf of Fernvale Residents, 16 February 2012 [p4: para 17].
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- 203 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011, Appendix E [p10-11].
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- 204 Exhibit 21, Seqwater, *Manual of Operational Procedures at Wivenhoe and Somerset Dam*, Version 7, November 2009 [p22].
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- 205 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5229: line 3].
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- 206 See Transcript, Robert Ayre, 3 February 2012, Brisbane [p5228: line 13]; Transcript, Terrence Malone, 5 February 2012, Brisbane [p5333: line 33; 5367: line 3]; Transcript, John Ruffini, 6 February 2012, Brisbane [p5421: line 14; p5449: line 2].
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- 207 Closing submissions on behalf of Seqwater, 17 February 2012 [p38: para 123].
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- 208 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p69: para 240-241].
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- 209 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p68: para 233].
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- 210 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5190: line 18; p5209: line 41 - p5213: line 9].
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- 211 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011, Appendix L [p4].
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- 212 Closing submissions on behalf of Seqwater, 17 February 2012 [p21: para 58 – p25: para 79]; Closing submissions on behalf of John Tibaldi, 17 February 2012 [p10: para 4.7 – p11: para 4.12]; Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p32: para 88 – p33: para 89]; Closing submissions on behalf of Terrence Malone, 16 February 2012 [p12: para 41; p13: para 46]; Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p10: para 22 - p11: para 31].
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- 213 Closing submissions on behalf of Seqwater, 17 February 2012 [p40: para 136].
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- 214 The gate openings were directed by Wivenhoe directive 3 and Wivenhoe directive 4, see: Exhibit 24, Seqwater, *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam*, Appendix L [p4-5].
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- 215 See Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named ‘Appendix A1’, ‘SDWD-201101071200’ in folder titled ‘Operational\_Versions’ last modified at 3.17 pm, 7 January 2011.
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- 216 See Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named ‘Appendix A1’, ‘SDWD-201101071200’ in folder titled ‘Operational\_Versions’. The difference is that in Mr Malone’s planned gate openings on the morning of 8 January, gate 3 is opened from 3.5 to 4.0 metres at midnight, 8 January; Mr Ruffini directed this gate opening at 8.00 am on 8 January. Mr Ruffini opened a different gate at midnight and so the outflows remained almost identical despite the change in time.
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- 217 See Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named ‘Appendix A1’, ‘SDWD-201101071200’, ‘SDWD-201101071800’, ‘SDWD-201101080900’ in folder titled ‘Operational\_Versions’.
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- 218 See Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named ‘Appendix A1’, ‘SDWD-201101071200’ in folder titled ‘Operational\_Versions’.
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- 219 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5361: line 41].
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- 220 Closing submissions on behalf of Seqwater, 17 February 2012 [p23-24: para 69-74].
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- 221 Closing submissions on behalf of John Tibaldi, 16 February 2012 [p11: para 4.11-4.12].
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- 222 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p12: para 40-42].
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- 223 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p10: para 22; p11: para 25].
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- 224 See Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named ‘Appendix A1’, ‘SDWD-201101071800’, in folder titled ‘Operational\_Versions’.
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- 225 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p25: para 62].

- 226 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5269: line 21; p6118-6119].
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- 227 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011, Appendix L [p66].
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- 228 Closing submissions on behalf of Seqwater, 17 February 2012 [p14: para 38(d)].
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- 229 Closing submissions on behalf of Seqwater, 17 February 2012 [p16: para 38(l)].
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- 230 Closing submissions on behalf of Seqwater, 17 February 2012 [p42: para 144].
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- 231 Closing submissions on behalf of Seqwater, 17 February 2012 [p43: para 147].
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- 232 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p50-51: para 148(b)].
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- 233 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p16: para 57].
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- 234 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p38-41].
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- 235 For information about fuse plugs, see section 2.2.9 *Fuse plugs* of the Commission's interim report.
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- 236 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p41].
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- 237 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6120: line 1].
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- 238 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5233: line 17].
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- 239 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6120: line 4].
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- 240 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6120: lines 21-40].
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- 241 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p170].
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- 242 Closing submissions on behalf of Seqwater, 17 February 2012 [p42: para 142].
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- 243 Closing submissions on behalf of Seqwater, 17 February 2012 [p30: para 95].
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- 244 Exhibit 430, Statement of Robert Drury, 6 May 2011, RD-5 [p200-201].
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- 245 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5364: line 8].
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- 246 Closing submissions on behalf of Seqwater, 17 February 2012 [p31-32: para 103-107].
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- 247 Closing submissions on behalf of Seqwater, 17 February 2012 [p47: para 168].
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- 248 Exhibit 44, Transcript of Interview by Commission Staff with Robert Ayre, 30 March 2011 [p14: line 29].
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- 249 Closing submissions on behalf of Fernvale Residents, 16 February 2012 [p3: para 11].
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- 250 Closing submissions on behalf of the Mid-Brisbane River Irrigators, 16 February 2012 [p5: para 30-38].
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- 251 Closing submissions on behalf of Seqwater, 17 February 2012 [p14: para 38(e)].
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- 252 Closing submissions on behalf of Seqwater, 17 February 2012 [p15: para 38(h); p49: para 182].
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- 253 Some of the model run spreadsheets are reconstructions: Exhibit 1058, Letter from Allens Arthur Robinson to QFCI dated 29 April 2011; Exhibit 1059, Letter from Allens Arthur Robinson to QFCI enclosing Appendix A1, dated 6 April 2011; Exhibit 1060, Appendix A1, attached to letter dated 6 April 2011 [p1]. The properties of the spreadsheet for model run 19 indicate that it was created on 5 April 2011. There are two reasons why the reconstruction is likely to be inaccurate. First, the gate opening sequences in this model run are radically different from those in the operational spreadsheets saved around the time of the model run. The gate opening sequence in model run 19 has a maximum number of increments of 50 and a maximum outflow of over 2 700 m<sup>3</sup>/s, whereas the contemporaneously saved spreadsheets from around that time - 'SDWD-201101091200' (last saved at 1.28 pm, 9 January), 'SDWD-201101091400' (last saved at 5.16 pm, 9 January) and 'SDWD-201101091600' (last saved at 5.37 pm, 9 January) - all indicate maximum increments of 30 or 27 and maximum outflow under 1 650 m<sup>3</sup>/s. Secondly, the gate sequence in model run 19 appears to be the same as that in model run 21 (conducted at 7.00 pm on 9 January) which is reflected in the contemporaneously saved spreadsheet from that time - 'SDWD-

- 201101091900' - which was saved at 8.29 pm, 9 January 2011.
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- 254 Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named 'Appendix A1', 'SDWD-201101091400', 'SDWD-201101091600', 'SDWD-201101091800', 'SDWD-201101091900' in folder titled 'Operational Versions'.
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- 255 Closing submissions on behalf of Seqwater, 17 February 2012 [p16: para 38(k)].
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- 256 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p12: para 43; p20: para 69].
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- 257 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p26: para 93].
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- 258 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p47-48: para 142].
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- 259 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5278-5281].
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- 260 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5140: line 22].
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- 261 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p47: para 139; p47: para 141].
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- 262 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p15: para 54].
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- 263 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p48: para 142(c)], perhaps by reference to Transcript, Brian Cooper, 8 February 2012, Brisbane [p5712: line 7].
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- 264 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p24].
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- 265 Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named 'Appendix A1', 'SDWD-201101091900' in folder titled 'Operational Versions'.
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- 266 Exhibit 23, Original and Unredacted Flood Event Log, 19 January 2011.
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- 267 Exhibit 1047, Situation report, 8 January 2011 at 5.53 pm.
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- 268 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5223: line 28].
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- 269 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5185: line 28].
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- 270 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5188: line 57].
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- 271 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5223: line 46].
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- 272 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5276: line 41].
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- 273 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5223: line 38].
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- 274 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5225: line 41].
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- 275 Transcript, Robert Ayre, 12 April 2011, Brisbane [p172: line 14].
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- 276 Transcript, Robert Ayre, 12 April 2011, Brisbane [p172: line 21].
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- 277 Transcript, Robert Ayre, 12 April 2011, Brisbane [p172: line 33].
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- 278 Transcript, Robert Ayre, 12 April 2011, Brisbane [p172: line 47].
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- 279 Exhibit 18, Supplementary Statement of Robert Ayre, 29 March 2011.
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- 280 Exhibit 18, Supplementary Statement of Robert Ayre, 29 March 2011 [p20: para 51].
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- 281 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p54: para 157].
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- 282 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p22: para 76-80].
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- 283 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p30: para 117].
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- 284 Closing submissions on behalf of Seqwater, 17 February 2012 [p46: para 164].
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- 285 Closing submissions on behalf of John Tibaldi, 17 February 2012 [p22: para 5.12].
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- 286 Closing submissions on behalf of Rober Ayre and SunWater, 16 February 2012 [p55: para 158]; Closing submissions on behalf of Seqwater, 17 February 2012 [p46: para 162].
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- 287 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5274: line 18].
- 288 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, Appendix K [p224]; Transcript, Robert Ayre, 4 February 2012, Brisbane [p5274: line 33].
- 289 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5276: line 16].
- 290 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5275: line 16].
- 291 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p96: para 392; p55: para 164].
- 292 Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named 'Appendix A1', 'SDWD-201101081500-Forecast72hr' in folder titled 'Operational Versions'.
- 293 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p30: para 116].
- 294 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5741: line 23].
- 295 Transcript, Greg Roads, 9 February 2012, Brisbane [p5805: line 43].
- 296 Transcript, Greg Roads, 9 February 2012, Brisbane [p5809: line 2].
- 297 Transcript, Greg Roads, 9 February 2012, Brisbane [p5849: line 4].
- 298 Transcript, Greg Roads, 9 February 2012, Brisbane [p5854: line 6].
- 299 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p58: para 177].
- 300 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5574: line 38].
- 301 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5574: line 52].
- 302 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5575: line 1].
- 303 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5575: line 3].
- 304 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5575: line 12].
- 305 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5189: line 26].
- 306 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5190: line 8].
- 307 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p60: para 186].
- 308 Closing submissions on behalf of Seqwater, 17 February 2012 [p47: para 164(g)].
- 309 Transcript, Robert Ayre, 12 April 2011, Brisbane [p174: line 8].
- 310 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5208: line 14].
- 311 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5213: line 44].
- 312 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5220: line 49].
- 313 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5267: line 33].
- 314 Exhibit 1049, Seventh statement of Robert Ayre, 1 February 2012 [p5: para 28].
- 315 Exhibit 1049, Seventh statement of Robert Ayre, 1 February 2012 [p7: para 48].
- 316 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5223: line 37].
- 317 Transcript, Robert Ayre, 12 April 2011, Brisbane [p173: line 45].
- 318 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6107: line 1].
- 319 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6107: line 18].
- 320 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6107: line 25].
- 321 Exhibit 23, Original and Unredacted Flood Event Log, 19 January 2011.
- 322 Exhibit 23, Original and Unredacted Flood Event Log, 19 January 2011; Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011, Appendix M: identifies 'Engineer 1' as the author of entry at 3:30pm on 9 January 2012. 'Engineer 1' is Mr Ayre. Mr Ayre says that this is an error: Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p16: para 121].
- 323 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p35].

- 324 Transcript, Neville Abblitt, 9 February 2012, Brisbane [p5862: line 22].
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- 325 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p31: para 120].
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- 326 Transcript, Neville Abblitt, 9 February 2012, Brisbane [p5870: line 31].
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- 327 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5058: line 52].
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- 328 Exhibit 1141, Transcript of Interview with Chloe De Marchi, 7 February 2012 Exhibit 9, Attachment 'ENGINEER 4 – APPENDIX M – 01.doc' [p2].
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- 329 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5193: line 29].
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- 330 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5193: line 31].
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- 331 Transcript, John Ruffini, 6 February 2012, Brisbane [p5404: line 38].
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- 332 Transcript, John Ruffini, 6 February 2012, Brisbane [p5403: line 9].
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- 333 Exhibit 42, Statement of John Ruffini, 24 March 2011, Annexure JLR-11.
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- 334 Exhibit 42, Statement of John Ruffini, 24 March 2011, Annexure JLR-11 [p2].
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- 335 Transcript, John Ruffini, 6 February 2012, Brisbane [p5402: line 30].
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- 336 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5301: line 10].
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- 337 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5301: line 13].
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- 338 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5301: line 19].
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- 339 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p98: para 398].
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- 340 Closing submissions on behalf of Seqwater, 17 February 2012 [p35: para 116(a)].
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- 341 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p22: para 76-80].
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- 342 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p33: para 129].
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- 343 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p63: para 204].
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- 344 Closing submissions on behalf of Seqwater, 17 February 2012 [p35: para 116(b)].
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- 345 Closing submissions on behalf of John Tibaldi, 17 February 2012 [p23: para 6.5].
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- 346 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p33: para 130-132].
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- 347 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p64: para 208].
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- 348 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p66: para 224 – p67: para 226].
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- 349 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p64: para 207].
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- 350 Closing submissions on behalf of Seqwater, 17 February 2012 [p35: para 116(c)].
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- 351 Closing submissions on behalf of John Tibaldi, 16 February 2012 [p23: para 6.6].
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- 352 Transcript, John Ruffini, 6 February 2012, Brisbane [p5403: line 9].
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- 353 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p4: para 25-26].
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- 354 Transcript, Robert Ayre, 11 April 2011, Brisbane [p81: line 38]; Transcript, Robert Ayre, 11 April 2011, Brisbane [p83: line 17]; Transcript, Robert Ayre, 12 April 2011, Brisbane [p172: line 21 – p173: line 38]; Transcript, Robert Ayre, 13 April 2011, Brisbane [p192: line 36]; Transcript, Robert Ayre, 13 April 2011, Brisbane [p193: line 7].
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- 355 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5194: line 8].
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- 356 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6099: line 45]. See also Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: line 35].
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- 357 The gate operations spreadsheet named 'SDWD-201101091400' and saved at 5.16 pm on 9 January 2011 shows that the inflows into the dam, during the period of 7.00 am to 7.00 pm on 9 January 2011, were going to be substantially outweighed by the flows in Lockyer Creek and the Bremer River at the time those flows and the dam releases would merge in the Brisbane River.
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- 358 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 Appendix E [p21].

- 359 Exhibit 23, Original and Unredacted Flood Event Log, 19 January 2011.
- 360 Exhibit 1080, Third Statement of Daniel Spiller, 1 February 2012, Annexure B [p104].
- 361 Exhibit 1080, Third Statement of Daniel Spiller, 1 February 2012, Annexure B [p110]; Exhibit 1150, Statement of Debra-Lee Best, 9 February 2012 [p1: para 6].
- 362 Transcript, Robert Drury, 6 February 2012, Brisbane [p5479: line 10].
- 363 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5614: line 12].
- 364 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5416: line 1].
- 365 Exhibit 1150, Statement of Debra-Lee Best, 9 February 2012 [p1: para 3].
- 366 Exhibit 1150, Statement of Debra-Lee Best, 9 February 2012, Attachment DLB-23.
- 367 Exhibit 1080, Third Statement of Daniel Spiller, 1 February 2012, Annexure B [p116].
- 368 Exhibit 1080, Third Statement of Daniel Spiller, 1 February 2012, Annexure B [p167].
- 369 Exhibit 1080, Third Statement of Daniel Spiller, 1 February 2012, Annexure B [p169].
- 370 Transcript, Robert Drury, 6 February 2012, Brisbane [p5485: line 50].
- 371 Transcript, Robert Drury, 7 February 2012, Brisbane [p5543: line 11; p5488: line 13].
- 372 See, for example, Transcript, Robert Drury, 7 February 2012, Brisbane [p5578: line 33].
- 373 Transcript, Robert Drury, 6 February 2012, Brisbane [p5489: line 48].
- 374 Transcript, Robert Drury, 7 February 2012, Brisbane [p5540: line 58].
- 375 Exhibit 1150, Statement of Lee Hutchison, 10 February 2012, Annexure A.
- 376 Exhibit 1150, Statement of Lee Hutchison, 10 February 2012 [p3: para 10].
- 377 Exhibit 1150, Statement of Lee Hutchison, 10 February 2012 [p3: para 13, 14].
- 378 Exhibit 1080, Third Statement of Daniel Spiller, 1 February 2012 [p6: para 19].
- 379 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5649: line 32].
- 380 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5659: line 6].
- 381 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5684: line 38].
- 382 Transcript, Robert Drury, 6 February 2012, Brisbane [p5490: line 38].
- 383 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5964: line 19].
- 384 Exhibit 1150, Statement of Stan Stevenson, 10 February 2012, Annexure SS-1.
- 385 Exhibit 1150, Statement of Stan Stevenson, 10 February 2012 [p1: para 3].
- 386 Exhibit 1150, Statement of Paul Bird, 10 February 2012, Annexure PB-1.
- 387 Exhibit 1150, Statement of Paul Bird, 10 February 2012 [p2: para 6].
- 388 Exhibit 1150, Statement of Michael Lyons, 10 February 2012 [p3: para 13].
- 389 Closing submissions on behalf of Seqwater, 17 February 2012 [p57: para 206].
- 390 Exhibit 1100, Statement of Peter Allen, 7 February 2012, Annexure PHA63 [p2].
- 391 Exhibit 1100, Statement of Peter Allen, 7 February 2012, Annexure PHA63 [p8].
- 392 Exhibit 1100, Statement of Peter Allen, 7 February 2012, Annexure PHA63 [p1].
- 393 Transcript, Peter Allen, 10 February 2012, Brisbane [p5911: line 43].
- 394 Transcript, Peter Allen, 10 February 2012, Brisbane [p5910: line 12].
- 395 Transcript, Peter Allen, 10 February 2012, Brisbane [p5911: line 48].
- 396 Transcript, Peter Allen, 10 February 2012, Brisbane [p5911: line 33].
- 397 Transcript, Peter Allen, 10 February 2012, Brisbane [p5910: line 36].
- 398 Transcript, Peter Allen, 10 February 2012, Brisbane [p5911: line 40].
- 399 Transcript, Peter Allen, 10 February 2012, Brisbane [p5910: line 56 – p 5911: line 5].
- 400 Transcript, Peter Allen, 10 February 2012, Brisbane [p5938: line 30].
- 401 Transcript, Peter Allen, 10 February 2012, Brisbane [p5938: line 36].

- 402 Closing submissions on behalf of John Tibaldi, 16 February 2012 [p26: para 7.7].
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- 403 Closing submissions on behalf of Seqwater, 17 February 2012 [p59: para 211].
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- 404 Transcript, Peter Allen, 10 February 2012, Brisbane [p5910: line 33; p5911: line 43].
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- 405 Transcript, Peter Allen, 10 February 2012, Brisbane [p5932: line 35].
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- 406 Exhibit 1068, Email from Peter Borrows to Rob Drury, John Tibaldi, Terry Malone, Paul Bird, 16 January 2011, 4.03 pm, Attachment titled 'Ministerial Briefing Note January 17 2011 Final Draft for distribution[1].doc' [p12].
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- 407 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p5: para 5].
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- 408 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p6: para 6].
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- 409 See for example Mr Tibaldi's evidence of the difficult conditions: Transcript, John Tibaldi, 3 February 2012, Brisbane [p5060: line 18; p5161: line 13].
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- 410 Exhibit 1050, Email from Duty Engineer (Terry Malone) to Mr Ruffini, Mr Tibaldi, Mr Ayre, Mr Malone and Mr Drury, 15 January 2011.
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- 411 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5303: line 43].
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- 412 Exhibit 1050, Email from Duty Engineer (Terry Malone) to Mr Ruffini, Mr Tibaldi, Mr Ayre, Mr Malone and Mr Drury, 15 January 2011.
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- 413 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5063: line 30]; Transcript, Terrence Malone, 4 February 2012, Brisbane [p5303: lines 48-50].
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- 414 Exhibit 23, Flood Event Log [p32].
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- 415 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5303: line 37].
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- 416 Exhibit 23, Flood Event Log [p32].
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- 417 Exhibit 23, Flood Event Log [p32].
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- 418 Exhibit 1050, Email from Duty Engineer (Terry Malone) to Mr Ruffini, Mr Tibaldi, Mr Ayre, Mr Malone and Mr Drury, 15 January 2011 [p3].
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- 419 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5305: line 18].
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- 420 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5305: line 55 – p5306: line 10].
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- 421 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5303: line 43].
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- 422 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5315: line 53; p5361: line 28].
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- 423 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5304: lines 8-45].
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- 424 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5306: line 21; p5307: line 1].
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- 425 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5196: lines 9-60].
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- 426 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5196: line 17].
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- 427 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5196: line 43].
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- 428 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5305: line 40].
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- 429 Transcript, John Ruffini, 6 February 2012, Brisbane [p5405: line 54; p5406: line 7].
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- 430 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5063: lines 4-55].
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- 431 Transcript, Robert Drury, 6 February 2012, Brisbane [p5494: line 50 – p5495: line 56].
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- 432 Transcript, Robert Drury, 6 February 2012, Brisbane [p5499: line 13].
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- 433 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5319: line 22].
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- 434 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5971: line 7].
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- 435 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5970: line 24].
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- 436 Transcript, Robert Drury, 6 February 2012, Brisbane [p5498: line 14].
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- 437 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5956: line 30].
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- 438 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5957: line 1; p5958: line 1].
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- 439 Transcript, Robert Drury, 6 February 2012, Brisbane [p5497: line 13].
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- 440 Transcript, Peter Allen, 10 February 2012, Brisbane [p5917: line 16].
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- 441 Transcript, Peter Allen, 10 February 2012, Brisbane [p5916: line 31].
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- 442 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6092: lines 37-40].
- 443 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6092: line 56 – p6093: line 9].
- 444 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p23].
- 445 Exhibit 1051, Email from Duty Engineer (Rob) to John Tibaldi, 15 January 2011, 6:57pm, Attachment.
- 446 Exhibit 1051, Email from Duty Engineer (Rob) to John Tibaldi, 15 January 2011, 6:57pm, [p2].
- 447 Exhibit 1051, Email from Duty Engineer (Rob) to John Tibaldi, 15 January 2011, 6:57pm [p4].
- 448 Exhibit 1051, Email from Duty Engineer (Rob) to John Tibaldi, 15 January 2011, 6:57pm [p4].
- 449 Exhibit 1051, Email from Duty Engineer (Rob) to John Tibaldi, 15 January 2011, 6:57pm [p6-7].
- 450 Exhibit 1051, Email from Duty Engineer (Rob) to John Tibaldi, 15 January 2011, 6:57pm.
- 451 Exhibit 1052, Email from John Tibaldi to Duty Engineer with attachment, 15 January 2011, 7:51pm.
- 452 Exhibit 1076, Email from Duty Engineer to Rob Drury and Peter Allen, 17 January 2011, 1:03pm.
- 453 Exhibit 1077, Email from Duty Engineer to John Ruffini, 17 January 2011, 6.06pm.
- 454 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5065: line 12].
- 455 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5065: lines 25-33].
- 456 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5066: line 40].
- 457 Transcript, John Ruffini, 6 February 2012, Brisbane [p5407: line 49].
- 458 Transcript, John Ruffini, 6 February 2012, Brisbane [p5408: line 10].
- 459 Transcript, John Ruffini, 6 February 2012, Brisbane [p5410: line 53].
- 460 Transcript, John Ruffini, 6 February 2012, Brisbane [p5408: line 55].
- 461 Transcript, John Ruffini, 6 February 2012, Brisbane [p5409: line 1].
- 462 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5294: line 21].
- 463 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011, Appendix M [p103].
- 464 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5287: line 35]; Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p9: para 53].
- 465 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5293: line 18].
- 466 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5242: line 38; p5244: line 41; p5246: line 9].
- 467 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5246: line 9].
- 468 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5293: line 55].
- 469 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p9: para 67]; Transcript, Robert Ayre, 11 February 2012, Brisbane [p6110: line 23].
- 470 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6110: line 23]; Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p10: para 76].
- 471 Exhibit 21, Seqwater, Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam, Revision 7, November 2009 [p30].
- 472 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5243: line 19].
- 473 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5293: line 39].
- 474 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5293: line 45].
- 475 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5293: line 51].
- 476 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5243: line 23].
- 477 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5245: line 39].
- 478 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5246: line 8 – p5247: line 17].
- 479 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5293: line 39; p5245: line 17; p5246: line 8].

- 480 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5247: line 43]. In saying so Mr Ayre appears to have assumed that Strategy Summary Log was created for the purpose of the Minister's brief.
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- 481 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p9: para 53].
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- 482 Exhibit 1049, Statement of Robert Ayre, 3 February 2012 [p9: para 66].
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- 483 Transcript, Robert Ayre, 11 February 2012 [p5200: line 55].
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- 484 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5245: line 30].
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- 485 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6109: line 45].
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- 486 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p9: para 53].
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- 487 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5202: line 44].
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- 488 Transcript, Terrance Malone, 4 February 2012, Brisbane [p5307: line 4].
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- 489 Transcript, Terrance Malone, 4 February 2012, Brisbane [p5307: line 41].
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- 490 Transcript, Terrance Malone, 4 February 2012, Brisbane [p5307: line 46].
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- 491 Transcript, Robert Drury, 7 February 2012, Brisbane [p5605: line 13].
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- 492 Transcript, Robert Drury, 7 February 2012, Brisbane [p5605: lines 1-56].
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- 493 Transcript, Robert Drury, 6 February 2012, Brisbane [p5504: line 54].
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- 494 Transcript, Robert Drury, 6 February 2012, Brisbane [p5504: line 54]; Transcript, Robert Drury, 7 February 2012, Brisbane [p5584: line 31; p5591: line 7].
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- 495 Transcript, Robert Drury, 7 February 2012, Brisbane [p5505: line 20; p5603: line 24].
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- 496 Transcript, Robert Drury, 7 February 2012, Brisbane [p5605: line 22].
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- 497 Transcript, Peter Allen, 10 February 2012, Brisbane [p5918: line 31].
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- 498 Transcript, Peter Allen, 10 February 2012, Brisbane [p5919: line 24].
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- 499 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5958: line 4].
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- 500 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5966: line 15].
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- 501 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5975: line 37].
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- 502 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5976: lines 18, 27; p5977: line 37].
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- 503 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5976: line 27; p5977: line 37].
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- 504 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5983: line 2].
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- 505 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5976: line 48].
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- 506 Exhibit 1139, Statement of Petrus Gerhardus Louw Van Blerk, 30 January 2012 [p2: para 6(c)].
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- 507 Transcript, Petrus Gerhardus Louw Van Blerk, Brisbane, 11 February 2012 [p6030: line 53].
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- 508 Transcript, Petrus Gerhardus Louw Van Blerk, Brisbane, 11 February 2012 [p6031: line 23].
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- 509 Transcript, David Pokarier, 10 February 2012, Brisbane [p5987: line 37]; Transcript, Kim Hang, 10 February 2012, Brisbane [p6002: line 2]; Transcript, Richard Stephens, 10 February 2012, Brisbane [p5999: line 20]; Transcript, John West, 10 February 2012, Brisbane [p6007: line 23]; Transcript, Neville Ablitt, 9 February 2012 Brisbane [p5861: line 57]; Transcript, Mark Tan, Brisbane 11 February 2012 [p6037: line 37].
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- 510 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5245: line 39].
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- 511 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5247: lines 46-53].
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- 512 Closing submissions on behalf of Seqwater, 17 February 2012 [p56: para 203(e)].
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- 513 Closing submissions on behalf of Seqwater, 17 February 2012 [p56: para 203(f)].
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- 514 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p9: para 53].
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- 515 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, Annexure SR-12 [p1].
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- 516 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, Annexure SR-12 [p1]. Somewhat confusingly, parts of the brief are dated 16 January 2011 and others are dated 17 January 2011. Mr Bradley explained that a draft was provided on 16 January and the final version tabled on 17 January. Exhibit 1150, Statement

- of John Bradley, 1 February 2012 [p4: para 21]. Nothing turns on this point.
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- 517 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, Annexure SR-12 [p1-2].
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- 518 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, Annexure SR-12, Attachment A [p12].
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- 519 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, Annexure SR-12, Attachment A, 'January 2011 Flood Event Report' [p7-9]. Rows prior to 7 January and after 11.00 am on 11 January have been removed.
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- 520 Exhibit 23, Unredacted Flood Event Log, entry for 2.00pm, 15 January 2011.
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- 521 Exhibit 1061, Email, Daniel Spiller to Duty Engineer, 15 January 2011, 2.21 pm titled 'FW: Cabinet in confidence – discussion points'.
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- 522 Transcript, Robert Drury, 6 February 2012, Brisbane [p5499: lines 30-33].
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- 523 Exhibit 23, Unredacted Flood Event Log, entry for 5.00pm, 15 January 2011.
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- 524 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5972: lines 28-56].
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- 525 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p35].
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- 526 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5198: lines 30-33].
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- 527 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5067: line 10].
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- 528 Exhibit 1095, Email, John Tibaldi to Rob Drury titled 'Full document - JT Draft – 02', 6.34pm, 15 January 2011.
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- 529 Exhibit 1053, Email, John Tibaldi to Peter Borrows, Rob Drury, John Ruffini, John Tibaldi, Terry Malone, Rob Drury, Duty Seq, 9:10pm, 15 January 2011.
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- 530 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5064: line 17; p5066: line 40].
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- 531 Transcript, Robert Drury, 6 February 2012, Brisbane [p5500: lines 1-39].
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- 532 Transcript, Robert Drury, 6 February 2012, Brisbane [p5504: lines 7-30].
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- 533 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5324: line 15].
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- 534 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5199: lines 20-50].
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- 535 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5200: line 23]; Transcript, Robert Ayre, 11 February 2012, Brisbane [p6109: line 57 – p6110: line 21].
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- 536 Transcript, John Ruffini, 6 February 2012, Brisbane [p5407: lines 20-50].
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- 537 Exhibit 1053, Email, John Tibaldi to Peter Borrows, Rob Drury, John Ruffini, John Tibaldi, Terry Malone, Rob Drury, Duty Seq, 9:10pm, 15 January 2011.
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- 538 Email, John Tibaldi to Duty Engineer, John Ruffini, Robert Ayre, 6.42am, 16 January 2011.
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- 539 Email, John Tibaldi to Duty Engineer, John Ruffini, Robert Ayre, 8.17am, 16 January 2011.
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- 540 Exhibit 1065, Email, Peter Allen to Sent to Rob Drury, Peter Borrows, Duty Seq, John Bradley, Barry Dennien, Daniel Spiller, Michael Lyons, Elaina Smouha, Peter Allen, Mike Foster, Bob Reilly, 11.58am, 16 January 2011.
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- 541 Exhibit 1067, Email, Peter Borrows to recipients, including Bob Reilly, Rob Drury, Duty Seq, John Bradley, Barry Dennien, Dan Spiller, Peter Allen, 3.59pm, 16 January 2011.
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- 542 Exhibit 1069, Email, Peter Borrows to recipients, including Bob Reilly, Rob Drury, Duty Seq, John Bradley, Barry Dennien, Dan Spiller, Peter Allen, 4.28pm, 16 January 2011.
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- 543 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5321: line 41].
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- 544 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5203: line 20].
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- 545 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5203: line 20].
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- 546 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5203: line 52 – p5204: line 39]; Exhibit 1049, Seventh Statement of Robert Ayre, 1 February 2012 [p9: para 64].
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- 547 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5204: line 36].
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- 548 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5204: line 50].
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- 549 Exhibit 17, Statement of Robert Ayre [p1:para 2]; Transcript Robert Ayre, 13 April 2011, Brisbane [p198: 132]
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- 550 Exhibit 23, Unredacted Flood Event Log, entry for 12.12pm, 15 January 2011.
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- 551 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5321: line 22].
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- 552 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5320: lines 33-54].
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- 553 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5308: line 43].
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- 554 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5321: line 51].
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- 555 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5322: lines 1-20].
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- 556 Transcript, John Ruffini, 6 February 2012, Brisbane [p5411: line 55].
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- 557 Transcript, John Ruffini, 6 February 2012, Brisbane [p5412: line 15].
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- 558 Transcript, John Ruffini, 6 February 2012, Brisbane [p5412: line 20].
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- 559 Transcript, John Ruffini, 6 February 2012, Brisbane [p5412: line 22 – p5413: line 15].
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- 560 Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5788: lines 29-45].
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- 561 Transcript, Ken Smith, 10 February 2012, Brisbane [p6025: line 2].
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- 562 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5671: lines 21-50].
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- 563 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5630: lines 18-36].
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- 564 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5959: line 5].
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- 565 Transcript, James Pruss, 11 February 2012, Brisbane [p6050: line 50 – p6051: line 20].
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- 566 Transcript, Robert Drury, 6 February 2012, Brisbane [p5504: line 39]; Transcript, Robert Drury, 7 February 2012, Brisbane [p5509: line 32].
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- 567 Exhibit 390, Statement of John Bradley, 4 April 2011, Annexure JNB-30; Exhibit 1150, Statement of John Bradley, 1 February 2012 [p4: para 21].
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- 568 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p4: para 22].
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- 569 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5067: line 32].
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- 570 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5067: line 41].
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- 571 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5066: line 46 – p5077: line 11].
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- 572 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5160: line 18].
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- 573 Transcript, Robert Drury, 6 February 2012, Brisbane [p5580: line 9].
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- 574 Exhibit 1048, Statement of Robert Ayre, 1 February 2012 [Exhibit 2, Folder 7].
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- 575 Exhibit 1048, Statement of Robert Ayre, 1 February 2012 [p3-4: para 16].
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- 576 Submission, Holding Redlich, 1 March 2012.
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- 577 Submission, Holding Redlich, 1 March 2012 [para 6].
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- 578 Exhibit 1098, Statement of Barry Dennien, 3 February 2012 [p3: para 9 – p4: para 16]; Exhibit 1150, Statement of Anna Bligh, 6 February 2012 [p3: para 8-9].
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- 579 Exhibit 1098, Statement of Barry Dennien, 3 February 2012 [p5: para 19]; Annexure A [p157].
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- 580 Exhibit 414, Report of Brian Cooper, 12 January 2011.
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- 581 Exhibit 414, Report of Brian Cooper, 12 January 2011 [p3].
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- 582 Exhibit 414, Report of Brian Cooper, 12 January 2011 [p2].
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- 583 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6095: lines 14-16].
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- 584 Email, Peter Allen to Duty Engineer, 15 January 2011, 1.31 pm.
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- 585 Email, Duty Engineer to Terry Malone, 15 January 2011, 1.41 pm.
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- 586 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6095: line 5 – p6096: line 35].
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- 587 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5064: line 25; p5066: line 40].
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- 588 Transcript, John Tibaldi, 11 February 2012, Brisbane [p6127: line 57 – p6128: line 10].
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- 589 Transcript, John Tibaldi, 11 February 2012, Brisbane [p6128: lines 10-35].
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- 590 Exhibit 23, Unredacted Flood Event Log, entry for 2.00 pm, 15 January 2011.
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- 591 Exhibit 1061, Email, Dan Spiller to Duty Engineer, 15 January 2011, 2.21 pm. The reference is 'Get more comprehensive report from Brian Cooper?'
- 592 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p4: para 21].
- 593 Exhibit 1062, Email, Rob Drury to Duty Engineer, 15 January 2011, 5.07 pm.
- 594 Exhibit 1062, Email, Rob Drury to Duty Engineer, 5.07 pm, 15 January 2011.
- 595 Exhibit 393, Statement of Peter Borrows, 1 April 2011, Attachment PB-12 (Email, Peter Borrows to Rob Drury, Jim Pruss and Duty Engineer, 2.03 am, 17 January 2011).
- 596 Exhibit 24, Seqwater *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p35]; Exhibit 1143, Key – register of names and positions.
- 597 Email, Peter Borrows to Paul Bird, Rob Drury and John Tibaldi, 17 January 2011, 2.32 pm.
- 598 He also said, 'in terms of the peak release on the Tuesday I think that was reasonable...', (Transcript, Robert Ayre, 11 February 2012, Brisbane [p6113: lines 1-4]).
- 599 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6112: line 41 – p6113: line 15].
- 600 Transcript, John Ruffini, 11 February 2012, Brisbane [p6075: line 45 – p6077: line 11].
- 601 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p8].
- 602 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the Operation of Somerset and Wivenhoe Dam*, 2 March 2011 [p1].
- 603 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p1: para 4]; Exhibit 55, Transcript of Interview with John Tibaldi, 29 March 2011 [p6: line 10]; Exhibit 1075, Statement of Terrence Malone, 1 February 2012 [p1: para 3 – p2: para 4]; Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p4: para 22].
- 604 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5023: line 44].
- 605 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5023: line 32].
- 606 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5023: line 20].
- 607 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5326: line 32].
- 608 Exhibit 1075, Statement of Terrence Malone, 1 February 2012 [p2: para 4].
- 609 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p3: para 15]; Exhibit 1075, Statement of Terrence Malone, 1 February 2012 [p3: para 8(a), 9].
- 610 Exhibit 1075, Statement of Terrence Malone, 1 February 2012 [p3: para 8(b); p4: para 12], Annexures TAM-1 and TAM-2.
- 611 Transcript, Robert Ayre, 12 April 2011, Brisbane [p106: lines 49-54].
- 612 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p10: para 64, 71].
- 613 Transcript, John Ruffini, 11 February 2012, Brisbane [p6078: line 21].
- 614 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5023: line 40].
- 615 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p2: para 8]; Exhibit 43, Transcript of Interview with John Ruffini, 29 March 2011 [p44: line 44]; Transcript, John Tibaldi, 2 February 2012, Brisbane [p5023: line 52].
- 616 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p2: para 8]; Transcript, John Tibaldi, 2 February 2012, Brisbane [p5023: line 52].
- 617 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5283: line 27].
- 618 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5283: line 27].
- 619 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5326: line 26].
- 620 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p2: para 5].
- 621 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5138: line 8].
- 622 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p2: para 7; p7: para 38].
- 623 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p2: para 8].

- 624 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5205: line 39].
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- 625 Transcript, John Ruffini, 11 February 2012, Brisbane [p6073: line 2].
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- 626 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6104: line 53].
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- 627 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6093: line 52].
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- 628 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6105: line 1].
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- 629 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6093: line 52].
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- 630 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: line 28]; Transcript, Robert Ayre, 11 February 2012, Brisbane [p6105: line 15].
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- 631 Exhibit 51, Statement of John Tibaldi, 25 March 2011 [p5: para 21]; Transcript, John Tibaldi, 3 February 2012, Brisbane [p5134: line 49]; Exhibit 1078, Statement of John Ruffini, 30 January 2012 [p3: para 19; p4: para 25; p4: para 29]; Exhibit 17, Statement of Robert Ayre, 23 March 2011 [p31: para 154]; Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p5: para 29]; Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p18: para 95]; Exhibit 45, Statement of Terrence Malone, 25 March 2011 [p7: para 25].
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- 632 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p3: para 12].
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- 633 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5036: line 40].
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- 634 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5082: line 33].
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- 635 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5083: line 3].
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- 636 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p3: para 17].
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- 637 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5025: lines 55-56].
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- 638 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p3: para 16].
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- 639 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p1: para 5].
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- 640 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5025: lines 28-50; p5076: lines 30-42].
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- 641 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5076: line 35].
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- 642 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5076: line 42].
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- 643 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5076: line 49].
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- 644 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5077: line 1].
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- 645 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5084: line 11; p5085: line 34].
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- 646 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5037: lines 25-47].
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- 647 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5037: lines 25-47].
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- 648 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5037: line 19].
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- 649 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5119: line 12].
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- 650 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5026: line 30].
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- 651 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5035: line 22].
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- 652 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5159: line 26].
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- 653 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5159: line 46].
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- 654 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5159: line 46].
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- 655 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5031: lines 19-50].
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- 656 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p3: para 19].
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- 657 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item B.
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- 658 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item B [p5].
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- 659 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item B [p10].
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- 660 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item B [p15].
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- 661 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item E [p9].
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- 662 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item M [p5].

- Note that the lake level did not exceed 68.5 metres during this time period.
- 663 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the Operation of Somerset and Wivenhoe Dam*, 2 March 2011, Appendix A [p3].
- 664 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5119: lines 17-33].
- 665 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item P.
- 666 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item P [p5].
- 667 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item P [p7].
- 668 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item P [p9].
- 669 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item Q-U.
- 670 It is named 'Flood MGt Strategies and Manual Compliance – 01. doc', and there are no other drafts attached to emails sent before it.
- 671 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item O [p12].
- 672 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p4: para 25-26].
- 673 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p4: para 25-26].
- 674 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p4: para 26].
- 675 Mr Tibaldi produced a table of the range of estimated allowable releases under strategy W2 in his statement: Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p5-6].
- 676 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p6: para 29; p7: para 36].
- 677 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5035: line 29; p5058: line 20].
- 678 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5035: lines 35-40].
- 679 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p6: para 31].
- 680 See Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p7: para 32].
- 681 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p7: para 31].
- 682 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p7: para 33].
- 683 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5034: line 45 – p5035: line 26].
- 684 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5035: line 6].
- 685 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p7: para 33].
- 686 Transcript, Peter Allen, 10 February 2012, Brisbane [p5920: line 36; 5939: line 26].
- 687 Transcript, Peter Allen, 10 February 2012, Brisbane [p5920: line 54].
- 688 Transcript, Peter Allen, 10 February 2012, Brisbane [p5920: line 16].
- 689 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p7: para 33].
- 690 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5035: line 45].
- 691 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5036: lines 5-34].
- 692 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p8: para 52].
- 693 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p8: para 52].
- 694 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p8: para 52].
- 695 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5207: line 40].
- 696 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5207: line 40].
- 697 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5207: line 55].
- 698 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5328: line 10].
- 699 Transcript, John Ruffini, 6 February 2012, Brisbane [p5416: line 54].
- 700 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5209: line 13]; Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p17-18: para 92-94]; Transcript, Terrence Malone, 4 February 2012, Brisbane [p5309: line 31 – p5310: line 6]; Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: line 6]
- 701 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p7: para 38].

- 702 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5024: line 41].
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- 703 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5209: line 7].
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- 704 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p5: para 28].
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- 705 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p17: para 92 – p18: para 94].
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- 706 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5199: line 34]; Transcript, Robert Ayre, 4 February 2012, Brisbane [p5248: lines 11-31].
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- 707 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p2: para 5-6].
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- 708 Exhibit 1048, Statement of Robert Ayre, 30 January 2012, Exhibit 6 [p4].
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- 709 Exhibit 1048, Statement of Robert Ayre, 30 January 2012, Exhibit 6 [p4].
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- 710 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p7: para 43]; Exhibit 7 [p5].
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- 711 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p6: para 32-33; p7: para 42-45; p8: para 49; p9: para 55-56].
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- 712 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5209: lines 7-11].
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- 713 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6105: lines 15-19].
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- 714 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5220: line 11].
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- 715 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6116: lines 5-10].
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- 716 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5209: line 18].
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- 717 Exhibit 17, Statement of Robert Ayre, 23 March 2011 [p31: para 154].
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- 718 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p5: para 29].
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- 719 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5292: line 49].
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- 720 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5024: line 29].
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- 721 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5024: line 38].
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- 722 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5309: line 35; p5310: line 6].
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- 723 Exhibit 1075, Statement of Terrence Malone, 1 February 2012 [p5-6: para 14(b)].
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- 724 Transcript, Terrence Malone, 2 February 2012, Brisbane [p5300: lines 20-40; p5309: line 51].
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- 725 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: lines 20-38].
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- 726 Exhibit 45, Statement of Terrence Malone, 25 March 2011 [p7: para 25].
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- 727 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: lines 20-38]; Exhibit 45, Statement of Terrence Malone, 25 March 2011 [p7: para 25].
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- 728 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5369: line 12].
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- 729 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5327: line 51 – p5328: line 8].
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- 730 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5024: line 48].
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- 731 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5025: line 4].
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- 732 Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: line 6].
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- 733 Exhibit 1078, Statement of John Ruffini, 30 January 2012 [p2: para 7; p2: para 13; p3: para 21; p4: para 27].
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- 734 Transcript, John Ruffini, 6 February 2012, Brisbane [p5418: lines 35-58].
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- 735 Transcript, John Ruffini, 6 February 2012, Brisbane [p5399: lines 17-47].
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- 736 Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: lines 29-41; p5449: lines 39-41].
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- 737 Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: line 53 – p5415: line 1].
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- 738 Transcript, John Ruffini, 6 February 2012, Brisbane [p5458: lines 25-58].
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- 739 Transcript, John Ruffini, 6 February 2012, Brisbane [p5458: line 40-58].
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- 740 Exhibit 1078, Statement of John Ruffini, 30 January 2012 [p3: para 19; p4: para 25; p4: para 29].
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- 741 Exhibit 43, Transcript of Interview with John Ruffini, 29 March 2011 [p45: line 11].
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- 742 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p10: para 34]; Closing submissions on behalf of John Ruffini,

- Peter Allen and the State of Queensland, 16 February 2012 [p22: para 77]; Closing submissions on behalf of Seqwater, 17 February 2012 [p16: para 38(l)]; Closing submissions on behalf of John Tibaldi, 17 February 2012 [p16: para 4.36]; Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p12: para 26].
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- 743 Closing submissions on behalf of Seqwater, 17 February 2012 [p17: para 40].
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- 744 Closing submissions on behalf of Seqwater, 17 February 2012 [p17: para 41 – p19: para 47; p74: para 267].
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- 745 Closing submissions on behalf of Seqwater, 17 February 2012 [p17: para 43].
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- 746 Closing submissions on behalf of Seqwater, 17 February 2012 [p69: para 254 – p73: para 259].
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- 747 Closing submissions on behalf of Seqwater, 17 February 2012 [p69-70: para 255].
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- 748 Closing submissions on behalf of Seqwater, 17 February 2012 [p71]; Transcript, Professor Apelt, 8 February 2012, Brisbane [p5749: line 20 – p5750: line 58].
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- 749 Closing submissions on behalf of Seqwater, 17 February 2012 [p73: para 259].
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- 750 Closing submissions on behalf of Seqwater, 17 February 2012 [p60: para 215; p64: para 234].
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- 751 Closing submissions on behalf of Seqwater, 17 February 2012 [p64: para 235].
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- 752 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p30: para 110 – p31: para 111].
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- 753 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p34: para 136-138; p35: para 141-143].
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- 754 Exhibit 51, Statement of John Tibaldi, 25 March 2011 [p5: para 21]; Transcript, John Tibaldi, 3 February 2012 [p5134: line 46].
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- 755 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5310: line 4].
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- 756 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5080: line 7 – p5081: line 5]; Transcript, Robert Ayre, 3 February 2012, Brisbane [p5215: line 3 – p5216: line 2]; Transcript, Terrence Malone, 4 February 2012, Brisbane [p5309: line 23 – p5311: line 1; p5332: lines 37-47]. Letters including this proposition were sent to the lawyers for each engineer before his evidence concluded: Correspondence to Gadens (Terrence Malone), 9 February 2012; Correspondence to Holding Redlich (Robert Ayre), 6 February 2012, 9 February 2012; Correspondence to Dibbs Barker (John Tibaldi), 9 February 2012; Correspondence to Crown Law (John Ruffini), 9 February 2012.
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- 757 Closing submissions on behalf of Seqwater, 17 February 2012 [p61: para 222].
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- 758 Closing submissions on behalf of Seqwater, 17 February 2012 [p62: para 228 – p63: para 233].
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- 759 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p4: para 8 – p5: para 10].
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- 760 Closing submissions on behalf of Mr Ayre and SunWater Limited, 16 February 2012 [p83: para 310].
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- 761 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p4: para 8].
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- 762 None of the others admitted to such a meeting – see 16.8 *The first attempts to record strategy choice*.
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- 763 The section requires a public official who suspects that a matter may involve official misconduct to notify the Crime and Misconduct Commission.
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- 764 Exhibit 21, *Manual of Operational Procedures at Wivenhoe and Somerset Dams*, Version 7, November 2009 [p8: section 2.9].
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- 765 Exhibit 21, *Manual of Operational Procedures at Wivenhoe and Somerset Dams*, Version 7, November 2009 [p8: section 2.9].
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- 766 Exhibit 34, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe and Somerset Dams*, Version 6, December 2004 [p13: section 2.9].
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- 767 Exhibit 21, *Manual of Operational Procedures at Wivenhoe and Somerset Dams*, Version 7, November 2009 [p2: section 1.2].
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- 768 Section 15 and 31, *South East Queensland Water (Restructuring) Act 2007*.
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- 769 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5951: lines 2-4].
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- 770 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5949: line 56].
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- 771 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5951: line 9].

- 772 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5950: line 28].
- 773 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5951: line 53].
- 774 Transcript, James Pruss, 11 February 2012, Brisbane [p6052: line 10].
- 775 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5951: line 9].
- 776 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5947: line 15; p5951: line 35].
- 777 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5947: line 15].
- 778 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5951: line 41].
- 779 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5952: line 9].
- 780 Transcript, James Pruss, 11 February 2012, Brisbane [p6051: line 48].
- 781 Transcript, James Pruss, 11 February 2012, Brisbane [p6053: line 1].
- 782 Transcript, James Pruss, 11 February 2012, Brisbane [p6053: line 14].
- 783 Transcript, James Pruss, 11 February 2012, Brisbane [p6053: line 30].
- 784 Transcript, James Pruss, 11 February 2012, Brisbane [p6055: line 55].
- 785 Transcript, James Pruss, 11 February 2012, Brisbane [p6055: line 55].
- 786 Transcript, James Pruss, 11 February 2012, Brisbane [p6056: line 23].
- 787 Transcript, James Pruss, 11 February 2012, Brisbane [p6056: line 29].
- 788 Transcript, James Pruss, 11 February 2012, Brisbane [p6056: line 48 – p5067: line 5].
- 789 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5955: line 54].
- 790 Transcript, James Pruss, 11 February 2012, Brisbane [p6057: line 7].
- 791 Section 17.3 *Review of flood event reports*, deals with the Commission's general findings and recommendations about review of flood event reports produced in accordance with flood mitigation manuals and emergency action plans.
- 792 Transcript, Peter Allen, 10 February 2012, Brisbane [p5904: line 5].
- 793 Transcript, Peter Allen, 10 February 2012, Brisbane [p5929: line 11].
- 794 Transcript, Peter Allen, 10 February 2012, Brisbane [p5911: lines 35-50].
- 795 Transcript, Peter Allen, 10 February 2012, Brisbane [p5930: lines 45-60].
- 796 Transcript, Peter Allen, 10 February 2012, Brisbane [p5915: line 3053].
- 797 Transcript, Peter Allen, 10 February 2012, Brisbane [p5918: lines 30-35].
- 798 Transcript, Peter Allen, 10 February 2012, Brisbane [p5917: lines 35-40].
- 799 Transcript, Peter Allen, 10 February 2012, Brisbane [p5919: line 56].
- 800 Transcript, Peter Allen, 10 February 2012, Brisbane [p5920: lines 1-11].
- 801 Transcript, Peter Allen, 10 February 2012, Brisbane [p5921: line 12].
- 802 Transcript, Peter Allen, 10 February 2012, Brisbane [p5923: line 43].
- 803 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5034: line 45 – p5035: line 26].
- 804 Transcript, Peter Allen, 10 February 2012, Brisbane [p5936: line 11].
- 805 Transcript, Peter Allen, 10 February 2012, Brisbane [p5923: line 54; p5928: line 55].
- 806 Transcript, Peter Allen, 10 February 2012, Brisbane [p5924: line 1].
- 807 Transcript, Peter Allen, 10 February 2012, Brisbane [p5924: line 10].
- 808 Transcript, Peter Allen, 10 February 2012, Brisbane [p5924: line 14].
- 809 Transcript, Peter Allen, 10 February 2012, Brisbane [p5924: line 19].
- 810 Transcript, Peter Allen, 10 February 2012, Brisbane [p5924: line 32].
- 811 Transcript, Peter Allen, 10 February 2012, Brisbane [p5939: line 5].
- 812 Transcript, Peter Allen, 10 February 2012, Brisbane [p5924: line 39; p5939: line 44].
- 813 Transcript, Peter Allen, 10 February 2012, Brisbane [p5927: line 10].
- 814 Transcript, Peter Allen, 10 February 2012, Brisbane [p5927: line 18].

- 815 Transcript, Peter Allen, 10 February 2012, Brisbane [p5927: lines 28-38].
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- 816 Exhibit 1099, Statement of Peter Allen, 3 February 2012 [p3: para 12].
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- 817 Exhibit 1128, Statement of Peter Allen, 12 September 2012 [p5: para 12(g)].
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- 818 Transcript, Peter Allen, 10 February 2012, Brisbane [p5928: lines 20-34].
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- 819 Transcript, Peter Allen, 10 February 2012, Brisbane [p5928: line 36]. For more on the Wivenhoe Dam and Somerset Dam Optimisation Study, see *17.1 Longer term review of the Wivenhoe and North Pine manuals*.
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- 820 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p36: para 148].
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- 821 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012, Attachment.
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- 822 Letter, Justice C E Holmes, Commissioner to Director-General, Department of Environment and Resource Management, 8 March 2011.
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- 823 Transcript, Peter Allen, 10 February 2012, Brisbane [p5928: line 1].
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- 824 Transcript, Peter Allen, 16 May 2011, Brisbane [p2090: line 11].
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- 825 Transcript, Peter Allen, 17 May 2011, Brisbane [p2131: line 37].
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- 826 Transcript, Peter Allen, 10 February 2012, Brisbane [p5929: line 33].
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- 827 Transcript, Peter Allen, 10 February 2012, Brisbane [p5905: line 54].
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- 828 Exhibit 1100, Statement of Peter Allen, 7 February 2012, Annexure PHA-63, Email from Peter Allen to Brian Cooper Consulting, 10.57 am, 12 January 2011.
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- 829 Transcript, Peter Allen, 10 February 2012, Brisbane [p5923: line 54; p5928: line 55; p5929: line 1].
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- 830 See Exhibit 397, Statement of Peter Allen, 4 April 2012 [p51: para 149 – p53: para 152].
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- 831 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p36: para 150].
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- 832 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p36: para 150].
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- 833 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p37: para 151].
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- 834 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p37: para 152-153].
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- 835 Exhibit 393, Statement of Peter Borrows, 1 April 2011 [p1: para 3].
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- 836 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5944: line 29].
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- 837 Exhibit 427, Statement of Jim Pruss, 4 April 2011 [p2: para 19].
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- 838 Exhibit 393, Statement of Peter Borrows, 1 April 2011 [p6: para 46-47].
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- 839 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5958: line 27]; [p5959: line 4]; Transcript, Jim Pruss, 11 February 2012, Brisbane [p6050: line 31].
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- 840 Exhibit 393, Statement of Peter Borrows, 1 April 2011 [p6: para 47].
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- 841 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5947: line 33].
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- 842 Mr Borrows trained as a civil engineer. Exhibit 393, Statement of Peter Borrows, 1 April 2011 [p1: para 8]. Mr Pruss holds a Bachelor of Science: Exhibit 427, Statement of Jim Pruss, 4 April 2011 [p2: para 9].
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- 843 Exhibit 1138, Statement of Ken Smith, 1 February 2012 [p1-2: para 4].
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- 844 Exhibit 1138, Statement of Ken Smith, 1 February 2012 [p2: para 5].
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- 845 Exhibit 1150, Statement of Anna Bligh, 6 February 2012; Exhibit 1138, Statement of Ken Smith, 1 February 2012.
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- 846 Transcript, Ken Smith, 10 February 2012, Brisbane [p6010].
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- 847 Exhibit 1138, Statement of Ken Smith, 1 February 2012, Attachment 5 [p1]; Transcript, Ken Smith, 10 February 2012, Brisbane [p6015: line 56].
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- 848 Exhibit 1138, Statement of Ken Smith, 1 February 2012, Attachment 7 [p45]; Transcript, Ken Smith, 10 February 2012, Brisbane [p6016: line 30]; Exhibit 1150, Statement of Anna Bligh, 6 February 2012, AMB-03 [p1].
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- 849 Exhibit 1138, Statement of Ken Smith, 1 February 2012, Attachment 5 [p3]; Transcript,

- Ken Smith, 10 February 2012, Brisbane [p6017: line 35].
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- 850 Exhibit 1138, Statement of Ken Smith, 1 February 2012, Attachment 4 [p1]; Attachment 8 [p1]; Exhibit 1150, Statement of Anna Bligh, 6 February 2012, AMB-05 [p33].
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- 851 Exhibit 417, Statement of Barry Dennien, 5 April 2011, Annexure E [p1674]; Transcript, Ken Smith, 10 February 2012, Brisbane [p6022: line 24].
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- 852 Exhibit 1150, Statement of Anna Bligh, 6 February 2012 [p3:para 9; AMB-05].
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- 853 Exhibit 1138, Statement of Ken Smith, 1 February 2012 [p4: para 12].
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- 854 Transcript, Ken Smith, 10 February 2012, Brisbane [p6011: line 21].
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- 855 Transcript, Ken Smith, 10 February 2012, Brisbane [p6023: line 24].
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- 856 Transcript, Ken Smith, 10 February 2012, Brisbane [p6023: line 47].
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- 857 Transcript, Ken Smith, 10 February 2012, Brisbane [p6024: line 10].
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- 858 Exhibit 1150, Statement of Anna Bligh, 6 February 2012 [p4: para 12].
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- 859 Exhibit 1150, Statement of Anna Bligh, 6 February 2012 [p3: para 11].
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- 860 Exhibit 1150, Statement of John Bradley, 2 February 2012 [p1: para 2-3].
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- 861 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012 [p2, para 9].
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- 862 Exhibit 1150, Statement of Terry Wall, 2 February 2012 [p1: para 2-3].
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- 863 Exhibit 1150, Statement of James Reeves, 1 February 2012 [p1: para 2].
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- 864 Exhibit 1115, Statement of Stephen Robertson, 1 February 2012; Exhibit 1150, Statement of John Bradley, 1 February 2012; Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012; Exhibit 1150, Statement of Terry Wall, 2 February 2012; Exhibit 1150, Statement of James Reeves, 1 February 2012.
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- 865 Transcript, Stephen Robertson, 9 February 2012 [p5780].
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- 866 Exhibit 1115, Statement of Stephen Robertson, 1 February 2012 [p2: para 5-8]; Transcript, Stephen Robertson, 9 February 2012 [p5783: line 9].
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- 867 Transcript, Stephen Robertson, 9 February 2012 [p5782: line 24].
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- 868 Exhibit 1115, Statement of Stephen Robertson, 1 February 2012, Attachment B [p14]; Transcript, Stephen Robertson, 9 February 2012 [p5785: line 1].
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- 869 Transcript, Stephen Robertson, 9 February 2012 [p5784: line 19].
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- 870 Exhibit 1115, Statement of Stephen Robertson, 1 February 2012, Attachment B [p18]; Transcript, Stephen Robertson, 9 February 2012 [p5785: line 31].
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- 871 Exhibit 1115, Statement of Stephen Robertson, 1 February 2012, Attachment B [p20]; Transcript, Stephen Robertson, 9 February 2012 [p5785: line 51].
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- 872 Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5785: line 45].
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- 873 Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5790: line 55].
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- 874 Exhibit 11, Statement of Stephen Robertson, 1 April 2011 [SR-12]; Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5787: line 56].
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- 875 Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5791: line 20].
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- 876 Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5791: line 29].
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- 877 Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5790: line 2-50].
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- 878 Transcript, Stephen Robertson, 9 February, Brisbane 2012 [p5789: lines 20-30].
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- 879 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p1: para 6].
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- 880 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p2: para 12]; JNB-02: p53.
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- 881 Exhibit 1150, Statement of John Bradley, 1 February 2012, JNB-02 [p56].
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- 882 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p2: para 12]; JNB-02.
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- 883 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p4: para 20].
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- 884 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p4: para 23].
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- 885 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p3: para 14].

- 886 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p3: para 15-16].
- 887 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012 [p2: para 12].
- 888 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012, DLB-16: Email, Daniel Spiller to various, 9 January 2011, 11:07pm.
- 889 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012, DLB-15: Email, Daniel Spiller to various, 10 January 2011, 9:46am..
- 890 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012, DLB-17; Email, Lance McCallum to Debbie Best, 10 January 2011, 12:26pm.
- 891 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012, DLB-20: Email, Kathy Reilly to Debbie Best, 14 January 2011, 5:27pm.
- 892 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012 [p4: para 25]; DLB-20.
- 893 Exhibit 393, Statement of Peter Borrows, 1 April 2011, PB-12.
- 894 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012 [p4: para 21-22].
- 895 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012 [p4: para 23-24].
- 896 Exhibit 1150, Statement of Terry Wall, 2 February 2012 [p1: para 4-5].
- 897 Exhibit 1150, Statement of Terry Wall, 2 February 2012 [p2: para 8].
- 898 Exhibit 1150, Statement of Terry Wall, 2 February 2012 [p2: para 9-10].
- 899 Exhibit 1150, Statement of James Reeves, 1 February 2012 [p1: para 5-6].
- 900 Exhibit 1150, Statement of James Reeves, 1 February 2012 [p2: para 8].
- 901 Submission from South East Queensland Water Grid Manager, 11 March 2011 [p1: para 1]
- 902 Exhibit 1097, Statement of Barry Dennien, 1 February 2012 [p2: para 7].
- 903 Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p2: para 8(a)].
- 904 Transcript, Daniel Spiller, 7 February 2012, Brisbane [p5611: line 29].
- 905 Exhibit 1097, Statement of Barry Dennien, 1 February 2012 [p2: para 5].
- 906 Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p2: para 6-7].
- 907 Exhibit 1097, Statement of Barry Dennien, 1 February 2012; Exhibit 1080, Statement of Daniel Spiller, 1 February 2012.
- 908 Exhibit 1097, Statement of Barry Dennien, 1 February 2012 [p5: para 18].
- 909 Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p4: para 15].
- 910 Exhibit 1097, Statement of Barry Dennien, 1 February 2012 [p4: para 15]; Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p4: para 13-14].
- 911 Exhibit 1097, Statement of Barry Dennien, 1 February 2012 [p4: para 15].
- 912 Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p5-6: para 16-23].
- 913 Exhibit 1097, Statement of Barry Dennien, 1 February 2012 [p3: para 11]; Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p3: para 9].
- 914 Transcript, Daniel Spiller, 7 February 2012, Brisbane [p5609: line 38].
- 915 Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p4: para 12]; Transcript, Daniel Spiller, 7 February 2012, Brisbane [p5610: line 13].
- 916 Transcript, Daniel Spiller, 7 February 2012, Brisbane [p5610: line 41; p5611: line 54].
- 917 Exhibit 1080, Statement of Daniel Spiller, 1 February 2012, Annexure B [p167-169]; Transcript, Daniel Spiller, 7 February 2012, Brisbane [p5617: lines 20-57].
- 918 Transcript, Daniel Spiller, 7 February 2012, Brisbane [p5618: line 1 – p5619: line 39].
- 919 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5684: line 38].
- 920 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5671: lines 40-50].
- 921 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5672: line 10].
- 922 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5672: line 32].
- 923 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, SR-12.

- 924 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5630: line 32].
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- 925 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5632: line 28].
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- 926 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5631: line 38].
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- 927 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5635: line 20].
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- 928 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5637: line 28].
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- 929 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5637: line 48].
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- 930 Opening submission by Seqwater, 11 March 2011 [p49: para 188].
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- 931 Opening submission by Seqwater, 11 March 2011, Attachment 29.
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- 932 Supplementary submission by Seqwater, 4 April 2011, Attachment 27.
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- 933 Exhibit 410, Review of Seqwater Document 'January 2011 Flood Event' by Colin Apelt, 9 March 2011; Exhibit 412, Report of Leonard McDonald, 'Flood event of January 2011 – Wivenhoe Dam water releases – compliance with manual', 10 March 2011; Exhibit 413, Report of Greg Roads, 'Review of the operation of Wivenhoe and Somerset Dams during the Jan 2011 Flood Event', 9 March 2011; Exhibit 411, Report of Brian Shannon, 'Review of Dam Operations Brisbane River Floods – January 2011'.
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- 934 The issue Mr McDonald identified related to the decision not to implement strategy W2. He noted, though, there was in that respect 'some ambiguity in the Manual requirements' (Exhibit 412, Report of Leonard McDonald, 'Flood event of January 2011 – Wivenhoe Dam water releases – compliance with manual', 10 March 2011 [p1, 9]). Mr Roads identified two possible minor deviations: taking forecast rainfall into account, there could have been a transition to W4 at 10.00 am on 11 January 2011; and the timing of gate closures on 12 January 2011. Mr Roads noted that these deviations 'may be due to a lack of clarity in the manual rather than non-compliance' (Exhibit 413, Report of Greg Roads, Review of the operation of Wivenhoe and Somerset Dams during the Jan 2011 Flood Event, 9 March 2011 [p4-5]).
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- 935 Exhibit 407, WMA Water, *Report to the Queensland Flood Commission of Inquiry, Final Report*, May 2011 [p48: para 167].
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- 936 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5959: line 43].
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- 937 Submissions were due to the Commission by 11 March 2011. Exhibit 1044, Email from Jim Pruss to various: 'Reports', 7 March 2011, 9:17 am.
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- 938 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5557: lines 45-48].
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- 939 Transcript, Greg Roads, 8 February 2012, Brisbane [p5753: line 53; p5754: line 28; p5755: lines 25-26]; Exhibit 1110, Greg Roads – teleconference notes, 9 February 2011.
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- 940 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5560: lines 30-47]. See also Transcript, Brian Shannon, 9 February 2012, Brisbane [p5817: lines 17-25].
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- 941 Transcript, Greg Roads, 9 February 2012, Brisbane [p5761: lines 10-12]; Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5562: lines 33-34]; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5727: line 55 – p5728: line 10]. Transcript, Brian Shannon, 9 February 2012, Brisbane [p5819: lines 34-36]. Mr Roads said he accepted 'that as the water level fell over the line [the flood operations engineers] were automatically in W3, whether they liked it or not' (Transcript, Greg Roads, 9 February 2012, Brisbane [p5768: line 44-46]). In his report, Table 3.1 sets out 'the date and time when Seqwater transitioned into each strategy'. It shows that strategy W3 was engaged at 8.00 am on 8 January 2011 (Exhibit 413, Report of Greg Roads, Review of the operation of Wivenhoe and Somerset Dams during the Jan 2011 Flood Event, 9 March 2011 [p2-4]).
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- 942 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5560: lines 5-7]; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5727: line 55 – p5728: line 10]. Transcript, Brian Shannon, 9 February 2012, Brisbane [p5819: lines 34-36]. Mr Roads said he accepted 'that as the water level fell over the line [the flood operations engineers] were automatically in W3, whether they liked it or not' (Transcript, Greg Roads, 9 February 2012, Brisbane [p5768: line 44-46]). In his report, Table 3.1 sets out 'the date and time when Seqwater transitioned into each strategy'. It shows that strategy W3 was engaged at 8.00 am on 8 January 2011 (Exhibit 413, Report of Greg Roads, Review of the operation of Wivenhoe and Somerset Dams during the Jan 2011 Flood Event, 9 March 2011 [p2-4]).
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- 943 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5560: line 5; p5562: line 9; p5568: lines 49-52]; Exhibit 412, Report of Leonard McDonald, 'Flood event of January 2011 – Wivenhoe Dam water releases – compliance with manual', 10 March 2011 [p2].
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- 944 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5560: lines 22-48].

- 945 Closing submissions on behalf of Greg Roads, 15 February 2012.
- 946 Exhibit 1141, Transcript of interview with Ms Chloe De Marchi with exhibits and index attached; Transcript, Chloe De Marchi, 11 February 2012, Brisbane [p6039-6049]; Exhibit 1142, McGrath Nichol Report – Transmittal Letter, Excel Document TRS-LTR4 MG; Exhibit 1144, Letter from QFCI to Allens Arthur Robinson, 7 February 2012; Exhibit 1145, Email from Allens Arthur Robinson to QFCI, 8 February 2012, 10.13 am.
- 947 Transcript, Greg Roads, 9 February 2012, Brisbane [p5767: line 37 – p5768: line 8; p5772: lines 43, 55]; Transcript, Brian Shannon, 9 February 2012, Brisbane [p5819: line 45; p5823: line 16].
- 948 Exhibit 413, Report of Greg Roads, Review of the operation of Wivenhoe and Somerset Dams during the Jan 2011 Flood Event, 9 March 2011 [p2]; Transcript, Greg Roads, 9 February 2012, Brisbane [p5761: line 1; p5762: line 8; p5767: line 37 – p5768: line 8].
- 949 Transcript, Brian Shannon, 9 February 2012, Brisbane [p5823: line 20].
- 950 Transcript, Brian Shannon, 9 February 2012, Brisbane [p5817: lines 19-28; p5822: line 4].
- 951 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5721: line 40 – p5722: line 5].
- 952 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5727: line 12]; Exhibit 410, Review of Seqwater Document ‘January 2011 Flood Event’ by Colin Apelt, 9 March 2011 [p2].
- 953 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5560: lines 30-47].
- 954 Exhibit 412, Report of Leonard McDonald, Flood event of January 2011 – Wivenhoe Dam water releases – compliance with manual, 10 March 2011 [p2]. See also Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5562: lines 8-18; p5571: line 12].
- 955 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5724: line 50]; Transcript, Greg Roads, 9 February 2012, Brisbane [p5765: line 1]; Transcript, Brian Shannon, 9 February 2012, Brisbane [p5817: line 12].
- 956 Transcript, Brian Shannon, 9 February 2012, Brisbane [p5817: lines 3-37].
- 957 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5724: line 50]; Transcript, Greg Roads, 9 February 2012, Brisbane [p5722: lines 18-35]
- 958 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5561: lines 51-55; p5562: lines 19-31]; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5729: lines 27-42; p5731: lines 36-56]; Transcript, Brian Shannon, 9 February 2012, Brisbane [p5824: lines 1-13].
- 959 Transcript, Greg Roads, 9 February 2012, Brisbane [p5771: lines 50-57].
- 960 Closing submissions on behalf of Greg Roads, 15 February 2012.
- 961 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5569: line 1 – p5572: line 5]; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5734: line 37 – p5737: line 21]; Transcript, Greg Roads, 9 February 2012, Brisbane [p5799: lines 15-48; p5804: line 43 – p5805: line 41]; Transcript, Brian Shannon, 9 February 2012, Brisbane [p5847: line 30 – p5848: line 19].
- 962 Other than those associated with W4.
- 963 See, for example, Transcript, Colin Apelt, 8 February 2012, Brisbane [p5728: lines 40-50].
- 964 See, for example, Transcript, Greg Roads, 9 February 2012, Brisbane [p5770: line 10; p5802: lines 23-42].
- 965 Transcript, Peter Borrows, 10 February 2012, Brisbane [p 5951: lines 19-27; p5959: line 39]; Transcript, James Pruss, 11 February 2012, Brisbane [p6055: line 53 – p6066: line 2]. See also Transcript, James Pruss, 11 February 2012, Brisbane [p6056: line 47 – p6057: line 5].
- 966 Exhibit 1084, Meeting invite, organised by Jim Pruss, with attendees, and agenda attached – Technical Report Discussion, 3 February 2011; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5716: lines 11-42]; Transcript, James Pruss, 11 February 2012, Brisbane [p6053: lines 1-43]; Transcript, Robert Ayre, 11 February 2012, Brisbane [p6113: line 20].
- 967 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5716: lines 11-39]. Mr Shannon said the same thing of a meeting he attended on 18 February 2011 (Transcript, Brian Shannon, 9 February 2012, Brisbane [p5818: line 20]).

- 968 Transcript, James Pruss, 11 February 212, Brisbane [p6053: lines 14-33]. Mr Pruss also said one of the purposes of the meetings about the report, held on 8 February 2011, 18 February 2011 and 21 February 2011, was to '[get] everybody who need[ed] to be involved up to speed' (Transcript, James Pruss, 11 February 2012, Brisbane [p6057: line 28]).
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- 969 Exhibit 1085, Meeting invite, organised by Brooke Foxover with attendees, and agenda attached – Technical Report Discussion, 8 February 2011; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5719: lines 17-34]; Transcript James Pruss, 11 February 2012, Brisbane [p6054: lines 25-55]. See also Transcript, Robert Ayre, 11 February 2012, Brisbane [p6113: line 34].
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- 970 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5719: lines 17-35].
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- 971 Exhibit 1147, Handwritten notes of Robert Ayre, provided to QFCI in a letter dated 9 February 2012 [p3]; Transcript, Robert Ayre, 11 February 2012, Brisbane [p6110: line 48].
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- 972 Transcript, Brian Shannon, 9 February 2012, Brisbane [p5825: line 55 – p5826: line 56].
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- 973 Exhibit 1088, Email from Chloe Cross to John Tibaldi with 18 Feb Meeting notes attached, 21 February 2011, 8.26 am; Transcript, Brian Shannon, 9 February 2012, Brisbane [p5826: line 53].
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- 974 Transcript, James Pruss, 11 February 2012, Brisbane [p6055: lines 3-33].
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- 975 Exhibit 1103, Email from Brooke Foxover to Colin Apelt, 7 February 2011, 5.16 pm.
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- 976 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5717: lines 39-50]. In his reply to the email, Professor Apelt did not respond to the point.
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- 977 Transcript, James Pruss, 11 February 2012, Brisbane [p6055: line 50].
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- 978 Exhibit 1071, Email from Greg Roads to Terry Malone, 17 January 2011, 9.11 am; Transcript, Greg Roads, 9 February 2012, Brisbane [p5773: line 50 – p5774: line 29].
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- 979 Hedley Thomas, *The Australian*, 'Water releases before deluge too low: engineer', 17 January 2011: [www.theaustralian.com.au/national-affairs/water-releases-before-deluge-too-low-dam-expert/story-fn59niix-1225989066171](http://www.theaustralian.com.au/national-affairs/water-releases-before-deluge-too-low-dam-expert/story-fn59niix-1225989066171).
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- 980 Exhibit 1071, Email from Greg Roads to Terry Malone, 17 January 2011, 9.11 am.
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- 981 Mr Maher was Seqwater's Principal Engineer, Dams and Weirs.
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- 982 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p86].
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- 983 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011.
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- 984 BMT WBM, Technical Review of Hydraulic Modelling Reports by WMA Water (28 July 2011) and SKM (5 August 2011) specifically as they relate to Ipswich City – Supplementary Report prepared for Ipswich City Council, September 2011; Fernvale and Surrounding Communities Action Group, Submissions concerning further questions for Mark Babister, 30 August 2011; Mr Michael J O'Brien, An Avoidable Disaster – Submission in response to Hydraulic Modelling Reports, 31 August 2011; Mid Brisbane Rivers Irrigators Incorporation, Response to WMA Report, undated; Seqwater, Response to Mr Babister's Report, 1 September 2011 (which included an additional response as an addendum: SKM, Comments on Review of Hydraulic Modelling Final Report prepared by WMAwater for Queensland Flood Commission of Inquiry July 2011, 25 August 2011); Seqwater, Further response to Mr Babister's hydrodynamic modelling report, 21 November 2011.
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- 985 Exhibit 1124, WMAwater, Response to Submissions Relating to WMAwater Report: *Review of Hydraulic Modelling* for the Queensland Floods Commission of Inquiry, 18 November 2011; Exhibit 1126, WMAwater, *Response to Seqwater submission 'Further response to Mr Babister's hydrodynamic modelling report'* dated 21 November 2011, 28 November 2011.
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- 986 Exhibit 1125, WMAwater, Modelling of Additional Dam Release Scenarios – Addendum to *Review of Hydraulic Modelling Final Report*, 18 November 2011.
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- 987 Mr Michael J O'Brien, Review of Hydraulic Modelling, 23 November 2011; Mr Michael J O'Brien, Review of Hydraulic Modelling, 25 November 2011; Mr Michael J O'Brien, Review of Hydraulic Modelling, 10 December 2011.
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- 988 Transcript, Brian Cooper, 8 February 2012, Brisbane [p5708: lines 16-37]; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5734: lines 37-44].
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- 989 The type of judgment call that is involved is explained by Emeritus Professor Apelt. See Transcript, Colin Apelt, 8 February 2012, Brisbane [p5728: lines 43-55].
- 990 Exhibit 1127, WMAwater, RE: Clarification of Scenario C and Additional Modelling, 3 February 2012.
- 991 Transcript, Mark Babister, 10 February 2012, Brisbane [p5889: line 22].
- 992 Calibrate (with respect to a hydrologic and hydraulic model) means the checking of values derived from the model against physical measurements. This is achieved by adjusting parameters, within an acceptable range and in a consistent manner to best fit the physical measurements. See Glossary.
- 993 As the model has only been calibrated to the January 2011 flood event, it is not suitable for use in modelling any other event: WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 4.10 [p23: para 56 (f)].
- 994 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 4.10 [p22-23: para 56].
- 995 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 4.10 [p21: para 52; p23: para 56(d)].
- 996 In this chapter, all references to metres are references to Australian Height Datum unless otherwise stated.
- 997 Exhibit 1126, WMAwater, *Response to Seqwater submission 'Further response to Mr Babister's hydrodynamic modelling report'* dated 21 November 2011, 28 November 2011 [p6-7: para 24]; Transcript, Mark Babister, Brisbane, 26 October 2011 [p4421: line 45]; Exhibit 883, WMAwater, *Brisbane River 2011 Flood Event – Flood Frequency Analysis Final Report*, September 2011 [p10-11: para 46-47].
- 998 Exhibit 883, Statement of Terrence Malone, 20 October 2011 [p10: para 45].
- 999 Transcript, Mark Babister, 26 October 2011, Brisbane [p4422: line 32]; Exhibit 1126, WMAwater, *Response to Seqwater submission 'Further response to Mr Babister's hydrodynamic modelling report'* dated 21 November 2011, 28 November 2011 [p7: para 25, 27].
- 1000 WMAwater did not conduct an independent review of Sinclair Knight Merz's modelling of cases 4 and 5 and suggested a slightly different approach to modelling case 3, which it did consider. (WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 5 [p26-28: para 62-64].) The Commission therefore is not in a position to make a finding as to the precise accuracy of the figures represented in the graph. However, the graph does provide a useful indication of the effect of the dams on the January 2011 flood.
- 1001 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 1.3 [p2: para 8(a)].
- 1002 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 4.10 [p22: para 56(a)].
- 1003 Exhibit 1124, WMAwater, Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p2: para 8].
- 1004 Exhibit 1124, WMAwater, Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p2: para 6].
- 1005 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 1.3 [p3: para 8(d)]; section 5 [p24 -p31]; section 7 [p40: para 93]; Seqwater, Response to Mr Babister's Report, 1 September 2011, section 2.1 [p3]; Exhibit 1124, WMAwater Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling*, 18 November 2011 [p2-3: para 8-10].
- 1006 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 7 [p40: para 93]; Seqwater, Response to Mr Babister's Report, 1 September 2011, Annexure C; Exhibit 1124, WMAwater, Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling*, 18 November 2011 [p16: para 71].
- 1007 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 7 [p40: para 93]; Exhibit 1124, WMAwater Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p2: para 8].
- 1008 Seqwater, Response to Mr Babister's Report, 1 September 2011, Annexure C [p11: para 6]; Exhibit 1124, WMAwater Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p16: para 71].

- 1009 WMAwater, *Review of Hydraulic Modelling Final Report Final Report*, July 2011, section 7 [p40: para 93].
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- 1010 WMAwater, *Review of Hydraulic Modelling Final Report Final Report*, July 2011, section 1.3 [p3: para 8(e)]; section 5 [p28-31].
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- 1011 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 1.3 [p3: para 8(e)]; section 5 [p28-31].
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- 1012 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 1.3 [p4: para 16]; section 7.1 [p42: para 103]; Exhibit 1124, WMAwater, Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p16: para 67], Transcript, Mark Babister, Brisbane, 10 February 2012 [p5900: line 17].
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- 1013 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 6, table 5 [p32: para 67].
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- 1014 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, section 2.5.3 [p55].
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- 1015 Exhibit 1125, WMAwater, Modelling of Additional Dam Release Scenarios – Addendum to *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p3: para 11; p5: para 18].
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- 1016 Exhibit 1125, WMAwater, Modelling of Additional Dam Release Scenarios – Addendum to *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p3: para 12; p5: para 19].
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- 1017 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 6 [p32: para 66(c)].
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- 1018 Exhibit 1125, WMAwater, *Modelling of Additional Dam Release Scenarios*, 18 November 2011 [p3: para 7, 13].
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- 1019 Exhibit 1125, WMAwater, *Modelling of Additional Dam Release Scenarios*, 18 November 2011 [p3: para 14].
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- 1020 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 6 [p32: para 66(d)].
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- 1021 Exhibit 1127, WMAwater, RE: Clarification of Scenario C and Additional Modelling, 3 February 2012 [p5: para 11(i)].
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- 1022 Exhibit 1127, WMAwater, RE: Clarification of Scenario C and Additional Modelling, 3 February 2012 [p5: para 11(i)].
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- 1023 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 6 [p32: para 66(e)].
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- 1024 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 7 [p41: para 98].
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- 1025 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 7 [p41: para 98].
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- 1026 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, section 2.5.4 [p57].
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- 1027 GHD, which was commissioned by the Queensland Government to perform a rapid assessment of options to increase the flood mitigation of Wivenhoe Dam, also modelled the effect of lowering the full supply level of Wivenhoe Dam to 75 per cent under different scenarios (for example, raising the dam wall and changing the applicable operating strategies): see its ‘Report for Investigation of options to increase the flood mitigation performance of Wivenhoe Dam’, December 2011. That report was provided to the Commission by the Minister for Finance, Natural Resources and the Arts on 20 December 2011; its results were not able to be included in the process conducted for the modelling performed by Mr Babister.
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- 1028 [www.bom.gov.au/hydro/flood/qld/networks/section4.shtml](http://www.bom.gov.au/hydro/flood/qld/networks/section4.shtml).
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- 1029 Exhibit 1126, WMAwater, *Response to Seqwater submission ‘Further response to Mr Babister’s hydrodynamic modelling report’ dated 21 November 2011*, 28 November 2011 [p5: para 18].
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- 1030 In a very late submission (dated 12 February 2012), DHI Water and Environment Pty Ltd contended that the scenarios did not fully exploit the flood mitigation capabilities of Wivenhoe Dam. However, what DHI was proposing involved operation of Wivenhoe Dam outside the rules of the Wivenhoe manual. In a later still submission, on 15 February 2012, Nadia Guterres, a Water Engineer employed by Cardno, said that her analysis, based on publicly available information, had reached much the same conclusion as Mr Babister.
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- 1031 Transcript, Mark Babister, 10 February 2012, Brisbane [p5891: lines 4-11].
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- 1032 Transcript, Mark Babister, 10 February 2012, Brisbane [p5891: lines 10-13].
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- 1033 Exhibit 1127, WMAwater, Clarification of Scenario C and Additional Modelling, February 2012 [p10: para 23].

1034 Transcript, Mark Babister, 10 February 2012,  
Brisbane [p5891: lines 28-32].

1035 Transcript, Mark Babister, 10 February 2012,  
Brisbane [p5892: lines 19-22]. The submission  
of 12 February 2012 from DHI Water and  
Environment Pty Ltd said that it, as developer of  
the MIKE11 river and flood modelling software,  
had identified a number of issues in relation to  
how the model has been developed and applied  
that limited its predictive capabilities, adding to  
the uncertainty associated with the model results.

1036 Transcript, Mark Babister, 10 February 2012,  
Brisbane [p5892: lines 10-16].

1037 Transcript, Mark Babister, 10 February 2012,  
Brisbane [p5900: lines 20-30].

1038 Transcript, Gregory Roads, 9 February 2012,  
Brisbane [p5773: lines 29-42].

1039 Transcript, Mark Babister, 10 February 2012,  
Brisbane [p5891: line 44 – p5892: line 8].

1040 Transcript, Mark Babister, 10 February 2012,  
Brisbane [p5899: lines 50-57].

1041 Transcript, Mark Babister, 10 February 2012,  
Brisbane [p5897: line 25 – p5898: line 20].

1042 Transcript, Brian Shannon, 9 February 2012,  
Brisbane [p5833: line 40 – p5835: line 30].

1043 Transcript, John Tibaldi, 2 February 2012,  
Brisbane [p5086: lines 52-54].

1044 Transcript, Robert Ayre, 3 February 2012,  
Brisbane [p5214: line 27].

# 17

## 17 Other dam issues

This chapter deals with those aspects of the Commission's investigation into the operation of dams unrelated to the narrow issue canvassed in the February 2012 hearings.

The longer term review of the flood mitigation manuals relevant to Wivenhoe, Somerset and North Pine dams is dealt with in section 17.1 below. It was in part dealt with by the interim report, which set out scientific investigations that should be completed before such a review took place.<sup>1</sup> Those recommendations are now supplemented in this report with recommendations as to the procedure by which the review should take place.

The review and approval by the Department of Environment and Resource Management (DERM) of flood mitigation manuals is dealt with in section 17.2. DERM's review of flood event reports, a topic that takes on greater prominence given the questions raised about the veracity of Seqwater's March 2011 flood event report, is addressed in section 17.3.

The effect of the dams' operation in relation to the slumping of river banks upstream and downstream of the dams is the subject of section 17.4.

Three other topics related to Wivenhoe, Somerset and North Pine dams were raised on the material and submissions received by the Commission: the operation of the Wivenhoe Power Station by Tarong Energy, the presence of cracking in Somerset Dam and the impact of the operation of all three dams on nearby bridges and crossings. Those three matters should also be taken into account in the longer term review of the flood mitigation manuals.

The Commission also investigated dams in areas where regional hearings were held. Information on dams in the Fraser Coast, Maryborough, Gympie, Sunshine Coast, Bundaberg, North Burnett and South Burnett local government regions was collected and considered. Those dams included eight operated by each of Seqwater<sup>2</sup> and SunWater,<sup>3</sup> and eight dams operated by Wide Bay Water Corporation, South Burnett Regional Council, Newcrest Mining and Stanwell Corporation.<sup>4</sup> The evidence received on Lenthalls Dam, near Maryborough, warranted specific attention by the Commission; its operation is discussed at length in section 17.8 below.

Aspects of the detention basins in Toowoomba were raised in submissions which members of the public made to the Commission. Given the flash flooding of 10 January 2011, a consideration of those detention basins was appropriate and appears at section 17.9.

Finally, the Commission considered the role of DERM in the regulation of dams, outside of its involvement in the review of flood mitigation manuals and flood event reports. That involved a consideration of DERM's response to the Bureau of Meteorology forecast in October 2010, its process of review of emergency action plans, its interaction with disaster management personnel, its performance of dam safety audits and its management of non-commercial water assets. The consideration of those topics identified an unfortunate vacuum in responsibility for flood mitigation in Queensland.

## 17.1 Longer term review of the Wivenhoe and North Pine manuals

The Commission's interim report recommended reviews of the flood mitigation manuals applicable to Wivenhoe and Somerset dams and North Pine Dam on both an interim (before the 2011/2012 wet season) and a long term basis.<sup>5</sup> The interim report set out the scientific investigations that would be required to be undertaken as part of the longer term review of both manuals. It did not make recommendations about the procedure of the review, the policy decisions to be made by government at the end of it nor the approval of the manual by government; those were not tasks that could be completed before the onset of the 2011/2012 wet season. It was indicated in the interim report that those issues would be dealt with in the final report.<sup>6</sup> The first two of those topics will be addressed in this section; the approval of flood mitigation manuals is dealt with in section 17.2 below.

Seqwater has completed interim reviews of both manuals. The approval of Revision 8 of the Wivenhoe manual by the Director-General of DERM was gazetted on 1 October 2011.<sup>7</sup> Approval of Revision 6 of the *Manual of Operational Procedures for Flood Mitigation at North Pine Dam* ('North Pine manual') was gazetted on 11 October 2011.<sup>8</sup>

In response to the passage of the *Disaster Management and Other Legislation Amendment Act 2010*, and the subsequent declaration of a temporary full supply level at Wivenhoe Dam by the responsible Minister, Seqwater added a chapter to the Wivenhoe manual to deal with a drain down to a temporary full supply level. That chapter was added to the Wivenhoe manual and submitted to DERM for approval as Revision 9; approval of it was gazetted on 14 November 2011.<sup>9</sup>

Those interim reviews, and the steps taken to begin the scientific investigations required for the longer term review of the Wivenhoe and North Pine manual, have assisted the Commission in making further recommendations.

The Commission envisages that each longer term review will progress in three stages:

1. completion of the scientific investigations required for the review
2. decision by government as to the operating strategies to be adopted after consideration of options
3. creation of the new manual by Seqwater.

### 17.1.1 The structure for the completion of the scientific investigations

Seqwater has begun the task of conducting the scientific investigations necessary for the reviews. It has initiated the Wivenhoe Dam and Somerset Dam Optimisation Study and the North Pine Dam Optimisation Study. Both studies will draw upon three separate investigations: into dam operations, water supply and floodplain risk management.<sup>10</sup> For the Wivenhoe study, the three investigations (dam operations, water supply security and floodplain management) are to be conducted through a technical working group under the supervision of the steering committee. The dam operations group is to be chaired by Seqwater, the water supply security group by Queensland Water Commission and the floodplain management group by the Department of Local Government and Planning.<sup>11</sup> Activities relevant to the local government regions of the Brisbane City Council, Ipswich City Council and Somerset Regional Council will be led by those councils respectively.<sup>12</sup>

Both studies will conclude with the presentation to government of options for operating strategies for the dams.<sup>13</sup> The Wivenhoe Dam and Somerset Dam Optimisation Study will arrive at a range of options, informed by the effects of flooding, the balance of competing interests across dam operations, floodplain development and water supply, flood risk and flood behaviour and the economic, social and environmental impacts of a range of flood management measures.<sup>14</sup>

Each optimisation study has a steering committee, chaired by Seqwater, with overall responsibility for the project.<sup>15</sup> In addition to Seqwater, both steering committees include representatives of DERM, the Queensland Water Commission, the South East Queensland Water Grid Manager and Brisbane City Council. The Wivenhoe study steering committee also includes representatives of Queensland Treasury, the Department of Local Government and Planning, the Queensland Reconstruction Authority, the Department of Community Safety, the Bureau of Meteorology and Brisbane, Ipswich and Somerset councils.<sup>16</sup> The North Pine study also includes representatives of the Moreton Bay council.<sup>17</sup>

Despite the lack of a finalised scope of work for the floodplain management study in the Wivenhoe Optimisation Study, it is likely that the work to be completed will overlap with the comprehensive flood study recommended for the Brisbane River catchment in chapter 2 of this report. The two studies have different purposes: the Wivenhoe study to assess the impacts of different operating environments at the dam, the flood study to inform land use planning and emergency management procedures. Investigations about the impacts of the operation of the dams on the floodplain are connected to investigations required to inform land use planning and emergency management, and vice versa, but each set of investigations is only a subset of the other. Investigations of the sort required for a review of the manual appear to be smaller in scope than those required for a comprehensive flood study. That can be gleaned both from the draft scope of work of the floodplain management technical working group,<sup>18</sup> and the fact that the whole of the optimisation study is expected to be completed by the end of 2012,<sup>19</sup> whereas the flood study is estimated to take approximately three years.<sup>20</sup> Some work as to the effects of dam operation on the floodplain and possible mitigation measures will need to be done, by someone, as part of the manual review. The Commission's view, however, is that the flood study it has recommended for the Brisbane River catchment should be undertaken separately from the optimisation study.

Elementary notions of efficiency suggest that the removal of the water supply and floodplain management studies from the dam operations study would be beneficial. The steering committees would not have as much work to oversee; the expert review panels would neither require so many experts with varying expertise nor need to review as much work. Sinclair Knight Merz, the project managers of the Wivenhoe Dam and Somerset Dam Optimisation Study, would not be faced with such a large and multi-faceted project. In the short term, some work done to set up the studies might be lost. If there were to be separation, the links between agencies forged by the initiation of the optimisation studies, and the work so far completed, should be built upon in the new study.

The three streams of investigation included in the optimisation studies are topics relevant to the review of the Wivenhoe and North Pine manuals. The Queensland Government will need advice on all those topics when it considers options for the operation of the dams, but it is not necessary that the advice come from one source. In fact, it may be beneficial for advice on competing objectives to come from different sources. The government will be required to weigh up the benefits and disadvantages of different options and strike a balance for the people of Queensland. The process for that decision is discussed further below at section 17.1.2. One integrated study, like the Wivenhoe study, has the benefit that it will 'package' each option in terms of impacts on other areas and costs because it has, within it, expertise in all relevant areas. On the other hand, it might, because of that integration, discard possible options before the government is involved. It is not the role of those involved in the optimisation study to do that balancing exercise for the government.

These concerns support the removal of both the water supply and floodplain management investigations from both optimisation studies.

Nonetheless, there are also good reasons, including the integration of investigations and agencies, to maintain the structure that has been implemented. It is a matter for the steering committee of each study whether the floodplain management and water supply security investigation remains part of it, or are conducted separately. The Commission recommends in *2.2 Flood studies* that the steering committee of the Wivenhoe Dam and Somerset Dam Optimisation Study consider whether the floodplain management investigation, a subset of which would involve a flood study, should be removed from the confines of that study: see recommendation 2.1. A similar decision should be made by the steering committee of the North Pine Dam Optimisation Study. The responsibility for completing floodplain management investigations and flood studies, if outside of the Optimisation Study, will fall on councils and the Queensland Government in accordance with the recommendations made in *2.5 The performance of flood studies in Queensland*.

If the investigations in each optimisation study are to be separated, there will need to be a high level of co-operation between those completing the different investigations. In particular, the data collection and creation part of each investigation must be performed in a manner which ensures that all have access to the data and its analysis. Models and other materials may, where appropriate, be shared between groups conducting the investigations. The agencies involved in separate floodplain management and water supply investigations would maintain their membership on the dam operations steering committee and so be able to ensure that integration.

As a final point, the Commission's interim report set out a list of scientific investigations that should form part of the review of the Wivenhoe manual in recommendations 2.12 and 2.13. All those investigations were directed at dam operations. The Commission is unable to assess in this report whether the scientific investigations to be

undertaken as part of the study in respect of dam operations are in accordance with those recommendations. That is because the scope of the work to be done by each technical working group in the Wivenhoe Dam and Somerset Dam Optimisation Study has not yet been finalised; that preparation is expected to continue into early 2012.<sup>21</sup> The steering committee of the Wivenhoe Optimisation Study has resolved to deliver recommendation 2.10 to 2.13; history will judge whether they succeed.

## *Recommendations*

- 17.1 The steering committees of the Wivenhoe Dam and Somerset Dam Optimisation Study and the North Pine Dam Optimisation Study should consider removing the water supply security investigation from each study.
- 17.2 The steering committee of the North Pine Dam Optimisation Study should consider whether it would be beneficial for the floodplain management investigation to be removed from the North Pine Dam Optimisation Study.

For recommendations relevant to the floodplain management investigation of the Wivenhoe Dam and Somerset Dam Optimisation Study, see recommendation 2.1 of this report.

### **17.1.2 Consideration of options for operating strategies by government**

The expected outcome of the longer term review of the manual is that options for operating strategies will be considered by the Queensland Government. Each option should involve a nominal full supply level and set out the strategies to be employed during a flood event. The range of options should be wide enough, and explained well enough, for the government to understand:

- the flood mitigation benefits of each option, distinguishing between flood mitigation for rural and urban areas respectively, and between different urban areas
- the water supply security implications of the full supply level of each option
- the dam safety implications of the full supply level of each option, including the flood that the dam is able to pass safely and the likely cost of and loss of life from dam failure.

Other considerations include:

- the submergence of bridges affected by the lake levels, releases or flooding around Wivenhoe, Somerset and North Pine dams, including the costs associated with raising those bridges
- the slumping and erosion of banks
- the effects on riparian fauna and flora.

See also recommendations 17.15 and 17.26 of this report.

The results (in terms of those topics) for each option must be considered over a range of flood events occurring both upstream and downstream of the dam. Clearly, the government will have to be presented with a wide spectrum of options from which it can determine how it wishes to prioritise different considerations in floods of different severity. The government might choose to give further direction to the steering committees of the optimisation studies as to the options to be presented. It could indicate in advance the objectives to which it intends to accord priority.

## Recommendation

- 17.3 The Queensland Government should ensure that, when it considers options for the operational strategies to be employed at Wivenhoe and Somerset dams, and North Pine Dam, it is presented with a wide range of options which prioritise differing objectives. The Queensland Government should determine the operational strategies by considering the implications of each option over a range of flood events for at least:
- inundation of urban and rural areas
  - water supply security
  - dam safety
  - submerging of bridges
  - bank slumping and erosion
  - riparian fauna and flora.

### 17.1.3 Creation of the new manuals

#### Lessons from the interim review

The interim reviews of Seqwater's flood mitigation manuals resulted in Revision 9 of the Wivenhoe manual<sup>22</sup> and Revision 6 of the North Pine manual.<sup>23</sup> Both manuals were sent to an independent dam safety and risk consultant for a peer review before they were submitted to DERM. That review involved consideration of more than one iteration of the manuals. In the end, the peer reviewer was satisfied with the manual's content and structure as an instructional document for engineers.<sup>24</sup> The manual was also reviewed numerous times by DERM lawyers and engineers with experience in dam operations before it was approved. The result of those reviews was that DERM considered the manual satisfactory.<sup>25</sup>

The changes made to the manuals in the interim reviews were scrutinised by the Commission for the purpose of informing recommendations to be made about the longer term reviews of the manuals, which are continuing. The Commission, from that scrutiny, has identified some areas of concern.

The Commission considers that there are two bases on which the manual must be judged: first, as an instructional document to be used by engineers during floods; second, as a set of procedures which, if observed, will confer immunity on a dam operator for civil actions against it.<sup>26</sup>

As to the second basis, the manual could conceivably be the epicentre of important litigation. Consequently, it is essential that it is expressed so that a determination can be made, in a forensic context, as to whether there has been compliance. For this reason, any examination of its efficacy cannot be limited to a consideration of its usefulness as an instructional document.

A well-written manual will also assist in public understanding, a point emphasised in the Commission's interim report. Public understanding, though, is a secondary concern to the two primary roles the manual must fulfil.

#### *Judged likely'*

Revision 9 of the Wivenhoe manual and Revision 6 of the North Pine manual introduced terms such as 'judged likely' into the conditions for the use of operational strategies. For example, Revision 7 of the Wivenhoe manual required that the predicted lake level 'be' between 68.5 metres and 74.0 metres for strategy W3 to apply, while Revision 9 says that the predicted lake level should be 'judged likely to be more than 2.5 metres above the [full supply level]'.<sup>27</sup> The same change has been made to strategies W1 and W2.<sup>28</sup> Strategy W4 now requires that the actual lake level 'exceed' 74.0 metres or the predicted level be 'judged very likely' to exceed 74.0 metres.<sup>29</sup>

The newly introduced terms have been defined as follows:

- ‘judged likely’ or ‘judges it likely’ means an event or circumstance being, in the professional engineering judgment of the duty flood operations engineer, sufficiently certain to occur given the likely consequences associated with any decision which depends upon the judgment
- ‘judged unlikely’ means an event or circumstance being, in the professional engineering judgment of the duty flood operations engineer, not sufficiently certain to occur given the likely consequences associated with any decision which depends upon the judgment
- ‘judged very likely’ means an event or circumstance being, in the professional engineering judgment of the duty flood operations engineer, certain or near certain to occur given the likely consequences associated with any decision which depends upon the judgment.<sup>30</sup>

For a court to be able to determine whether or not the dam operators complied with the manual without negligence,<sup>31</sup> it is necessary and appropriate for it to contain some objective standards. That was reflected in Revision 7 of the Wivenhoe manual by the requirement that certain states of affairs be likely or predicted.<sup>32</sup> The Commission’s interim report recommended that such provisions be amended on the basis that they were expressed inconsistently, but not on the basis that they imported an objective standard of reckoning.<sup>33</sup> In fact, such a standard is important; if all that is required to operate the dams is the subjective judgment of an engineer, there is little for the manuals to do. It would be an unhappy result if all that was required to achieve immunity on the scale provided by section 374 of the *Water Supply (Safety and Reliability) Act 2008* was that engineers had used their own judgment.

Of course individual decisions as to whether or not a relevant state of affairs exists will ultimately be a matter for the subjective judgment of the flood engineers. But their decisions should be made by reference to an objective criterion. The introduction of terms such as ‘judged likely’, and their accompanying definitions, effectively removes the presence of any objective standard.

It may be that, by linking the concept of ‘likelihood’ with the consequences of the decision, the revision was seeking to introduce something like what is known as a ‘Briginshaw’ test in a legal context, which requires that the standard of the evidence required rises as the consequences of an adverse finding increase in seriousness. A test of that kind would seem to be contemplated in that part of section 4.2 of Revision 9 of the Wivenhoe manual which deals with the flood engineers’ use of forecast rainfall.<sup>34</sup> That test has a place in the operation of the dams, but should be formulated in terms which are readily understandable.

#### *Strategy flowcharts*

A major structural change to the Wivenhoe manual in Revision 9 is the introduction of strategy flowcharts. There are a Wivenhoe strategy selection flowchart,<sup>35</sup> individual flowcharts for each of strategies W1, W2 and W3,<sup>36</sup> and a Somerset strategy flowchart.<sup>37</sup> Each flowchart presents as a series of decision points in a binary system. In each box is a question, which can only (according to the flowchart) be answered yes or no. Once answered, an arrow indicates the action that should be taken, or poses another question.

A flowchart is not an unreasonable way to present the information about strategies for the operation of Wivenhoe and Somerset dams. However, the Commission harbours concerns about aspects of these flowcharts.

#### *Strategy selection flowchart*

In the strategy selection flowchart, the threshold question is phrased in the negative: ‘[i]s it judged unlikely that the Wivenhoe Dam lake level will exceed the [full supply level]?’.<sup>38</sup> Answering such a question is difficult in a normal situation, let alone with the pressure of flood operations. Thought should be given to expressing the question in a form which asks whether the lake level is *likely to exceed* full supply level, accompanied by a rehearsal of the consequences according to whether the answer is yes or no.

In almost all cases, compound questions have been used: for example ‘[i]s the predicted Wivenhoe Dam lake level judged likely to exceed the [full supply level] by more than 3 metres within the next 24 hours *and* it is judged likely that drain down on the Dams will not commence within the next 48 hours?’ (emphasis added) in the strategy W2 flowchart.<sup>39</sup> Such questions carry with them the difficulty of determining whether an answer of ‘yes’ means ‘yes’ to one or both parts of the question. There should be no need for such questions to be unravelled, especially when they might be addressed by individuals under pressure: it is poor drafting practice.

A third criterion, effectively a sidenote to the flowchart, has been added for the purposes of many of the decisions regarding flows that submerge bridges downstream of Wivenhoe Dam. The situation in which the drain down of the dams is ‘judged likely’ to commence in the next 24 to 48 hours is an overriding consideration which allows the flood engineers to consider keeping a bridge open when the flowchart requires them to no longer give consideration to that objective.<sup>40</sup> Its status suggests that it should be included in the flow chart, not marginalised as a side note.

Whether or not these concerns are shared by the flood engineers, they do little to substantiate Seqwater’s claim (in its explanatory notes to the Wivenhoe manual provided to DERM) that ‘the flowcharts should enable persons with limited knowledge of Brisbane Basin hydrology to develop a basic understanding of transition options’.<sup>41</sup>

#### *Inconsistencies in the strategy W2 flowchart*

The strategy W2 flowchart in Revision 9 of the Wivenhoe manual<sup>42</sup> has two apparent inconsistencies. On the bottom row of that flowchart, the middle box asks whether the predicted Wivenhoe lake level is judged likely to exceed the full supply level by more than three metres within 24 hours and whether it is judged likely that the drain down of the dams will not commence within the next 48 hours. The red cross in that box indicates that the sidenote already mentioned, concerning the keeping open of the downstream bridges if the drawdown is judged likely to commence in the next 24 to 48 hours, applies. But it is obvious that the first position is inconsistent with the second: if it has been judged likely that drain down will not commence in the next 48 hours, it cannot be judged likely that the drain down will commence in 24 to 48 hours. Secondly, if the answer to the first question is yes – the flood engineer has judged it likely that the drain down will not commence within 48 hours – the flowchart directs the reader to a result oval which states that no consideration will be given to bridges ‘unless drain down of the dams is judged likely to commence in the next 24 to 48 hours’. Again, the inconsistency is obvious. Both inconsistencies should be rectified.

#### *Minimum gate openings in strategy W4*

It is unclear how the table of minimum gate openings in Strategy W4A in Revision 9 of the Wivenhoe manual<sup>43</sup> was determined. It is not the gate opening strategy used in the January 2011 event.<sup>44</sup> If it is not supported by modelling regarding different gate opening strategies in strategy W4 and their effects, this table should not be followed strictly by flood engineers nor replicated in further iterations of the manual.

#### *Registration*

Seqwater removed the requirement in both manuals that all flood engineers be registered as Professional Engineers in Queensland; only senior flood engineers are now required to be registered.<sup>45</sup> If that was a reaction to the Commission’s finding that Seqwater was in breach of Revision 7 of the Wivenhoe manual for failing to ensure that all flood engineers were registered,<sup>46</sup> it is unfortunate. Registration is not a mere formality; it reflects a commitment to maintaining skills through continuing education. It is part of the way in which expertise is acknowledged. Both manuals contemplate the situation in which a single flood engineer might operate the dams; in fact, that occurred in the early, and late, stages of the January 2011 flood event.<sup>47</sup> The manual provides that, where possible, the senior flood operations engineer should be in charge of operations for the whole of a flood event.<sup>48</sup> It also provides that other flood engineers, when on shift, are to direct flood operations in accordance with the overall strategy of the senior flood engineer.<sup>49</sup> If circumstances were to change drastically during a shift, it would be expected that the flood engineer on duty would act to meet the new circumstances, whether or not he or she was designated as senior. As an example, in the January 2011 flood event, neither of the two flood engineers on shift when the decision was made to transition to strategy W4 was a senior flood engineer.<sup>50</sup> Flood engineers on shift in the absence of a senior flood engineer are not supervised by a senior flood engineer. For those reasons, registration should be required for all flood engineers.

#### *Assessment of compliance in flood event report*

The report produced by Seqwater after a flood event should include an assessment of whether the operation of the dam during the flood event complied with the manual.<sup>51</sup> In addition to explaining the use of operational strategies and whether they were adopted and applied in compliance with the manual, Seqwater should be required to consider its compliance with other requirements, such as training and registration, in addition to those related to the operational strategies employed during an event. This was not done in response to the 2011 flood.

### *Scaling of quantitative precipitation forecasts*

Sqwater stated in the explanatory notes to the Wivenhoe manual submitted to DERM for approval that the flood engineers would continue ‘scaling’ up or down the quantitative precipitation forecasts when making predictions as to lake level.<sup>52</sup> If that is to occur, the process, and the reasons for it, should be explained in the manual.

### **Discretion of flood engineers**

The Wivenhoe manual gives the flood engineers substantial discretion as to the way the dam is operated. For example, the strategies do not set out prescriptively the release rates to be implemented during each strategy. The senior flood engineer is also given discretion to depart from the terms of the manual to achieve the flood mitigation objectives in it.<sup>53</sup> There was no suggestion that the manual in force at the dam at the time of the January 2011 flood event gave too much or too little discretion. However, a consideration of the scope of the discretion would be a valuable part of a comprehensive review of the manual.

### **Pre-releases in response to weather forecasts**

The North Pine manual stated that ‘pre-releases’ could be made outside the confines of the table of gate opening intervals in that manual to reduce the risk of the dam overtopping.<sup>54</sup> The scope of that allowance is not clear.<sup>55</sup> The idea of releasing water in advance of forecast rainfall is attractive. Sqwater has had work done in the past on the feasibility of pre-releases of water in response to rainfall forecasts.<sup>56</sup> That work has not supported the use of rainfall forecasts in operational decisions.<sup>57</sup> Sqwater has, however, clarified circumstances in which rainfall forecasts may be reliable and useful to flood engineers in Revision 9 of the Wivenhoe manual.<sup>58</sup> The time is ripe, then, for further consideration of the circumstances in which a pre-release might be employed.

### **‘Transition’ strategies**

The flood engineers gave evidence in the February 2012 hearings of the Commission that, at the time of the 2011 flood, there was some confusion as to when and how strategy W2 should be implemented and as to how the choice between strategy W2 and W3 should be made.<sup>59</sup> Particularly some, if not all, of the flood engineers, did not appreciate at the time of the January 2011 flood that W2 was not a transition strategy between W1 and W3.<sup>60</sup> That misunderstanding is not surprising: W2 was described expressly as a transition strategy in Revision 7 of the Wivenhoe manual, and the flowchart contained in it indicated it should be used between W1 and W3. The clarification of this issue was part of recommendation 2.9 in the Commission’s interim report. More recently, a submission the Commission received from a member of the public proposed an interpretation of the respective applications of W2 and W3 which was entirely different from the flood engineers’, but which was open, at the least.<sup>61</sup> If strategies of the form of W2 or W3 in Revision 7 are chosen as part of the longer term review of the Wivenhoe manual, the criteria for their use and the conditions under which each of them should be used should be explained clearly and simply so as to avoid these problems in the future.

### **‘Urban inundation’**

The protection of urban areas from inundation, which is the second highest objective for flood mitigation in Revision 7 and Revision 9 of the Wivenhoe manual, has proved to pose some difficulty. In evidence in February 2012, Mr Malone accepted that the term could refer to a wide range of circumstances.<sup>62</sup> He said that he relied on the manual (then in force, Revision 7) which prescribed the limit of urban damage to be a flow in the Brisbane River of 4000 m<sup>3</sup>/s.<sup>63</sup> Mr Tibaldi said that some urban damage occurs with flows as low as 1600 m<sup>3</sup>/s or 1900 m<sup>3</sup>/s, including the inundation of bike paths and inundation of low lying houses.<sup>64</sup> Mr Ayre described the impact of a flow of 1600 m<sup>3</sup>/s in the Brisbane River on tide heights as a consideration relevant to the protection of urban areas.<sup>65</sup> It is undesirable if different flood engineers have different interpretations of this term, because it will affect what any of them tries to achieve in pursuance of the objective. If this term is to be used in the manual prepared as part of the longer term review, it should be precisely defined.

If the definition involves diverse concepts, then some attempt must be made to relate those concepts back to the strategies, so that flood engineers can reach a clear understanding of their objectives and primary considerations.

## 'Natural peak flow'

The concept of natural peak flow was relevant to the implementation of strategies W2 and W3 under Revision 7 of the Wivenhoe manual. For example: in W2, the target flow in the Brisbane River at Lowood was capped at the lesser of the 'natural peak flow at Lowood excluding Wivenhoe Dam releases, and 3500 m<sup>3</sup>/s';<sup>66</sup> in W3, the target flow in the Brisbane River is dependent on the timing of the 'naturally occurring peak at Moggill (excluding Wivenhoe Dam releases)'.<sup>67</sup> (The concept is not used in the same way in Revision 9 of the Wivenhoe manual.)<sup>68</sup>

The engineers gave evidence that 'natural peak flow' for the purposes of W2 meant the estimated flow emanating from downstream tributaries and local Brisbane River flows downstream of the dam. For Lowood, that means the flows from the Lockyer Creek; for Moggill the flows from the Lockyer Creek and the Bremer River.<sup>69</sup> The submission from a member of the public referred to above suggested that the term meant instead the flow that would have occurred without artificial intervention; in other words, as though neither Somerset nor Wivenhoe dams had been built. The peak flow for Lowood would consist of the flows from the Stanley and Brisbane rivers in the absence of the dams, as well as the flow from Lockyer Creek.<sup>70</sup> Again, the interpretation is at the least arguable.

If the concept of natural peak flows is to be used in the new revision of the manual, it should be defined.

There are no transition strategies in the current version of the North Pine manual, nor is the protection of urban areas from inundation an objective at that dam. The concept of natural peak flow is not used. Nonetheless, these issues might become relevant in the longer term review of the North Pine manual depending on what strategies are chosen for that dam.

## *Recommendation*

- 17.4 Seqwater should, in creating the new Wivenhoe and North Pine flood mitigation manuals, comprehensively consider:
- the amount of discretion that is able to be exercised by the flood engineers and the senior flood engineers, and the description of the circumstances in which such discretion may be exercised
  - the circumstances in which it might be appropriate to release water in advance of an impending flood on the basis of forecasts from the Bureau of Meteorology
  - if strategies of the form of strategy W2 and W3 in Revision 7 are included in the revised manual, or any strategy defined as a 'transition strategy', when and how those strategies should be implemented
  - if the concept of 'urban inundation' is relevant to the operation of the dam, how it should be defined, and if the definition involves diverse concepts, how those concepts can be related back to the strategies, so that flood engineers can reach a clear understanding of their objectives and primary considerations
  - if the concept of 'natural peak flow' is relevant, how it should be defined.

## Writing the flood manuals

Seqwater did a substantial amount of work to revise the Wivenhoe and North Pine manuals in the short period between the Commission's interim report and the 2011/2012 wet season. The review resolved many inconsistencies and ambiguities that appeared in Revision 7 of the Wivenhoe manual. DERM did not identify any failings requiring it to withhold its approval of the new manual. It involved both lawyers and engineers in its review. It was satisfied by the extensive legal and technical reviews of wording and the clarification of strategies.<sup>71</sup>

The Commission considers, however, that the new Wivenhoe manual is attended by deficiencies which were not present in Revision 7. Some matters of concern, such as the structure of flowcharts, have been outlined above. Another concern is that the writing style has become more legalistic and complex. Definitions have been provided for words that are in common use, such as 'likely'.

The Commission recognises that a clear and precise expression of procedures used in the operation of a dam during flood is not an easy task. The writing required is different from that of engineers' reports or legal documents.

The Commission reiterates its view that the use of a technical writer could assist Seqwater in the preparation of the manuals. A technical writer is a professional writer, skilled in the art of preparing technical or instructional documents. There would be considerable benefit in having the final versions of the manuals written, in their entirety, by a technical writer, who was not bound to follow any particular structure or style adopted in previous iterations of the manuals. Such a technical writer should be independent of the flood engineers who will use the manuals in flood operations, although he or she would, of course, be required to engage substantially with the flood engineers in order to understand the procedures that are to be set out in the manual.

The immunity provided for by section 374 of the *Water Supply (Safety and Reliability) Act 2008* necessitates a legal review of the manuals. The purpose of the legal review should be, though, to confirm the manuals' terms are clear and unambiguous so that a court can determine compliance with them, if required. It should not be to over-define and legalise the document in a way that detracts from its other purposes.

The Wivenhoe and North Pine manuals are the only two flood mitigation manuals approved under the Act. The principles arising from this consideration of those two manuals should also be applied to any flood mitigation manual approved in the future for any dam in Queensland.

## *Recommendations*

- 17.5 The conditions for the use of a particular strategy in all flood mitigation manuals should reflect objective standards.
- 17.6 The Queensland Government should ensure that all flood mitigation manuals include the requirement that those operating the dam during flood events hold current registrations as professional engineers.
- 17.7 Seqwater should consider engaging a technical writer to develop completely new manuals after the operational strategies for Wivenhoe, Somerset and North Pine dams are set by the Queensland Government.
- 17.8 Seqwater should ensure a legal review of the Wivenhoe manual and the North Pine manual is completed before the manual is submitted for approval.

### 17.1.4 A further consideration for the longer term review of the North Pine manual

North Pine Dam is located on the North Pine River, immediately upstream of urban areas that are within the boundaries of the Moreton Bay Regional Council. Its basic characteristics were outlined in the Commission's interim report in section 2.2.10 and the January 2011 flood event in section 2.10. Its full supply level is 39.6 metres.<sup>72</sup> The top of the embankment is 43.28 metres.<sup>73</sup> At Wivenhoe, the flood mitigation capacity of the dam is the volume able to be held between the full supply level and the top of the embankment.<sup>74</sup> Looking at North Pine Dam in the same way, its flood storage capacity is the volume of water able to be held between 39.6 and 43.28 metres.<sup>75</sup>

North Pine Dam is unique among the dams in Queensland which have flood mitigation manuals. It is operated in accordance with prescriptive tables of gate openings and, as operated, has insignificant flood mitigation capacity. Discretion such as that exercised by flood engineers at Wivenhoe is not a feature of the operation of North Pine Dam during flood events. The evidence was that it was built for water supply; flood mitigation was not a primary focus.<sup>76</sup>

However, the dam does have over two vertical metres of flood mitigation capacity.<sup>77</sup> The review of the North Pine manual should result in the Queensland Government's receiving options for operating strategies over a wide range of full supply levels. It should consider in that context whether North Pine should operate as a flood mitigation dam, and if so, whether strategies like those in the Wivenhoe manual should be employed to utilise North Pine Dam's flood mitigation capacity.

## *Recommendation*

- 17.9 The Queensland Government should consider whether North Pine Dam should be operated as a flood mitigation dam when it considers possible operating strategies and full supply levels as part of the longer term review of the *Manual of Operational Procedures for Flood Mitigation at North Pine Dam*.

## 17.2 Review and approval of flood mitigation manuals

The *Water Supply (Safety and Reliability) Act* provides for flood mitigation manuals to be prepared by owners of dams. The government can, by regulation, require the owner of a particular dam to prepare a flood mitigation manual.<sup>78</sup> The Director-General is empowered to approve a manual submitted to DERM for a period of five years or less.<sup>79</sup> There is also provision for amendment of existing manuals.<sup>80</sup> Where there is a flood mitigation manual for a dam, the dam's owner, operator and employees are protected from civil liability for any act or omission done honestly and without negligence in observance of the procedures in the manual.<sup>81</sup>

The Commission examined the review and approval of manuals under the Act. The review and approval of Revision 7 of the Wivenhoe manual can be briefly described as an example. The dam safety regulator, Mr Allen, held a delegation to exercise the Director-General's power to approve a manual. He, in conjunction with other officers, assessed the manual and suggested changes to its terms to Seqwater, some of which were adopted in further drafts. He approved the manual in November 2009.

### 17.2.1 Identity of approver

The choice of operating strategies under flood mitigation manuals has the capacity to affect millions of people. The manual is produced after many competing interests have been balanced; it provides immunity from civil action for a dam operator under certain circumstances. It is the Minister, as the representative of the people, who should approve the manual for use by dam operators. DERM officers should maintain the role of assessing the manual and providing information and advice in order for the Minister to make the decision.

## *Recommendation*

- 17.10 The Queensland Government should amend the *Water Supply (Safety and Reliability) Act 2008* to designate the Minister as the person who must approve a flood mitigation manual.

### 17.2.2 Independence of assessor

The assessment of flood mitigation manuals should be undertaken by a person who is independent of both the flood engineers and those who created the manual. Mr Allen approved Revision 7 of the Wivenhoe manual and assessed Revision 9 before it was approved by the Director-General.<sup>82</sup> Mr Allen has been involved for a long period in the operation of the dams, including in the development of the manuals over many years<sup>83</sup> and has, inevitably, a close professional relationship with the current flood engineers.<sup>84</sup> For reasons given elsewhere (see section 16.12 above), the Commission considers that it would not be appropriate for Mr Allen to review the flood event report prepared in respect of the January 2011 floods at Wivenhoe and Somerset dams. Equally, appointing Mr Allen to assess the new versions of the flood mitigation manuals may give rise to the appearance of a lack of independence and critical oversight by DERM of Seqwater and its manual. That oversight is required by the process of review and approval under the *Water Supply (Safety and Reliability) Act*. There is no suggestion that Mr Allen's previous review of the manual was compromised because of his involvement in the development of the manual or his relationship with the flood engineers. However, it would be appropriate in future that a clearly independent person be chosen to perform this role.

Mr Allen made the point that whoever is the assessor will need to understand how the dam is operated to assess the manual.<sup>85</sup> Expertise in dam operations is necessary, but knowledge of particular dams should not be needed.

The manual itself should clearly define the procedures to be followed. If a person who does not already know the procedures cannot understand them from the manual, it is clearly not fulfilling its purpose. See section 17.1, above, for the purposes of a flood mitigation manual.

## ***Recommendation***

- 17.11 The assessment of flood mitigation manuals should be completed by a person with appropriate expertise who has had no involvement in its development, at any stage, and who can be seen to be independent of all individuals who were so involved.

### **17.2.3 Work procedure**

A work procedure was developed in 2010 for the assessment of flood mitigation manuals: DS 5.1 *Flood mitigation manual for a dam*.<sup>86</sup> That work procedure had a number of inadequacies that were explored during the Commission's first round of hearings:

- By way of information for action officers, the document<sup>87</sup> included the statement that '[t]he aim of the flood mitigation manual is to give the dam owners indemnity for flood release operations if they are conducted in accordance with the provisions of the approved manual'. The dam safety regulator, Mr Allen, who prepared DS 5.1,<sup>88</sup> agreed that this choice of words was poor.<sup>89</sup> Clearly the purpose of a flood mitigation manual is to set out the procedures by which a dam mitigates floods.
- The checklist against which manuals were to be judged did little more than mirror the contents of Revision 7 of the Wivenhoe manual.<sup>90</sup>
- The work procedure failed to deal with the competing aims that are involved in flood mitigation manuals, which will involve putting some people at some degree of risk for the overall benefit of the community. Mr John Bradley, then Director-General of DERM, agreed in the Commission's public hearings that the review of the manual should address this.<sup>91</sup> The question of whether the manual presented to DERM is consistent with the balance as struck by the executive was not posed in work procedure DS 5.1. That may be attributable to the fact the executive has not, in the past, clearly decided and communicated what that balance should be.

In 2011, DERM reviewed its work procedures for the review of flood mitigation manuals. It has created a new version of work procedure DS 5.1 *Flood mitigation manual for a dam*.<sup>92</sup> This is to be used for the assessment of a new flood mitigation manual; that is, for a dam that has never had a manual before. The new DS 5.3 *Processing a flood mitigation manual for a dam following review*<sup>93</sup> is the procedure to use for the assessment of a new revision of a manual that already exists. It is that procedure which was used for the assessment of Revisions 8 and 9 of the Wivenhoe manual and Revision 6 of the North Pine manual in 2011, and will be used relevant to the manuals for those dams in the future.

Both new procedures deal with the first point made above; the offending words have been removed. As to the second point, the checklist of factors still aligns closely with the content of the current Wivenhoe and North Pine manuals.<sup>94</sup> The Commission does not have evidence as to whether the work procedure includes consideration of all topics that should be considered in the assessment of a flood mitigation manual. It is not possible, on the evidence, to give unqualified endorsement to either of DS 5.1 or 5.3. The Queensland Government may consider it prudent to obtain independent expert advice about what should be contained in flood mitigation manuals to reflect this in its work procedures.

Neither DS 5.1 nor 5.3 deals with the final point made above. The most important consideration in an assessment of the manual by DERM, aside from compliance with the Act, is whether it reflects the decision as to the operating strategies and balance between objectives decided by the government. If the manual does not reflect the executive's will, it should be rejected. This does not mean that the executive's policy decisions must be inserted into the procedure, only that the assessor should confirm that the manual is consistent with the government's policy.

One question posed to the assessor by the work procedures is whether the manual complies with the outcomes of this Inquiry.<sup>95</sup> The Commission's recommendations have no status without executive commitment to implement

them. Even when such a commitment is given, the executive may vary or supplement the approach advocated by the Commission. It is the executive, not the Commission, to which DERM must look for the policy position that is reflected in flood mitigation manuals.

DERM should also ensure that the manual is in such a form that a ready determination can be made as to whether its procedures have been observed, so that the manual is capable of playing its role under section 374 of the *Water Supply (Safety and Reliability) Act 2008*. That requires it to provide objective standards by which decisions are to be made.

## Recommendations

- 17.12 The Queensland Government should continue to assess and review the adequacy of work procedures DS 5.1 and 5.3, having regard to the need for flood mitigation manuals to reflect the will of the executive.
- 17.13 Prior to approving a flood mitigation manual, the Queensland Government should be satisfied that its terms are expressed in a manner that allows a determination of compliance with it to be made by reference to objective standards.

### 17.3 Review of flood event reports

When an emergency action plan for a dam is triggered by a flood, a flood event report must be prepared by the owner of the dam and submitted to DERM.<sup>96</sup> The content of the flood event report is specified in the emergency action plan for each referable dam. The emergency action plan will usually incorporate a provision requiring the dam owner to prepare a flood event report, within 30 days of a flood, that includes:<sup>97</sup>

- a description of the flood event
- instrument readings, where appropriate
- a description of any observed damage
- photographs
- details of communication and actions which took place during the flood
- a description of how the emergency action plan was implemented during the event
- comment on the adequacy of the emergency action plan and any changes proposed.

A similar requirement to produce flood event reports is imposed on the owners of referable dams that have flood mitigation manuals.<sup>98</sup> This requirement is triggered when there are flood releases from the dams.<sup>99</sup> The required content of these reports is set out in the flood mitigation manuals and usually involves the production of a more comprehensive report than that required under an emergency action plan.<sup>100</sup> (The operators of dams with both emergency action plans and flood mitigation manuals may have obligations under each; Seqwater, the operator of Wivenhoe Dam, for example, has an obligation under both the emergency action plan<sup>101</sup> and the manual<sup>102</sup> to write a report.)

In the 2010/2011 floods, 24 emergency action plans were activated and flood event reports submitted to DERM.<sup>103</sup> These were reviewed by a dam safety engineer.<sup>104</sup> Reports were also prepared and submitted under the Wivenhoe manual and the North Pine manual.<sup>105</sup> The only serious damage to dams identified in any of these reports was erosion in the Wivenhoe Dam spillway chute.<sup>106</sup> In the course of the flood event report being prepared for the North Pine Dam, a concern was raised regarding the design flood hydrology for North Pine Dam.<sup>107</sup> The Commission deals with the review of the Wivenhoe and Somerset dams flood event report in section 16.12, above.

The Commission is not in a position to assess the adequacy of the flood event reports DERM received and reviewed following the 2010/2011 floods. The level of detail in these reports varies considerably.<sup>108</sup> To the extent that DERM identified any inadequacies in the level of information provided in the flood event reports it should, if it has not done so already, raise those inadequacies with the relevant dam operators and require that all missing information be provided.

Flood event reports are only prepared if an emergency action plan is activated or flood releases are made under a flood mitigation manual. The triggers for the activation of the emergency action plan are not the same for all dams. Some dam owners elect to have their emergency action plans activated during relatively small floods, whereas others are triggered only in extreme floods.<sup>109</sup> While DERM does make some enquiries about whether an emergency action plan has been triggered if it has reason to believe this may have occurred, it is the responsibility of the dam owner to identify the need for a flood event report to be submitted.<sup>110</sup>

DERM does not have a formal work procedure for the review of the flood event reports.<sup>111</sup> The director of the dam safety unit within DERM said that while there may be some benefit to having such a procedure for the review of flood event reports produced under emergency action plans, it is unlikely to be helpful for reviewing the reports produced under flood mitigation manuals, given that only three dams have flood mitigation manuals and these manuals are under review.<sup>112</sup> The Commission is not aware of any particular issue arising out of DERM's review of the flood event reports following the 2010/2011 floods, but there appears to be an obvious advantage in developing a procedure for the review of flood event reports prepared following future floods. It would ensure that expectations of what is required by way of review are clear and that institutional knowledge is retained even if experienced individuals leave DERM. In particular, it would be useful for DERM to formalise a process for ascertaining which dams may require a flood event report to be submitted, reminding the owners of those dams of their obligation to submit a flood event report, and reviewing such reports.

The Commission notes the comments of the director of the dam safety unit that drafting formal work procedures for the review of flood event reports produced under flood mitigation manuals may not be an efficient use of time, as the reviewer would be a skilled engineer who would inevitably have to have reference to the flood mitigation manual itself. Drafting a work procedure that restates the flood mitigation manual may not, therefore, be a worthwhile exercise, particularly as the manuals are presently under review. However, there is a benefit to ensuring that there is a formal and transparent process for receiving and reviewing reports produced under flood mitigation manuals in the same way as those produced under emergency action plans.

## Recommendation

17.14 The Department of Environment and Resource Management should prepare formal work procedures for the review of flood event reports created under emergency action plans and flood mitigation manuals. These should include procedures for:

- making enquiries with the owners of referable dams that have catchments that have been subject to heavy rainfall (or where there is other reason to believe the emergency action plan has been triggered) as to whether the emergency action plans have been triggered
- reminding owners of referable dams that have had emergency action plans triggered of their obligation to submit a flood event report
- upon receipt of a flood event report, reviewing it, identifying any dam safety or other issues or areas where insufficient detail has been provided, raising those matters with the dam owner or other affected party and identifying appropriate remedial steps
- raising any issues identified in the report that are beyond the expertise of the Department of Environment and Resource Management, or are likely to be of particular interest to another body, with the appropriate body
- keeping a record of the process and results of the review of the flood event report
- fixing an appropriate timeline for the completion of each of the above steps: the time required may depend on specific circumstances, but must allow for any potential safety issues to be identified and remedied efficiently.

## 17.4 Bank slumping

Before publication of the interim report, the Commission received several submissions from people whose property had suffered severe erosion or bank slumping (where chunks of riverbank become unstable and topple or slide into the river) during or immediately following the January 2011 flood event at Wivenhoe Dam. These submissions provided a stark reminder of the magnitude of the flood and the impact the river can have on land bordering it.

The majority of the submissions were received from people in the mid-Brisbane River region between Wivenhoe Dam and Mt Crosby Weir. Other submissions were received from landowners upstream of Wivenhoe Dam in and around the township of Harlin. Several of these landowners contended that releases from Somerset and Wivenhoe dams were at least partly to blame for the damage to riverbanks.<sup>113</sup>

In response, Seqwater submitted that the question of whether the operation of Wivenhoe and Somerset dams caused or contributed to erosion or slumping of the Brisbane River's banks was a matter for expert evidence. This view was supported by Mr Terry Wall, then acting Director-General of DERM, who indicated that a comprehensive geomorphological assessment was necessary to determine the cause of the bank slumping.<sup>114</sup>

The Commission accepted Seqwater's submissions on this point, and called for it to provide an expert report on the subject. DERM was also invited to provide expert evidence, but did not.

On 10 October 2011, the Commission received a report from Dr Bruce Abernethy, of Sinclair Knight Merz, an expert on fluvial geomorphology (the study of the behaviour of river channels and human impacts thereon).<sup>115</sup> Dr Abernethy's report included an assessment of riverbank erosion and slumping in the upper and mid-Brisbane River regions. It did not, however, include a consideration of the likely impact of different modes of operation of the Wivenhoe and Somerset dams on erosion, instability and slumping. Accordingly, the Commission asked Dr Abernethy to prepare a supplementary report that considered this issue and provided a more detailed analysis of the riverbank erosion and slumping process.

### 17.4.1 Riverbank erosion and slumping in January 2011

Both the upper and mid-Brisbane River regions experienced significant riverbank erosion and slumping. At Harlin, upstream of Wivenhoe Dam, for example, the river channel underwent a major transformation as large sections of the riverbank fell away.<sup>116</sup> One Harlin property holder's submission indicated that some 30 acres of his property had been lost as a result of the slumping,<sup>117</sup> Another reported the loss of approximately 4.5 acres.<sup>118</sup> A number of photographs vividly illustrating the dramatic effects of riverbank slumping have been provided to the Commission. The photograph to the right is just one of these. It shows a 3.9 metre sheer cliff created by the slumping of bank material into the river.



*3.9 metres depth of land lost at Harlin (photo courtesy Jenny Moore)*

*Source: Exhibit 41, Statement of Jenny Moore, 7 April 2011 [p13]*

The effects of riverbank slumping were equally dramatic in the mid-Brisbane River region downstream of Somerset Dam and Wivenhoe Dam, as illustrated in the following photograph, showing the loss of approximately 8 hectares of land from a farm in the mid-Brisbane River region.



*Approximately eight hectares of farm washed away*

*Source: Mid Brisbane River Irrigators, Submission to the Queensland Floods Commission of Inquiry, 11 March 2011, Annexure 6*

In many instances, the damage caused by the slumping cannot feasibly be repaired by landholders. While nature will eventually take its course, and restore the riverbanks to some extent, that process is likely to take many years.<sup>119</sup>

### 17.4.2 The causes of riverbank erosion and slumping

That the banks of the Brisbane River were damaged is uncontested. What is less certain is the cause of the damage, and the extent to which the operation of Wivenhoe and Somerset dams played a part.

The banks of rivers change over time, either through natural processes or human intervention.<sup>120</sup> The causes of bank erosion and slumping are many and varied. Some causes operate locally, while others are associated with wider changes to the river's flow, for example, by way of damming.<sup>121</sup> Changes to a river's flow caused by the construction of a dam may result in the complete readjustment of the river's channel over a period of up to 500 years.<sup>122</sup>

On a local level, a range of factors determines whether and how erosion or slumping occurs.<sup>123</sup> In river reaches subject to flooding, such as those in the upper and mid-Brisbane River regions, riverbanks are damaged primarily by a process of slumping.<sup>124</sup> Riverbank slumping generally occurs as a result of bank instability caused by either a reduction of a bank's internal strength initiated by complex processes occurring below the earth's surface, or a change in the form of the bank (usually as a result of scour – the direct removal of bank materials by the physical action of flowing water).<sup>125</sup> When the stability of a bank is compromised by these processes, whole blocks of material may slide or topple from the bank into the river channel.<sup>126</sup>

The instability that leads to riverbank slumping commonly occurs when an increase in a river's flow, which saturates the riverbank, is followed by a corresponding decrease in flow, which removes the support the water was providing to the saturated bank, leading it to collapse into the river under its own weight.<sup>127</sup> The rate of slumping in such circumstances depends on several factors, including bank composition and moisture content and the speed of water

flow.<sup>128</sup> Given that bank material may vary significantly from one part of a river to another nearby section, different failure modes may be observed in close proximity to each other.<sup>129</sup> These factors make it difficult to predict the occurrence of bank failure.<sup>130</sup> Generally speaking though, the faster a river's level falls following elevated flow, the greater the likelihood that slumping will occur.<sup>131</sup>

The riverbank erosion and slumping process is further complicated by landholder activity. The effect of floodwater on riverbanks may, for example, be mitigated considerably by vegetation growing on and around riverbanks. Where flooding occurs in areas where vegetation has been cleared, bank slumping is likely to be greater.<sup>132</sup>

Although the process is complex, it is possible to provide a broad summary of the circumstances in which bank slumping may occur. According to Dr Abernethy, the conditions necessary for slumping will arise where a flood:

- is large enough to wet the higher parts of the bank
- is of sufficient duration to allow water to seep into the bank
- recedes faster than the banks are able to drain.<sup>133</sup>

It is trite to say that the operation of a dam may have an impact on the size, duration and recession of a flood. The concern expressed by upper and mid-Brisbane River landholders regarding the impact of the operation of Wivenhoe Dam on their riverbanks is, therefore, entirely understandable.

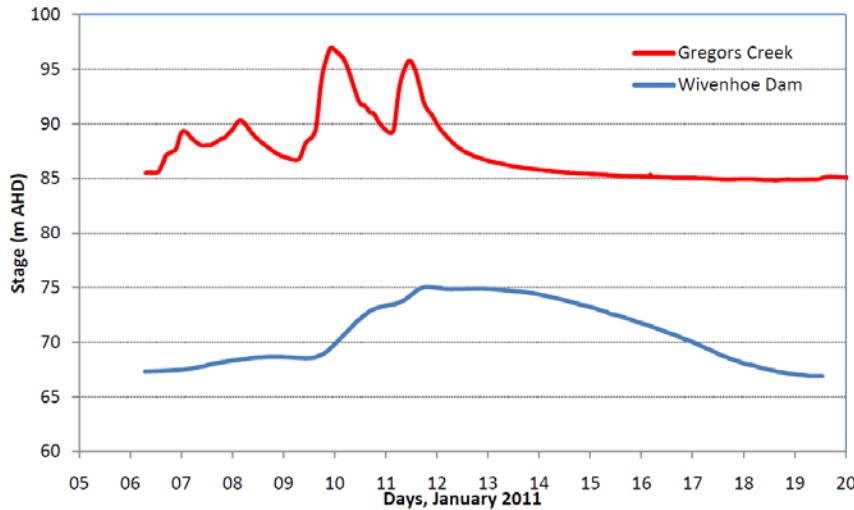
### 17.4.3 Slumping in the upper-Brisbane River

The first report provided by Dr Abernethy includes a review of the flood damage at Harlin<sup>134</sup>. Dr Abernethy's report echoes the observations of landholders in respect of the severity of bank slumping and assesses the likely impact of Wivenhoe Dam on it.

In doing so, Dr Abernethy reviews the river heights at the Gregors Creek gauge, which is downstream of Harlin and approximately 83 kilometres upstream of the Wivenhoe Dam wall. Figure 17(a) below sets out the water levels at both the Gregors Creek gauge and Wivenhoe Dam for the period between 6 and 20 January 2011. A review of Figure 17(a) reveals that between 8 and 13 January 2011, the water level at Gregors Creek gauge rose and fell on three separate occasions independently of the level of Lake Wivenhoe, which rose steadily from 8 January 2011 until 11 January 2011, levelled off, and then began falling towards the end of 13 January 2011.

The lack of correlation between the water levels at Gregors Creek and Wivenhoe Dam led Dr Abernethy to conclude that the river flow and, in turn, bank slumping at Harlin was controlled by local channel conditions; the operation of Wivenhoe Dam during the flood was not responsible for the damage to the riverbanks observed at and around Harlin.<sup>135</sup> The force of that reasoning is obvious, and the Commission accepts the conclusion as correct.

**Figure 17(a)**



Stage heights at Gregors Creek and Wivenhoe Dam gauges

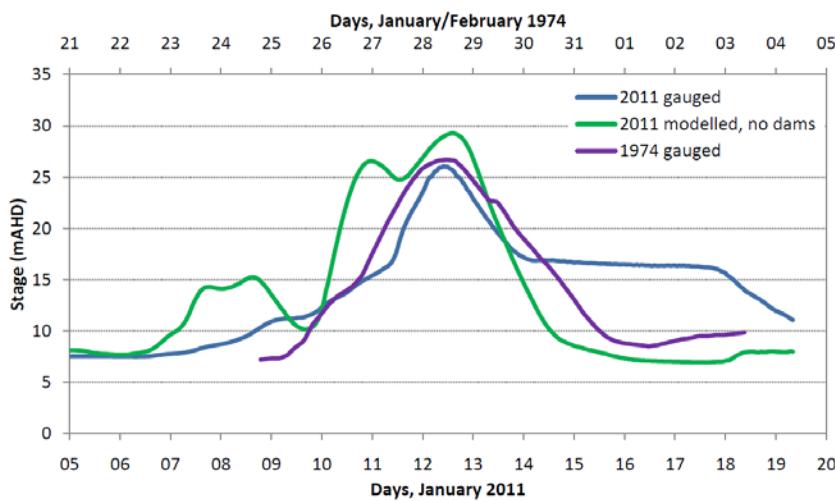
Source: Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p6].

## 17.4.4 Slumping in mid-Brisbane River

Again, Dr Abernethy's first report supports landholders' assertions that substantial riverbank slumping occurred in the mid-Brisbane River region as a result of the flooding. Dr Abernethy's report, however, diverges from the submission made by some landholders that, as a result of the pattern of releases from Wivenhoe Dam, the river flowed at a higher rate and receded faster in January 2011 than it did in 1974, thereby causing additional bank slumping.<sup>136</sup>

Figure 17(b) below sets out a comparison between the level of the Brisbane River at Mt Crosby Weir during the 2011 flooding as compared to the observed 1974 levels, and a calculation of the levels that would have been experienced in 2011 if Wivenhoe Dam had not been built. The graph demonstrates that the management of releases from Wivenhoe Dam in 2011 led to a lower peak and more gradual recession than would have occurred in the absence of the dam.<sup>137</sup> It also reveals that the process of drawing down Wivenhoe Dam to full supply level resulted in the river level remaining elevated for longer than it did in 1974. On those bases, Dr Abernethy concluded that the operation of the Wivenhoe and Somerset dams between 7 and 14 January 2011 did not exacerbate the riverbank damage reported in the mid-Brisbane River region.<sup>138</sup>

Figure 17(b)



Modelled and gauged hydrographs at Mt Crosby Reservoir

Source: Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p10].

This conclusion was founded on a comparison between observed flow rates and those that would have been experienced had the dams not existed, rather than a consideration of the likely impact of different modes of operation of the Wivenhoe and Somerset dams on erosion and slumping. With that in mind, it should be noted that Dr Abernethy's first report does observe that the maintenance of a higher water level between 14 and 18 January extended the period of riverbank inundation, potentially allowing water to seep further into the bank than it did during previous flooding.<sup>139</sup> As a result of this, and despite the fact that the second drawdown (from 18 January 2011) occurred at a slower than natural rate,<sup>140</sup> the banks may not have drained sufficiently.<sup>141</sup> While, in light of the great variation in bank and flow conditions at different locations, Dr Abernethy was not able to conclusively determine whether the slumping was attributable to the combination of the prolonged elevated flow between 14 and 18 January 2011 and the subsequent drawdown from 18 January 2011 onwards,<sup>142</sup> it is possible that this was the case.

In his second report,<sup>143</sup> Dr Abernethy gave a further explanation of his inability to reach a firm conclusion on this point. He noted that the complex interaction between the various factors involved in riverbank slumping means that a more conclusive assessment cannot be made without conducting an in-depth program of field testing of the bank properties at various locations.<sup>144</sup> In considering the factors involved in riverbank erosion, Dr Abernethy gave his opinion that significantly less slumping would have been observed in the mid-Brisbane River region if naturally occurring vegetation had not been cleared from the riverbanks.<sup>145</sup> On a general level, though, Dr Abernethy

confirmed that the longer a river is maintained at a high level, the slower the drawdown needs to be to minimise bank slumping.<sup>146</sup>

In summary, given the size of the flood, it is likely that substantial bank erosion and slumping would have occurred in the mid-Brisbane region regardless of the pattern of releases from Wivenhoe Dam.<sup>147</sup> Indeed, it should be noted that extending the drawdown longer than would have occurred naturally may, in some instances, have contributed to increased bank slumping.<sup>148</sup> Nevertheless, it is possible that had the drawdown phase been extended, particularly in the period from 18 January onwards, the extent of the bank slumping may have been reduced.

#### 17.4.5 Riverbank slumping and dam operation strategies

Part 3.6 of the Wivenhoe manual as it stood in January 2011 (and in its present form) requires that consideration be given to reducing potential bank slumping. It notes that '[r]apid draw down of stream levels where banks are saturated should be avoided if this can be managed within the other flood mitigation objectives'.<sup>149</sup>

The ability of the flood engineers to draw down the lake level gradually so as to minimise bank slumping is constrained by all the higher ranked flood mitigation objectives in the Wivenhoe manual. Of particular relevance are the objectives to ensure dam safety and minimise disruption to rural life. Part 3.2 of the manual provides that the structural safety of the dams is of paramount importance and observes that, in view of the significant probability of two or more flood producing storms occurring in short succession, floodwaters should be emptied within seven days of the flood peak.<sup>150</sup> Dam operators are also required to read part 3.6 of the manual subject to the requirement in part 3.4 to minimise any disruption to rural areas, for example, by limiting the inundation of downstream bridges.

It appears that the operation of the dam during the January 2011 flooding accorded with part 3.6 of the manual (as circumscribed by part 3.2); the drawdown of the dam extended until the morning of 19 January 2011, approximately seven days after the peak of the flooding.<sup>151</sup> Releases from Wivenhoe Dam had remained stable at approximately 3500 m<sup>3</sup>/s between 14 January and 17 January 2011 before decreasing progressively until the morning of 19 January 2011. This caused the river level at Mt Crosby Weir to remain stable between 14 and 18 January 2011 and, as noted above, may have resulted in parts of the riverbank becoming saturated and collapsing under their own weight in the subsequent drawdown phase.<sup>152</sup>

The manual allows for an extension of the drawdown because of downstream flood conditions. It does not, however, explicitly contemplate prolonging the drawdown beyond seven days in an attempt to limit the effects of riverbank slumping. Given that bank slumping may be reduced if the drawdown period is extended so that the mid-Brisbane River's level decreases more gradually,<sup>153</sup> this may be unduly inflexible.<sup>154</sup> As already observed, the longer a river flows at a high level, the slower the drawdown must be to minimise slumping.<sup>155</sup> Where there is no risk to Wivenhoe Dam's structural safety, and no significant danger to the safety of downstream communities and infrastructure,<sup>156</sup> it may be prudent to prolong the drawdown of the lake in an effort to reduce downstream bank slumping.

The same is true of the interaction between parts 3.6 and 3.4 of the manual. In certain circumstances, it may be appropriate to extend the inundation of a lower level crossing (provided lasting damage to that crossing is not likely to result), and the associated inconvenience to local residents, in order to reduce the likelihood of significant bank slumping.

Both assessments necessitate a balancing of competing interests that is best undertaken by the Queensland Government in the consideration of appropriate operating strategies for Wivenhoe and Somerset dams during the longer term review of the manual. See also recommendation 17.3 above.

#### *Recommendation*

- 17.15 As part of the longer term review of the *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam* the Queensland Government should consider whether the dam operators should be able to extend the drawdown of the lake beyond seven days in order to reduce downstream bank slumping.

## 17.5 Wivenhoe Power Station

The Wivenhoe Power Station is a pumped storage hydroelectric power station located on the eastern side of Wivenhoe Dam. The power station has been operating since 1984.<sup>157</sup> On 1 July 2011, the State of Queensland transferred ownership and management of the power station from Tarong Energy Corporation to CS Energy Limited. Both companies are government-owned corporations.

In view of this change in ownership, this section refers to Tarong Energy in its consideration of the January 2011 flooding and the terms of documents developed or entered into by Tarong Energy. Recommendations for the future operation of the Wivenhoe Power Station, on the other hand, are made by reference to CS Energy.

### 17.5.1 Splityard Creek Dam

The Wivenhoe Power Station produces electricity by releasing water from Splityard Creek Dam into Wivenhoe Dam, which drives the power station's turbine generator. Splityard Creek Dam is an earth and rock fill dam with a capacity of approximately 28 700 megalitres. It is 76 metres high and 1120 metres long. The dam's embankment crest is at a level of EL (elevation above sea level) 168 metres<sup>158</sup> and its full supply level is 166.5 metres.

Splityard Creek Dam has a relatively small catchment area of 3.6 square kilometres. It is designed with a spillway capable of releasing 420 m<sup>3</sup>/s, substantially greater than the largest inflows recorded during the January 2011 flooding and larger than the peak flow associated with the probable maximum flood.<sup>159</sup>

At full capacity, the dam allows the power station to operate for approximately 10 hours.<sup>160</sup> The dam can be re-filled via a pumping system that recycles water from Lake Wivenhoe into the dam.

### 17.5.2 Interaction between Splityard Creek Dam and Wivenhoe Dam

The storage capacity of Splityard Creek Dam pales in comparison with that of Wivenhoe Dam. When Splityard Creek Dam is full, its contents equate to less than two per cent of the water held by Wivenhoe Dam at full supply level, and less than one per cent of the water held when Wivenhoe Dam's flood compartment is also full.

Wivenhoe Dam is designed on the premise that, even in a flood with an average recurrence interval of 100 000 years, the water level will not exceed 80 metres.<sup>161</sup> That level is the crest of the embankment; if the water were to exceed 80 metres, the risk of dam collapse would rise dramatically. If closed, the radial gates in the dam wall are likely to experience a critical structural failure if the water level exceeds 79 metres.<sup>162</sup> At either of those levels, a release of the full capacity of Splityard Creek Dam would induce a rise in Wivenhoe Dam's level not exceeding 17 centimetres.<sup>163</sup> It follows that only in extraordinary circumstances could the operation of the Wivenhoe Power Station be significant to the structural integrity of Wivenhoe Dam. Similarly, it is unlikely that a release from Splityard Creek Dam would trigger one of Wivenhoe Dam's fuse plugs (located at 75.7, 76.2 and 76.7 metres).

That said, even small increases in the level of Wivenhoe Dam, such as those resulting from releases from Splityard Creek Dam, could affect the way the dam is operated by the flood engineers. For example, the engineers may:

- change strategy under the Wivenhoe manual if the dam level reaches a certain trigger height (for example, from W1 to W2 or W3 if the actual lake level rises above 1.5 metres above full supply level)<sup>164</sup>
- increase releases in a way that causes bridge closures downstream of Wivenhoe Dam as the lake level rises through different trigger levels under strategy W1<sup>165</sup>
- if not advised of changes to the Wivenhoe Dam level resulting from releases from Splityard Creek Dam, make errors in adjusting the hydrologic models used to predict likely dam levels (for example, by altering the runoff coefficient).<sup>166</sup>

The Wivenhoe manual recognises the impact of releases from Splityard Creek Dam by requiring personnel at Wivenhoe Dam to take the operation of the power station into account during a flood.<sup>167</sup> It should be noted that the manual observes that releases from Splityard Creek Dam can result in increases of up to 300 millimetres in the Wivenhoe Dam lake level.<sup>168</sup> The comment in the manual is not supported by any further data and is significantly larger than the figure Tarong Energy has calculated as representing the maximum impact of such releases.<sup>169</sup> It appears to have been included simply to draw attention to the necessity for Wivenhoe Dam operators to consider potential releases from Splityard Creek Dam. The reason for this discrepancy is unclear. It may, for example, have

arisen because the two calculations were premised on different Wivenhoe Dam levels. CS Energy and Seqwater should ensure that any confusion as to the impact of releases is resolved and amend the manual accordingly.

### 17.5.3 Wivenhoe Power Station during the January 2011 flooding

At the height of the January 2011 rainfall, inflow to Splityard Creek Dam over a four hour period averaged approximately 30 m<sup>3</sup>/s,<sup>170</sup> substantially less than the spillway capacity of the dam.<sup>171</sup>

There are two transmitter devices at Splityard Creek Dam that provide remote measurements of its water level. At approximately 1.30 pm on 10 January 2011, one of these transmitters failed. Tarong Energy's usual practice in the event of transmitter failure is to have a staff member conduct a physical observation of the dam to ensure that the readings provided by the remaining transmitter are accurate. This was not possible during the flood event, because the access road to the dam had been obstructed by a number of landslides.<sup>172</sup> There were no surveillance cameras or other devices that would have allowed staff to conduct remote visual monitoring of dam levels.

Tarong Energy considered that there was little risk that the dam would be overtopped by water.<sup>173</sup> Nevertheless, there were concerns that the high rainfall and associated runoff might lead to erosion of the dam wall, slipping of the dam rim or rock movement.<sup>174</sup> In light of the transmitter failure and access difficulties, Tarong Energy decided to reduce the dam level by commencing power generation and, in doing so, releasing water into Wivenhoe Dam.<sup>175</sup> Splityard Creek Dam's water level at this time was EL 163.3 metres.<sup>176</sup> Power generation commenced at approximately 11.00 am on 11 January 2011 and continued until shortly before 7.00 pm,<sup>177</sup> by which time approximately 5262 megalitres of water had been released into Wivenhoe Dam.

When this release is considered together with smaller releases that occurred on 10 January 2011, a total of 8647 megalitres of water was released from Splityard Creek Dam into Wivenhoe Dam by the operation of the power station on 10 and 11 January 2011.<sup>178</sup> Accounting for the recycling of water back into Splityard Creek Dam before the 10 January 2011 release, the operation of Wivenhoe Power Station resulted in a net addition of approximately 5887 megalitres to Wivenhoe Dam during that period.<sup>179</sup>

The release that took place on 11 January 2011 cannot sensibly be considered in isolation from other inflows into Wivenhoe Dam. The total inflow into Wivenhoe Dam in the 24 hours from 12.00 am on 11 January 2011 was approximately 635 616 megalitres.<sup>180</sup> Releases from Splityard Creek Dam comprised less than one per cent of this amount. When releases from Splityard Creek Dam began, the water level at Wivenhoe Dam was approximately EL 74.10 metres. Releases continued until shortly before 7.00 pm, by which time Wivenhoe Dam had reached its peak level of EL 74.97 metres. In those circumstances, the release from Splityard Creek Dam on 11 January 2011 is likely to have resulted in the level of Wivenhoe Dam rising by approximately four centimetres.<sup>181</sup>

On Tarong Energy's calculations, even if it had elected to release approximately 23 500 megalitres, the full power generation capacity of the Splityard Creek Dam (and more than four times the actual release on 11 January 2011), Wivenhoe Dam's level would only have risen by 17 centimetres.<sup>182</sup>

At the time of the release, Wivenhoe Dam was already being operated in accordance with strategy W4, (that is to say that Seqwater's sole consideration was the safety of the dam).<sup>183</sup> Releases from Splityard Creek Dam did not, therefore, result in a change in the release strategy employed by Seqwater. Additionally, there was little danger that releases from Splityard Creek Dam would trigger any of Wivenhoe Dam's fuse plugs. This is fortunate, but no guarantee that releases in future flood events will be similarly inconsequential.

#### *Recommendation*

17.16 CS Energy should supplement physical monitoring of Splityard Creek Dam with visual monitoring by installing surveillance cameras or similar devices.

## 17.5.4 Communication about releases

Tarong Energy's (and now CS Energy's) right to take water from Wivenhoe Dam for the operation of the Wivenhoe Power Station is subject to the terms of a Deed of Practice for Wivenhoe Dam and Wivenhoe Power Station entered into by the predecessors of Tarong Energy and Seqwater on 22 October 1987. Among other things, the deed requires Wivenhoe Power Station to be operated in a manner that, as far as practicable, assists Seqwater in its attempts to mitigate flooding of the Brisbane River.<sup>184</sup>

The deed of practice also includes an acknowledgment by both parties of the Wivenhoe Manual<sup>185</sup> and requires Tarong Energy to assist Seqwater in its implementation.<sup>186</sup>

The deed of practice contains an express requirement that Seqwater notify Tarong Energy once it forms an intention to act in a manner that may result in a variation of the level of Wivenhoe Dam. It does not, however, impose any corresponding obligation on Tarong Energy. Notwithstanding the absence of such an obligation, a communication protocol was established on 7 October 2010. This protocol requires Tarong Energy to inform Seqwater of any movement of water between Splityard Creek Dam and Wivenhoe Dam once the Wivenhoe Dam level exceeds EL 67 metres.<sup>187</sup>

Tarong Energy's adherence to this protocol in the period immediately following its adoption appears to have been somewhat variable; a number of releases in October and November 2010 occurred in the absence of any notification.<sup>188</sup> The same is true of the January 2011 flood event at Wivenhoe Dam. Tarong Energy provided notice via email of the release of approximately 3385 megalitres on 10 January 2011,<sup>189</sup> but did not adhere to the protocol on 11 January 2011, when it released 5262 megalitres without notifying Seqwater.<sup>190</sup>

As at 11 January 2011, Wivenhoe Power Station was being controlled remotely by Tarong Energy employees situated at the Tarong Power Station, 180 kilometres north-west of Brisbane. Personnel at the Tarong Power Station, rather than at the Wivenhoe Power Station, were primarily responsible for notifying Seqwater of the releases.<sup>191</sup> Wivenhoe Power Station personnel, for their part, were engaged in attempts to prevent the influx of water into the power station machine hall.<sup>192</sup> Because of access difficulties, both power stations were operating under a skeleton staffing arrangement.<sup>193</sup>

From approximately 5.00 pm on 11 January 2011, Tarong Energy personnel experienced a loss of both telephone and email communications.<sup>194</sup> This loss of communications was caused by a power outage in the Brisbane central business district, where Tarong Energy's corporate network is based.<sup>195</sup> The impact of the corporate network outage was compounded by difficulties with mobile phone reception. Personnel at the Wivenhoe Power Station also reported difficulties with mobile phone reception throughout the flood event.<sup>196</sup>

These factors do not, of themselves, provide a satisfactory explanation for the failure to advise Seqwater of the releases before they occurred. The release began several hours before the corporate network outage. And although the reduced staff numbers undoubtedly placed additional burdens on the personnel who were able to attend work, at both Wivenhoe Power Station and Tarong Power Station, the protocol for notification of water movements is not onerous. It is unlikely that the preparation of a brief email outlining estimated flow rates, releases and pumping times would have significantly impinged upon the ability of Tarong Energy personnel at either power station to perform their other functions.

In the absence of any other communication, Seqwater's flood operations centre directed its operations manager to telephone an employee at Wivenhoe Power Station. Shortly before 6.00 pm on 11 January 2011, Seqwater's operations manager left a voice message requesting that no releases be made from Splityard Creek Dam.<sup>197</sup> Because of poor mobile phone reception, this message was not received for approximately 45 minutes.<sup>198</sup> Tarong Energy ceased power generation on receipt of the message; Seqwater was advised accordingly at approximately 6.41 pm.<sup>199</sup>

For clarity, the interactions between Tarong Energy and Seqwater regarding releases on 11 January 2011 can be summarised as follows (note that times are approximations only):

11.00 am	Releases from Splityard Creek Dam into Wivenhoe Dam commence
5.00 pm	Tarong Energy's corporate communication network fails as a result of a power outage
6.00 pm	Seqwater leaves a voice message requesting that no releases be made from Wivenhoe Power Station
6.41 pm	Seqwater's message is received and releases from the power station are stopped

Again, there is no evidence that Tarong Energy's failure to notify Seqwater of the releases created any risk that Wivenhoe Dam's fuse plugs would be triggered.<sup>200</sup> Tarong Energy personnel were subject to a number of important, competing demands and successfully ensured that the power station did not suffer significant flood damage. Nevertheless, the failure to notify Seqwater of the release should not be ignored. A similar breakdown in communications in future flood events could have damaging consequences.

While the failure to adhere to the protocol regarding dam releases cannot be attributed to the failure of internet and telephone communications from 5.00 pm on 11 January 2011, similar technological difficulties may have a greater impact in future flood events. The communication protocol, for example, relies on email communication. Mobile phone reception is regularly poor at the power station.<sup>201</sup> Experience in the January 2011 flooding demonstrates that these methods of communication may not be readily available when they are needed most. CS Energy has acknowledged that two-way radios, independent of any corporate communications network, would assist in ensuring the maintenance of appropriate communications with Seqwater.<sup>202</sup> The protocol should be updated to remove any ambiguity as to how and when information about releases is communicated and to ensure that, in circumstances where advice as to releases cannot be transmitted by email, CS Energy and Seqwater are able to communicate by phone or, if that is not possible, radio. The necessary radio equipment should be made available to relevant personnel. Arrangements should also be made to ensure that telephone and email communications at the power station are not entirely dependent on a network located off-site: possible means of doing so include installing a conventional land line telephone service, obtaining access to mobile internet and/or improving mobile phone reception.

As observed above, during the 2011 flooding Wivenhoe Power Station was operated by personnel who were not physically present at the power station. The protocol should ensure that, irrespective of whether Wivenhoe Power Station is being operated remotely or on-site, a direct line of communication is established between CS Energy personnel physically located at the power station and Seqwater employees at the Flood Operations Centre.

## Recommendations

- 17.17 CS Energy and Seqwater should agree upon and adhere to a formal communication protocol that requires CS Energy personnel to advise Seqwater, through the Flood Operations Centre, of water movements between Splityard Creek Dam and Wivenhoe Dam or Pryde Creek once a flood event is declared under the *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*. The protocol should ensure that a direct line of communication is established between CS Energy personnel physically located at the power station and the Flood Operations Centre.
- 17.18 The protocol should make provision for the use of telephone and/or radio where communication by email is not possible. Where necessary, CS Energy and Seqwater should make additional radio equipment available to relevant personnel.
- 17.19 CS Energy should put in place contingency measures to ensure email and telephone communications at Wivenhoe Power Station are not entirely dependent on a network located off-site.

### 17.5.5 Flood emergency planning

Tarong Energy has developed an emergency action plan in respect of Splityard Creek Dam. The emergency action plan provides guidance to Wivenhoe Power Station personnel in the event of an earthquake, which is regarded as the most likely threat to the dam's structural integrity.<sup>203</sup> The emergency action plan does not address high rainfall events. This is said to be because the design of the dam's spillway means that the dam wall cannot be overtopped by high rainfall events.<sup>204</sup> Similarly, the general business procedure, WIV-MAN-13: Emergency Response and Business Continuity Plan, which provides an overview of emergency response and business continuity planning in respect of the Wivenhoe Power Station, does not include flooding among its list of 'Credible Emergency Incidents'.<sup>205</sup> This omission is surprising.

There is a further business procedure designed to provide guidance to personnel at Wivenhoe Power Station in the event that Wivenhoe Dam exceeds its full supply level of EL 67.0 metres: WIV-OPS-15: Wivenhoe – High Rainfall,

High Dam Water Levels. WIV-OPS-15 makes repeated reference to the necessity to consider the emergency action plan. There is, however, nothing in the plan to indicate that it is triggered by high rainfall and rising lake levels, the circumstances that give rise to the operation of WIV-OPS-15. This apparent inconsistency may give rise to confusion in flood emergencies.

WIV-OPS-15 also requires staff at Wivenhoe Power Station to ‘establish close contact’ with Seqwater and monitor their predictions in relation to likely changes in dam levels.<sup>206</sup> No explanation as to what is involved in the establishment of ‘close contact’ is provided. As discussed above, the ramifications of a breakdown in communications between Seqwater and CS Energy could be significant. For this reason, it is important that any ambiguity in relation to communications between Seqwater and CS Energy be removed. As part of this, WIV-OPS-15 should be amended to make express reference to the formal communications protocol regarding releases.

## *Recommendations*

- 17.20 CS Energy should review its emergency action plan and business procedures to ensure they are wholly consistent and give appropriate consideration to flooding as a possible emergency event.
- 17.21 CS Energy should amend its business procedure to remove any ambiguity as to the establishment of communications with Seqwater and to acknowledge the formal communications protocol regarding releases.

### 17.5.6 Condition of Splityard Creek Dam

As considered above, Wivenhoe Power Station personnel were concerned that the high rainfall and associated runoff might compromise Splityard Creek Dam’s structural integrity. This concern played a significant part in their decision to release water into Wivenhoe Dam. On Wednesday 19 January 2011, dam safety engineers from SunWater carried out a physical inspection of the dam. They concluded that the dam was in good condition, and no structural issues required further attention.<sup>207</sup>

Another major factor in the decision to release water from Splityard Creek Dam was the failure of one of the dam’s two water level transmitters. This concern appears to have been addressed since the flooding; the transmitter that failed on 11 January 2011 was repaired in late January 2011. Both water level transmitters are now fully operational.<sup>208</sup>

### 17.5.7 Control of Splityard Creek Dam operations during flooding

Mr John Tibaldi, Seqwater’s current principal engineer, Dam Safety, has submitted that it would be sensible for the Wivenhoe Power Station and Splityard Creek Dam to operate under the direction of the flood operations centre once the level of Wivenhoe Dam exceeds 72 metres.<sup>209</sup> Mr Robert Ayre, one of the senior flood engineers under the Wivenhoe manual until mid-2011, contended that Seqwater should be able to direct the cessation of releases where Wivenhoe Dam’s lake level exceeds 67 metres.<sup>210</sup> Mr Ayre’s submission is in line with the recommendation he made to the Seqwater board following flooding in 1999.<sup>211</sup> This recommendation was not implemented. CS Energy, for its part, has expressed concern that an agreement requiring it to follow directions from Seqwater in relation to the release of water from Splityard Creek Dam may conflict with the statutory authority of the Australian Energy Market Operator to direct CS Energy to operate, or refrain from operating, assets such as the Wivenhoe Power Station that are connected to the National Electricity Market.<sup>212</sup>

Under the National Electricity Rules the Australian Energy Market Operator has power, for the purpose of ensuring security of electricity supply, to give directions to power generators.<sup>213</sup> Putting to one side, for the moment, that role of the Australian Energy Market Operator as it might affect the interactions between Seqwater and CS Energy, the relatively small storage capacity of Splityard Creek Dam means that the operation of the Wivenhoe Power Station is unlikely to have a significant impact on the storage capacity or structural integrity of Wivenhoe Dam. Wivenhoe Power Station personnel are also familiar with the operation of both the Splityard Creek Dam and the power station itself and, accordingly, are best placed to monitor and direct the operation of Splityard Creek Dam. In those circumstances, it is unnecessary for control of the power station to devolve completely to Seqwater.

However, there is a strong argument for Seqwater to be given a more limited power of direction. As discussed above in *17.5.2 Interaction between Splityard Creek Dam and Wivenhoe Dam*, it is conceivable that a 40 millimetre increase in Wivenhoe Dam's level could require the dam operators to transition from one strategy to the next under the manual or result in the closing of a bridge downstream of Wivenhoe Dam under strategy W1: events which might not have taken place in the absence of the release. These potential effects underscore the need for a clearly defined protocol regarding releases, and militate in favour of granting Seqwater (through the flood engineers) some power to direct CS Energy to stop or delay releases from Splityard Creek Dam during flood events.

The Australian Energy Market Operator has indicated that it would have no objection to such an arrangement.<sup>214</sup> In any event, it is likely that Rule 4.8.9(c) of the National Electricity Rules would resolve any conflict between a direction of the Australian Energy Market Operator and one made by Seqwater. Rule 4.8.9(c) provides that a power generator is not required to comply with a direction from the Australian Energy Market Operator where to do so would be a hazard to public safety or contravene any law. The operation of Wivenhoe Power Station at a time when Seqwater has requested that releases be stopped because of Lake Wivenhoe's elevated level appears likely to constitute a hazard to public safety for the purpose of the National Electricity Rules.

It is, however, important to note the need to balance dam safety and flood mitigation considerations against the implications of shutting down Wivenhoe Power Station. In certain circumstances, the power generation benefits associated with operating the power station may be such as to justify additional releases into Wivenhoe Dam (provided no risk to the dam's structural integrity results).<sup>215</sup> Determining precisely how the balance between these competing interests should be struck is a matter for the Queensland Government.

## Recommendation

- 17.22 The Queensland Government should consider whether to empower Seqwater, through the flood operations centre, to direct CS Energy to stop or delay releases from Splityard Creek Dam where a flood event is declared under the *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*.

## 17.6 Somerset Dam cracks

Somerset Dam is a 47 metre high concrete gravity dam with a 308 metre long embankment. It is situated upstream of Wivenhoe Dam on the Stanley River. Somerset Dam's concrete structure includes two internal galleries (enclosed passageways within the dam wall): an upper inspection gallery positioned at a level of EL (elevation above sea level) 88.9 metres and a lower drainage gallery at EL 66.0 metres.<sup>216</sup>

Construction of Somerset Dam began in 1935 and was completed in 1953. The prolonged duration of construction is partly attributable to the suspension of work between 1942 and 1948 because of the Second World War.<sup>217</sup> For further information about Somerset Dam generally see section 2.2.7 of the interim report.

There was some suggestion, in media reports following the 2011 flood event, that Somerset Dam's flood mitigation capacity may have been reduced by cracks in the dam's wall, with implications for the way in which Somerset Dam and Wivenhoe Dam were operated. The matter was also raised by submissions which members of the public made to the Commission.

In light of these suggestions, the Commission has conducted a review of several reports relating to the structural integrity of Somerset Dam prepared between 1995 and 2010. The Commission has also had reference to the view of Mr Tibaldi, Seqwater's principal engineer, Dam Safety. This part of the report constitutes the Commission's findings consequent upon that review.

In short, the reports considered by the Commission, and the evidence of Mr Tibaldi, indicate that cracks in Somerset Dam do not presently have any material impact on its structural integrity. In saying that, it must be noted that the Commission has not independently investigated the stability of the dam and had no input into the scope of, or methodology adopted in, the reports considered.

## 17.6.1 Investigating the cracks

Like most mass concrete structures, Somerset Dam is susceptible to cracking. The majority of concrete cracking is caused by tensile stress which occurs when the material is subjected to pulling or stretching forces as a result of volume change. Such volume change is generally caused by:

- changes in the moisture content of the concrete
- chemical reactions within the concrete
- changes in concrete temperature
- irregularities in construction procedures, including, for example, significant delays
- stress from the application of loads.<sup>218</sup>

The presence of cracking in concrete reduces its tensile strength (making it more likely to be pulled apart).<sup>219</sup> Depending on its nature and location, cracking in a dam wall may make it more susceptible to the upward pressure generated by water in the dam and, in turn, likely to collapse at a lower water level than would otherwise be the case.

Cracks have been observed in a number of parts of Somerset Dam since at least 1939, well before the conclusion of construction.<sup>220</sup> The majority of these are hairline cracks that are unlikely to have any meaningful impact on the structural integrity of the dam. That said, potentially significant cracking has occurred in the concrete structure. Of particular note are two cracks observed on the downstream side of the upper gallery wall. The first of these cracks is located approximately 0.4 metres above the gallery floor; the other sits at approximately 1.6 to 1.8 metres above the floor. The latter crack extends for most of the length of the gallery.<sup>221</sup>

The cracks in the gallery wall have been the subject of a number of investigations in recent years.<sup>222</sup> The most recent of these was undertaken in 2008 by SMEC, an independent engineering consultancy firm. The report produced by SMEC revealed that the cracking is evident in a number of areas across the downstream face of the dam and, accordingly, is likely to extend uninterrupted from the gallery to certain parts of the dam face.<sup>223</sup> No significant cracking was identified on the upstream side of the gallery wall.<sup>224</sup>

On a more general level, the SMEC report echoed previous findings that the most likely cause of the cracking is a change in concrete volume resulting from the dissipation of heat following the completion of construction.<sup>225</sup> It also demonstrated that the concrete above and around the upper gallery is of good quality. There were no indications of alkali aggregate reaction (a chemical reaction that can reduce concrete strength) in the concrete structure and little evidence of air bubbles in the concrete.<sup>226</sup>

The SMEC report concluded that there was little, if any, movement of the concrete in the area around the cracks downstream of the gallery<sup>227</sup> and that the cracks do not appear to have any negative impact on the overall structural stability or operation of Somerset Dam.<sup>228</sup> The report did not provide an in-depth explanation as to how this conclusion was reached. To the contrary, it appears that the investigation conducted by SMEC was limited to a localised analysis of the cracks and the surrounding concrete. It did not evaluate the impact of the cracking on structural integrity in light of dam levels or other relevant factors.

Previous investigations, however, have included a more detailed analysis of Somerset Dam's stability. The dam is presently operated in accordance with the findings set out in the New South Wales Department of Commerce's 2005 report entitled Somerset Dam: Stability of Abutment Monoliths.<sup>229</sup> This report included an assessment of previous studies undertaken by SMEC and a further two independent engineering consultancy firms: Sinclair Knight Merz and GHD. It concluded that Somerset Dam would maintain structural integrity at the storage level likely to be reached during a flood with an average recurrence interval of 100 000 years (which, it stated, would produce a dam level of EL 109.75 metres).<sup>230</sup>

The Department of Commerce report observed that the cracks in the dam wall drain into the gallery.<sup>231</sup> This minimises the impact of water pressure on the dam wall and, in turn, reduces stability concerns. Cracking above or below the gallery, however, was identified as a 'critical unknown'.<sup>232</sup> Such cracking, it was said, would become a 'plane of weakness' that may be subject to substantial water pressure.<sup>233</sup>

While the Department of Commerce report indicated that Somerset Dam was likely to remain stable at a level of EL 109.7 metres,<sup>234</sup> the presence of cracks above or below the upper gallery would reduce stability at higher water levels and result in the concrete structure failing at a lower level than would otherwise be the case. The report

estimates that, if such cracking is present, the dam would fail at a level of EL 110.1 metres, below the probable maximum flood level of EL 110.7 metres.<sup>235</sup> Importantly then, the SMEC report did not locate any significant cracking above the upper gallery. There has not been any comprehensive investigation, whether by SMEC in 2008 or otherwise, into the existence of further cracking below the upper gallery.

In 2009, Seqwater's annual dam safety inspection report (prepared by Mr Tibaldi, Seqwater's current principal engineer, Dam Safety) included the following reference to the cracking:

This issue was last examined several years ago and it is recommended that the issue be revisited to fully understand any dam safety issues associated with this cracking.<sup>236</sup>

Seqwater's 2011 annual dam safety inspection was conducted by a dam safety engineer reporting to Mr Tibaldi. The 2011 inspection report included a reference to the cracking in precisely the same terms:

This issue was last examined several years ago and it is recommended that the issue be revisited to fully understand any dam safety issues associated with this cracking.<sup>237</sup>

Notwithstanding the comments in the 2011 inspection report, Mr Tibaldi has stated that, having reviewed in detail the engineering reports into the cracking as part of the five year comprehensive dam safety inspection report in September 2010, and having considered the issue again in response to a requirement sent by the Commission on 20 December 2011, he considers that the crack is not presently an 'issue of structural concern'.<sup>238</sup>

The non-overflow crest level of Somerset Dam is EL 107.46 metres. Above this level, water will overtop part of the dam wall and be discharged onto its downstream face. The analysis contained in the Commerce report is predicated on an assumption that such overtopping will not result in the flooding of the gallery. If the gallery is flooded during overtopping, the stability of the dam will be markedly reduced.<sup>239</sup> In view of this, the Department of Commerce report recommended that the dam layout and waterproofing be reviewed to confirm that the gallery systems will not be flooded by an overtopping event. Seqwater should ensure that this is the case.

The material before the Commission tends towards a conclusion that the cracking in the Somerset Dam wall is not presently a threat to the dam's structural integrity. Given, however, the significant implications of a collapse of the Somerset Dam wall, the dam safety regulator may, as part of a review of the dam's safety under sections 353 to 355 of the *Water Supply (Safety and Reliability) Act 2008*, wish to review the materials on which this conclusion is based and consider whether any further investigations are necessary to ensure that the cracking does not compromise dam safety. From the perspective of ensuring that the cracking does not affect the operation of the dam, it may be prudent for Seqwater to commission an investigation into the extent of cracking below the level of the upper gallery and the impact of any such cracking.

## Recommendations

- 17.23 Seqwater should consider commissioning an investigation into the extent of cracking below the level of the upper gallery of Somerset Dam and the impact of any such cracking on the dam's stability and, in turn, its operation.
- 17.24 Seqwater should ensure that the Somerset Dam gallery is not susceptible to flooding during overtopping events.

### 17.6.2 Monitoring the cracking

Between 1969 and 1984, instruments were installed at 22 measurement points to monitor movement of the larger crack in the upper gallery.<sup>240</sup> The SMEC report recommended that the crack in the upper gallery continue to be monitored at least every four months. Since receiving that report, Seqwater has monitored the cracking on a monthly basis.<sup>241</sup>

Cracking recorded at each of the 22 measurement points was also assessed as part of the Five Year Comprehensive Dam Safety Inspection Report in September 2010. The safety report detailed the changes at each measurement point over the previous 11 years. It indicated that the crack opened between 0.5 millimetres and 1.1 millimetres at

each point during that period. After averaging the measurements observed at each of the points, the safety report concluded that the crack has opened at a rate of 0.064 millimetres per year for the past 11 years.<sup>242</sup>

The SMEC report also recommended that the cracking be inspected immediately following any significant inflows into the dam. During the course of the January 2011 flood, the cracking was monitored at least daily.<sup>243</sup> Additionally, the cracking has been reviewed following all significant inflows into the dam since the flooding.<sup>244</sup> Monitoring during and since the flooding has not revealed any significant change in the cracking.<sup>245</sup>

### 17.6.3 Impact of the cracking on the operation of Somerset Dam during floods

The peak water level at Somerset Dam in January 2011 was EL 105.11 metres.<sup>246</sup> This is significantly below the level identified by the Department of Commerce report as the point at which the structural stability of the dam may be compromised.

No comprehensive investigation into the impact of the cracking on the stability of the dam during and after the flooding has been undertaken. There is, however, no indication that the presence of the cracking posed any risk to the dam's structural integrity.

Seqwater has submitted that the presence of the cracks did not alter the way the dam was operated during the January 2011 flooding.<sup>247</sup> Neither the manual nor the flood event report contains any mention of the cracking or other stability concerns in relation to Somerset Dam.<sup>248</sup>

The manual includes an operating target line that provides guidance as to what the dam level at Somerset Dam should be when Wivenhoe Dam is at a particular storage level and vice versa: see Figure 17(c) below, which sets out the operating target line relative to the water levels at Wivenhoe and Somerset dams during the flood event.<sup>249</sup> This target line was developed on the basis of an assumption that the maximum storage capacity prior to dam collapse at Wivenhoe is EL 80 metres and at Somerset Dam it is EL 109.7 metres.<sup>250</sup> The critical level adopted for the purposes of Somerset Dam accords with the findings of the Department of Commerce report; it has not been reduced, at least since 2005, on account of stability concerns. It should be noted that the Commission has not investigated whether Seqwater has ever considered the water level at which the dam will fail to have been higher or lower than EL 109.7.

Figure 17(c)



Wivenhoe/Somerset Operating Target Line throughout the January 2011 Flood Event

Source: Exhibit 24, January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam, 2 March 2011 [p203].

The target line indicates that when Wivenhoe Dam is operating at 75 metres, Somerset Dam should be operated in such a way that its water level is approximately 105 metres. Wivenhoe Dam's lake level peaked at 74.97 metres Australian Height Datum at 7.00 pm on 11 January 2011. At that time, Somerset Dam's level was 104.6 metres. Somerset Dam's peak level of 105.11 metres was observed between 6.00 am and 9.00 am on 12 January 2011, at which time Wivenhoe Dam's level ranged between 74.77 and 74.78 metres Australian Height Datum.<sup>251</sup> As is apparent from the figure above, the water levels at Somerset were maintained at levels that accord fairly closely with the operating target line. There is nothing to suggest that the cracks in the dam wall led the operators of Somerset Dam to release more water than would otherwise have been the case.

## 17.7 Bridges and crossings near Wivenhoe, Somerset and North Pine dams

### 17.7.1 Crossings downstream of Wivenhoe, Somerset and North Pine dams

The January 2011 flooding and consequent dam releases resulted in the inundation and closure of a number of bridges downstream of Wivenhoe Dam. Two crossings downstream of North Pine Dam were also affected by floodwaters released from dams: Youngs Crossing and the A J Wyllie Bridge.<sup>252</sup>

Bridge closures are often inconvenient, forcing people to take alternative routes that extend their travel time. In some instances, their impact is more critical, restricting residents' access to essential supplies and hampering the efforts of emergency services personnel to provide needed assistance, including medical treatment or evacuation.<sup>253</sup> The Commission received a number of submissions from people expressing concern as to the frequency with which particular bridges downstream of the dams were closed.<sup>254</sup>

The impact of bridge closures is taken into account in the Wivenhoe manual.<sup>255</sup> When releases from Wivenhoe Dam first commence, dam operators make use of strategy W1, which aims to minimise disruption to downstream rural life by limiting releases so that particular bridges and crossings are not submerged.<sup>256</sup> The manual also notes that, following flood events, the operation of the dams should not unnecessarily prolong the inundation of the bridges.<sup>257</sup>

The Wivenhoe manual identifies seven bridges downstream of Wivenhoe Dam that may be affected by releases during flood events:<sup>258</sup>

- Twin Bridges on Wivenhoe Pocket Road
- Fernvale Bridge on Brisbane Valley Highway
- Savages Crossing on Banks Creek Road
- Burtons Bridge on Summerville Road
- Kholo Bridge on Kholo Road
- Mr Crosby Weir Bridge on Allawah Road
- Colleges Crossing on Mt Crosby Road.

Several of these bridges are submerged at relatively low flow rates. Twin Bridges, for example, is inundated when Brisbane River flows exceed 50 m<sup>3</sup>/s. Colleges Crossing, which is used by a significant number of vehicles, is submerged when river flows are between 175 m<sup>3</sup>/s and 200 m<sup>3</sup>/s.<sup>259</sup>

The seven bridges fall under the control of the Department of Transport and Main Roads (Colleges Crossing and Fernvale Bridge), Somerset Regional Council (Burtons Bridge, Twin Bridges, and Savages Crossing) or Brisbane City Council (Mt Crosby Weir and Kholo Bridge).

Youngs Crossing and AJ Wyllie Bridge, both at Petrie, cross the North Pine River. The Moreton Bay Regional Council controls Youngs Crossing, while A J Wyllie Bridge is under the control of the Queensland Government. As the Commission's interim report described,<sup>260</sup> Youngs Crossing was closed 18 times during the 2010/11 wet season because of releases from the North Pine Dam. Seqwater concluded in its flood event report that if Youngs Crossing were raised so that it was not submerged by flows under 300 m<sup>3</sup>/s, 16 of the 18 closures could probably have been avoided.<sup>261</sup>

## 17.7.2 Upgrading bridges and influence on dam operations

### Potential to upgrade bridges

The height and positioning of downstream bridges is of importance not only for the people who regularly travel over them, but also for the operation of Wivenhoe, Somerset and North Pine dams. Upgrading particular bridges to make them less susceptible to closure would, for example, provide additional flexibility to Seqwater in managing releases from Wivenhoe Dam under strategy W1, and in the drawdown of the lake level following a flood event.<sup>262</sup>

The Department of Transport and Main Roads has indicated that it works with local councils in considering bridge construction and upgrades.<sup>263</sup>

A range of matters needs to be taken into account in determining whether, how and where to upgrade (or build) river crossings, not least of which is the significant cost likely to be involved in such projects.<sup>264</sup> An in-depth cost-benefit analysis will be necessary before any decision can be made.

The possibility of upgrading crossings downstream of North Pine Dam was considered in the Commission's interim report.<sup>265</sup> After reviewing the impact of flooding between 10 October 2010 and 5 March 2011 on both Youngs Crossing and the AJ Wyllie Bridge, the Commission recommended that that Moreton Bay Regional Council undertake a cost-benefit analysis of options for the upgrade of Youngs Crossing to determine an outcome which best serves the public interest.<sup>266</sup>

In relation to river crossings downstream of Wivenhoe Dam, the Commission notes that the Department of Transport and Main Roads is presently undertaking a planning study to investigate options for an additional Brisbane River crossing in the Moggill/Ipswich West region. As part of this study, which it expects to complete by early 2012,<sup>267</sup> the department is investigating upgrades to a number of surrounding roads in an attempt to improve flood immunity. The study is confined to the Moggill/Ipswich West Region and does not consider upgrades to other downstream bridges and surrounding roads.<sup>268</sup> The Commission is not aware of any other plans to upgrade or create new bridge crossings downstream of Wivenhoe Dam.

The decision as to whether the upgrade of any bridge is justified is one for the Queensland Government, together with the relevant council. Seqwater will, following its review of the Wivenhoe manual, present the Government with options for release strategy and supply levels (see the discussion below and section *17.1 Longer term review of the Wivenhoe and North Pine manuals*); any decision as to bridge upgrade should be made with the benefit of that information.

### Recommendation

- 17.25 The Department of Transport and Main Roads, in conjunction with Brisbane City Council and Somerset Regional Council, should investigate options for the upgrade of Brisbane River crossings between Wivenhoe Dam and Colleges Crossing and undertake a cost-benefit analysis of these to determine the outcome which best serves the public interest.

### The impact of bridge upgrades on dam operating strategies

As observed above, any upgrade of existing bridges or development of new bridges on the Brisbane and North Pine rivers is likely to be relevant to the operation of the relevant dams.

Accordingly, the longer term review of the Wivenhoe manual and the North Pine manual ought to consider any plans for the upgrade of both upstream and downstream bridges affected by the operation of, respectively, Wivenhoe and Somerset dams or North Pine Dam. See also recommendation 17.3 above.

Seqwater has confirmed that it proposes to consider raising or upgrading of downstream bridges as part of the Wivenhoe Dam and Somerset Dam Optimisation Study.<sup>269</sup> The Commission considers that Seqwater should take any possible upgrade of the bridges into account when it performs modelling over a range of operating strategies as part of this study. It should design strategies that do not limit flows by reference to the need to keep some or all of the bridges open, and model the flood mitigation benefits of removing that restriction. Having done so, Seqwater

should give clear advice to the Queensland Government and relevant local councils as to the flood mitigation effects of upgrading each of the bridges. The same process should be followed in modelling strategies for the operation of North Pine Dam, and advice given accordingly as to the effects of upgrading the affected bridges. See also recommendation 17.4, above.

These processes should, as far as possible, occur concurrently with Department of Transport and Main Roads and local council investigations into the costs associated with upgrading each bridge.

## **Recommendation**

- 17.26 As part of the longer term review of the *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, the Queensland Government should consider the impact of possible upgrades of bridges downstream of Wivenhoe Dam on different operating strategies for the dam.

### **17.7.3 Communication of bridge closures**

Both the Wivenhoe and North Pine manuals provide that, prior to the closure of a bridge because of releases of water from the dams, the flood engineer on duty should notify the government agency responsible for the particular bridge so that it is able to make arrangements for its orderly closure.<sup>270</sup> Neither manual makes provision for such advice to be given directly to the Department of Community Safety or emergency services agencies.

There is also no such provision in the Wivenhoe Dam Emergency Action Plan<sup>271</sup> or the North Pine Dam Emergency Action Plan,<sup>272</sup> despite the fact that each includes an appendix entitled 'Road Closure/Public Notification Arrangements During Flood Events' which includes contact details for, respectively, representatives of the Somerset and Moreton Bay councils.<sup>273</sup>

The earlier emergency services and other agencies are notified of likely bridge closures, the better they are able to adjust accordingly; for example, by relocating personnel and amending response protocols.<sup>274</sup> Seqwater should, therefore, aim to expedite the communication of information regarding releases from all three dams, where possible providing such information directly to relevant emergency services agencies.

These considerations appear to have been addressed in the draft Dam Release Communications Protocol for the Brisbane River Catchment. This document contemplates the provision of advice regarding floodwater releases to, among others, Emergency Management Queensland, the Queensland Police Service and relevant local councils. The advice is to be provided in the form of a dam situation report. The template for the dam situation report appended to the protocol includes a range of information about dam levels, releases, the impact of releases on bridges downstream, and rainfall forecasts.<sup>275</sup>

In making these comments about communication arrangements, the Commission reaffirms the recommendations made in the interim report to the effect that:

- Seqwater consider creating a designated communications position within the flood operations centre<sup>276</sup>
- Seqwater consider consolidating its communication arrangements in a single document for each dam it operates.<sup>277</sup>

## 17.8 Lenthalls Dam

Lenthalls Dam is located in the Fraser Coast Regional Council area, on the Burum River close to the town of Howard, and is owned and operated by Wide Bay Water Corporation.<sup>278</sup> The dam is referable (one which poses a risk to the safety of two or more people should it fail)<sup>279</sup> and has a population at risk of 270 people.<sup>280</sup>

The Commission's investigation has been primarily concerned with the fact that, since their installation on the dam in February 2007, different gates have operated at varying levels of effectiveness during a number of floods.

The dam came to the attention of the Commission through a submission made by a concerned member of the public. The submitter's family owns and resides at a property upstream of the dam. Flooding on this property has been worsened on a number of occasions since 2008 by backwater resulting from the inoperability of some of the dam's gates during floods.<sup>281</sup>

The Commission has considered the communications since 2008 between Wide Bay Water and residents about the operation of the dam; the issues raised are described, in a general sense, in section 4.1.4 of the Commission's interim report and are dealt with by the recommendations contained in that section.

### 17.8.1 Installation and design of the crest gates

In February 2007, Lenthalls Dam's embankment was raised by 60 centimetres and five crest gates were installed on the existing spillway of the dam to increase the dam's full supply level by two metres to 26.0 metres.<sup>282</sup> The crest gates used had been successfully installed as part of new dam projects elsewhere but had never before been used to raise the full supply level of an existing dam, or installed on a dam with a curved crest, like Lenthalls Dam.<sup>283</sup>

The gates comprise four 14.8 metre wide gates (gates 1, 2, 4 and 5) and one 9.8 metre wide gate (gate 3) which is centrally positioned between the other gates.<sup>284</sup>

#### Automatic operation

The gates are designed to open automatically as the water level of the dam rises.<sup>285</sup> Their automatic operation is triggered by water filling buoyancy tanks inside the gates as the dam level rises; as the weight of a gate increases it drops and opens to allow greater flood releases.<sup>286</sup> As the dam's water level lowers, the buoyancy tanks drain, allowing the gates to lift and close, stopping the discharge of water.<sup>287</sup> Gate 3 is designed to open first, when the dam's full supply level is exceeded by 150 millimetres, followed by the others in succession, at 50 millimetre intervals.<sup>288</sup>

#### Manual operation

The crest gates can also be operated manually, in two ways. Each gate has a manual inlet valve which allows the tank in the gate to fill with water and open.<sup>289</sup> Opening the inlet valves allows for testing of the gates, or for the dam operator to lower the level of the dam at their discretion.<sup>290</sup> This procedure was codified in September 2008.<sup>291</sup> In instances where opening the inlet valve has not worked, a hydraulic jack has been used on some of the gates to make them operate.<sup>292</sup> Both means of manual operation have been used when gates have failed to open automatically during floods at the dam.

#### Testing

The automatic opening and closing of the gates, dependent as it is on water entering and leaving the buoyancy tanks, can only be observed as the water level of the dam rises and falls.<sup>293</sup> The ability of the gates to be manually opened and closed can be tested when the water level is low.<sup>294</sup> Being able to successfully open a gate manually does not mean that the gate will open automatically in flood as designed. That restriction on testing automatic operation explains in some part the sometimes lengthy intervals between identifying a solution and testing it. To better monitor the gates, Wide Bay Water has advised the Commission that it is considering, with a view to installation as soon as practicable, the use of closed circuit television cameras and gauges to measure the opening position of each gate.<sup>295</sup>



Crest gates on the spillway of Lenthalls Dam (photo courtesy Wide Bay Water)

### 17.8.2 Chronology of floods since installation of the gates

Since the installation of the gates in 2007, there have been seven floods that have exceeded the ‘trigger event’, defined in the emergency action plan, at which the gates are expected to operate.<sup>296</sup> Different gates have performed to varying levels of effectiveness during these floods; at times they have failed to operate as designed.

#### February 2008 flood

On 29 January 2008, in the lead up to the February 2008 flooding, Wide Bay Water staff manually opened gate 3 at a lake level of 25.44 metres.<sup>297</sup> Heavy rainfall commenced on 5 February 2008, causing the dam level to peak on 12 February 2008 at 27.41 metres.<sup>298</sup> The crest gates should have begun to open automatically at 26.15 metres.<sup>299</sup> In correspondence between Wide Bay Water and DERM on 10 March 2008,<sup>300</sup> the former gave this account of the gate openings from 5 February 2008:

- gate 3 opened automatically for a period on 16 February 2008, and
- gate 1 was opened by a hydraulic jack on 18 February 2008.<sup>301</sup>

The failure of most of the gates to operate as designed during the flood worsened flooding upstream of the dam.<sup>302</sup>

GHD, the designer of the crest gates for Lenthalls Dam, was engaged to prepare a report investigating the impact of the February flood on upstream properties.<sup>303</sup> GHD’s investigations confirmed that most of the gates failed to operate as designed during the flood and that this increased river heights near these properties.<sup>304</sup> GHD also identified excess pressure on the gates’ lintel seals as a likely cause of the gates’ failure.<sup>305</sup> This issue and the work undertaken to rectify it are discussed at section 17.8.3 *Observed problems and solutions implemented*.

## May/June 2008 flood

Another flood occurred over May and June 2008. As with the February 2008 flood, some of the gates did not operate as designed.<sup>306</sup> Gate 1 was manually opened with a hydraulic jack on 30 May 2008, and gate 3 opened automatically on 5 June 2008, although this opening occurred later than anticipated according to its design sequence.<sup>307</sup>

## March 2010 flood

Rainfall commenced in the catchment on 1 March 2010, and the dam level peaked at 26.45 metres on 6 March 2010.<sup>308</sup> During this flood a number of gates opened, some automatically, and some with manual assistance.

Gate 2 opened automatically as designed three times over the course of the flood.<sup>309</sup> Gate 4 opened automatically on 6 March 2010.<sup>310</sup> Gate 3 did not initially open as designed, but on 9 March it opened automatically after the level of the dam had begun to fall.<sup>311</sup>

Unsuccessful attempts were made to open both gates 1 and 5 manually by opening their inlet valves on 6 March 2010.<sup>312</sup> Gate 1 was opened with the use of a hydraulic jack that day, and was opened manually by using the inlet valve on 7 March.<sup>313</sup> All attempts to open gate 5 failed.<sup>314</sup>

## First December 2010 flood

The trigger event of 26.10 metres was reached early on 12 December 2010.<sup>315</sup> At this time, attempts to open gate 5 manually, first by using the inlet valve, and then with a hydraulic jack, failed.<sup>316</sup> Gate 1 was manually opened that morning, although it closed for a few hours when the dam level was 550 millimetres above full supply level, and opened again as the dam levels continued to fall.<sup>317</sup> According to Wide Bay Water, gate 1 should have stayed open until the level of the dam reached 350 millimetres above the full supply level.<sup>318</sup>

Gate 4 was also manually opened on 12 December, while gate 2 operated as designed by opening automatically.<sup>319</sup> The peak of the dam was reached late in the evening on 12 December 2010.<sup>320</sup> Neither gate 3 nor gate 5 opened at all, either automatically or manually, throughout the course of this flood.<sup>321</sup>

As a result of this flood, a second possible cause of the gate failures emerged: a problem with the air venting system in the gates.<sup>322</sup> This is discussed further at section 17.8.3 *Observed problems and solutions implemented*.

## Second December 2010 flood

On 15 December 2010, the chief operating officer of Wide Bay Water made a decision based on forecast rain to the dam catchment area to open gate 1 to control the rate at which the dam level was rising.<sup>323</sup> After some difficulty, the gate was opened manually on 16 December 2010.<sup>324</sup>

After gate 1 was opened, the chief operating officer came to the decision that the level of the dam could not be adequately controlled with only one gate open.<sup>325</sup> Consequently, on 17 December 2010, attempts were made to open both gates 4 and 5 manually, using a hydraulic jack. These attempts failed.<sup>326</sup> Gate 1 was the only crest gate open at this stage, even though the dam level was 26.54 metres and all of the gates should have been operating.<sup>327</sup>

The level of the dam peaked on 17 December 2010 at 26.78 metres.<sup>328</sup> At the time of the peak, operational staff observed that gate 1 had partially closed.<sup>329</sup> The dam level fell for a period, but started to rise once again on 18 December 2010, reaching another peak on 20 December 2010.<sup>330</sup>

An attempt to open gate 2 manually was proposed on 19 December 2010; Wide Bay Water's chief operating officer rejected the suggestion because both the weather and the dam levels meant that the procedure could not be completed safely.<sup>331</sup>

The dam level began to fall after peaking on 20 December 2010 at 26.89 metres.<sup>332</sup> Early on the morning of 21 December 2010, gate 2 was opened manually; the lake level was 26.46 metres and all gates should have been open.<sup>333</sup> After the successful manual operation of gate 2, the inlet valves of all other gates were opened manually; as a result, gate 1 opened.<sup>334</sup> For the second time during this flood, attempts were made to open gates 4 and 5 with a hydraulic jack;<sup>335</sup> again, these attempts were unsuccessful.

## Third December 2010 flood

During this flood, the dam peaked at 28.12 metres on 28 December 2010, at a level higher than that of the February 2008 flood.<sup>346</sup> With the exception of gates 1 and 5, all gates opened automatically at times.<sup>337</sup> Gate 1 was opened manually with the assistance of a hydraulic jack.<sup>338</sup> Gate 5 failed to open at any time.<sup>339</sup> The chief operating officer had concerns that gates 2, 3 and 4, which did open automatically during the flood, were not remaining open as designed.<sup>340</sup> Specifically, he could not be sure if gates 2, 3 and 4 were closing entirely, or partially closing, during the flood.<sup>341</sup>

This generated a third possible reason for the inability of the gates to operate as designed: hydrodynamic forces may have been causing the gates to rise during a flood.<sup>342</sup> This issue is discussed further at section 17.8.3 *Observed problems and solutions implemented*.

## January 2011 flood

After the floods experienced during December 2010, some of the gates were kept open to lower the level of the dam.<sup>343</sup> Rainfall began to fall in the catchment on 3 January 2011, with levels in the dam peaking on 8 January at 26.94 metres.<sup>344</sup>

The chief operating officer recalled that gates 2, 3 and 4 opened automatically during the flood; there is no event log for this flood to confirm this.<sup>345</sup> Gate 5 did not open at all during the flood.<sup>346</sup> Gate 1 closed on 11 January 2011 after its manual valve was closed.<sup>347</sup> The manual valve on gate 2 was left open until 12 January, to manage the inflows into the dam.<sup>348</sup>

## 17.8.3 Observed problems and solutions implemented

The seven floods that have occurred at Lenthalls Dam since the installation of the crest gates have exposed problems with the gates' operation but have also allowed Wide Bay Water, the gate designers, and associated external consultants, to identify possible reasons for the varying levels of effectiveness of the gates during floods. This is because the capability of the crest gates, and the efficacy of possible solutions, cannot be tested until the water level rises to the relevant threshold, which generally requires the occurrence of a flood.<sup>349</sup>

Three problems with the gates' operation have been identified:

- pressure on the lintel seals of the gates, which has proved so great that the weight of the gates during floods has not been enough to make them drop as designed
- problems with the air venting system inside the gates
- hydrodynamic forces causing the gates to close or partially close, after opening, as the dam level rises.

### Excess pressure on the gate lintel seals

At the time of installation, each crest gate was fitted with a seal to prevent water leaking out of the gate or beside the gate.<sup>350</sup>

As a result of the February 2008 flood, GHD, the designer of the crest gates, identified these seals as a likely cause of the failure of the gates to open; the seals proved so effective that the pressure on the gates during flood events was excessive and prevented them lowering as intended.<sup>351</sup>

In response to the gate failures during the February 2008 flood, and subsequently during the May/June 2008 flood, a site inspection and testing were carried out by Wide Bay Water; it was established that the gate seals needed modification.<sup>352</sup> GHD prepared a report outlining various options to address this problem.<sup>353</sup> A program of works to adjust the gate seals to reduce their friction loads, titled 'Seal Improvement Program', was carried out by Wide Bay Water between December 2008 and February 2009, on advice from GHD.<sup>354</sup>

Following the completion of the 'Seal Improvement Program', Wide Bay Water carried out testing on the gates to assess the operability of the crest gates.<sup>355</sup> This testing involved manual opening of the gates at water levels below 26.0 metres and revealed that the gates were operational following the improvement program;<sup>356</sup> the automatic opening of the gates was not able to be tested at that water level.

An external consultant engaged by Wide Bay Water found that the seal modifications had been effective in dramatically reducing the high lintel seal friction forces, which were now consistent with expectations.<sup>357</sup>

## Problems with the air venting system

Following the first December 2010 flood, Wide Bay Water's chief operating officer discussed with GHD a perceived problem with the air venting in the crest gates.<sup>358</sup> The solution suggested was drilling an 11 millimetre hole on top of the access hatch of each of the gates, enabling air trapped in them to be released.<sup>359</sup> This solution was initially tested on 21 December 2010 on gate 1, and manual tests confirmed the gate would operate with the holes in place.<sup>360</sup> The same procedure was adopted for the remaining gates on 22 December 2010.<sup>361</sup>

GHD undertook work to identify a permanent solution relating to the air venting system that would improve the performance of the gates.<sup>362</sup> In its June 2011 report, GHD stated that air becoming trapped in the gates' pipework caused a water lock preventing the gates from working.<sup>363</sup> GHD suggested modifying the vent system to allow the release of water trapped in the pipework after the gates had been lowered and raised.

To achieve this, snorkels have been installed on top of the holes in the gate access hatches to help release trapped air.<sup>364</sup> Since the addition of the snorkels, Wide Bay Water has been able to open all crest gates manually, except gate 5.<sup>365</sup>

An external consultant engaged by Wide Bay Water to peer review the snorkel solution regarded it as a successful arrangement, which could be adopted in a permanent form.<sup>366</sup>

## Hydrodynamic forces and the 'rising' behaviour of the gates

Dam operation staff witnessed one of the gates partially closing during the second flood at the dam in December 2010,<sup>367</sup> a problem again observed by Wide Bay Water's chief operating officer during the third December 2010 flood.<sup>368</sup> GHD, in a report completed after that flood, confirmed that although gates 2, 3 and 4 operated automatically during the early stages of the flood, they closed as the dam levels continued to rise.<sup>369</sup> Once the dam levels began to drop again, the gates appeared to open as designed.<sup>370</sup>

As with the other problems previously identified, Wide Bay Water has been working closely with GHD to arrive at a solution for the 'rising' behaviour of the gates observed during December 2010.<sup>371</sup> The first solution GHD proposed involved the installation of a hydraulic spoiler to the crest gates, but after modelling it was deemed not workable.<sup>372</sup>

The other solution proffered by GHD involved building a flow deflector upstream of the crest gates; computer modelling and concept development of this device is currently being carried out to test its efficacy. If this solution is found to be workable, it will be subject to a peer review by external consultants engaged by Wide Bay Water.<sup>373</sup> Following that review, the solution will be provided to DERM for comment, before submission to Wide Bay Water's board of directors for consideration. Wide Bay Water anticipates that it will be able to make a recommendation to the board in the first quarter of 2012.<sup>374</sup> A detailed design needs to be devised before the project can be put out to tender; Wide Bay Water has already commenced preparing a shortlist of contractors to save time in the event that the proposed solution proves workable.<sup>375</sup>

Two external consultants engaged by Wide Bay Water are currently conducting a peer review of the solution proposed by GHD in relation to the 'rising' behaviour of the gates.<sup>376</sup>

### 17.8.4 Current status of gate operability

Although the manual opening procedure has proved invaluable during the floods that have occurred at the dam, it cannot be relied on in every instance. This has been demonstrated by the floods where some of the gates, not just gate 5, have failed to open manually either through opening the inlet valve or with hydraulic assistance.<sup>377</sup>

The solutions implemented by Wide Bay Water to counter the pressure on the lintel seals and the air vent issues have improved the functioning of most of the gates. Following the installation of snorkels on the inlet valve, all gates except for gate 5 can be manually operated by opening their inlet valve.<sup>378</sup>

Wide Bay Water's chief operating officer was of the view in October 2010 that all crest gates, excepting gate 5, are capable of automatic operation.<sup>379</sup> The accuracy of that view cannot be confirmed until the onset of another flood.

The inoperability of gate 5 has been a recurrent problem. The gate was opened manually with a hydraulic jack on 12 October 2011,<sup>380</sup> 25 October 2011 and 3 November 2011.<sup>381</sup> The current expectation is that it will continue to be operable with the assistance of a hydraulic jack.<sup>382</sup>

Despite four years of work and investigation by Wide Bay Water and its external consultants, Wide Bay Water's chief operating officer cannot confirm that all the gates will work as designed.<sup>383</sup> If the solutions currently under review prove ineffective or impracticable, Wide Bay Water should investigate the feasibility of replacing the existing gates, or removing them altogether.

### 17.8.5 Dam safety implications

It might be thought that a failure of dam gates to open is a dam safety concern. Certainly, the failure of some of the gates in floods has caused water to back up more than is usual.

However, at their worst (if all spillway gates could not open), the problems with the gates do not prevent the dam from passing a flood of the capacity required by DERM's Guidelines on Acceptable Flood Capacity for Dams.<sup>384</sup> The dam spillway can pass a flood with an average recurrence interval of 2 000 000 years, if all gates operate as designed,<sup>385</sup> and a flood with an average recurrence interval of 50 000 years if none of the spillway gates were to open.<sup>386</sup> Additionally, given the current functionality of gates 1, 2, 3 and 4, DERM considers that there is 'not a very high risk' that failure of the gates to fully open will cause failure of the dam.<sup>387</sup>

The Commission asked DERM whether it has considered taking compliance action in respect of the dam and is advised that, although such action has been considered in respect of the operation of the spillway gates, it presently considers compliance action unsuitable because Wide Bay Water is doing 'as much as they can to correct the gate operational problems'.<sup>388</sup>

### 17.8.6 Preparing for wet seasons

In the lead up to the 2010/2011 wet season, Wide Bay Water:

- undertook a disaster simulation to test its response to the occurrence of a tropical cyclone<sup>389</sup>
- prompted by media coverage of the possible active wet season, held informal discussions with key staff about gate operations (no minutes were taken)<sup>390</sup>
- tested the ability of each gate to open and close and cleared the air venting system and pipework in the gates.<sup>391</sup>

In early December 2010, Wide Bay Water provided DERM with an annual report demonstrating compliance with its dam safety conditions. This report included specific advice on the operability of the crest gates.

Prior to the 2011/2012 wet season, Wide Bay Water opened the gates on a rotating basis to ensure their operability, and to release water from the dam.<sup>392</sup> In accordance with the standard operating procedures and operating and maintenance manual, general maintenance has been carried out, including clearing air vents and pipework.<sup>393</sup>

As part of its wet season preparedness more generally, Wide Bay Water tests the gates annually at the 'time of the first spring rains', generally through October and November.<sup>394</sup>

The Commission considers that Wide Bay Water's wet season preparation could be improved if it were to:

- conduct a flood simulation exercise which includes implementing contingency plans for the situation in which one or more of the gates fails to open automatically and/or manually
- hold meetings with key staff about gate operations and keep minutes of these meetings to provide a complete record for staff of the current strategy or procedures proposed for gate operations and floods.

In addition, given the persisting difficulties with the crest gates, DERM should seek to confirm the operability of the gates at Lenthalls Dam prior to all wet seasons until their operating problems are completely rectified.

## Recommendations

- 17.27 Wide Bay Water should, in addition to its usual wet season preparations and maintenance, undertake the following activities in advance of each wet season:
- conduct training for personnel on dam operation, including contingency plans for the situation in which one or more of the gates is inoperable
  - hold meetings of key personnel of Wide Bay Water involved in the operation of the dam during floods, which:
    - in addition to any other matters, inform staff about the current status of the gates, dam operation strategies and contingency plans for the situation in which one or more of the gates is inoperable
    - are recorded in minutes which document the information provided and are made available to all operational staff.
- 17.28 The Department of Environment and Resource Management should require Wide Bay Water, in advance of every wet season, to provide details of its expectation as to the operability of the crest gates if a flood occurs, until such time as all gates have been demonstrated to work as designed.

## 17.9 Detention basins in Toowoomba city

The Commission received a number of submissions from residents of the Toowoomba Regional Council area calling upon the council to mitigate the flood risks associated with East Creek, West Creek and Gowrie Creek.<sup>395</sup>

In response, the Commission investigated the council's and the Queensland Government's actions in respect of creek works, including detention basins,<sup>396</sup> designed to alleviate the impacts of flood in East and West creeks.

East and West creeks flow from the south, meeting to the north of the Toowoomba central business district to form the Gowrie Creek system.<sup>397</sup> The waterways and catchments of both creeks are steep, and the water runs quickly down the slopes. This contributes to swift rainfall runoff.<sup>398</sup> A full description of the Toowoomba catchments is contained in the Commission's interim report at section 7.1.1.

### 17.9.1 Flood mitigation actions by Toowoomba Regional Council

The former Toowoomba City Council investigated the need for creek works, including detention basins, to minimise the flood impacts of the Gowrie Creek system and to improve the capacity of the creeks to accommodate these flood mitigation measures.<sup>399</sup>

Following these investigations and community consultation, the council adopted the Gowrie Creek Catchment Management Strategy on 13 October 1998.<sup>400</sup> The strategy's suggested implementation period is 20 to 25 years.<sup>401</sup> The Toowoomba Regional Council has continued to implement this strategy since amalgamation in 2008.<sup>402</sup>

The strategy recommends structural measures, including detention basins, changing the profile and alignment of the creek channel,<sup>403</sup> and non-structural measures, such as town planning controls, to minimise flooding.<sup>404</sup> Initially the works proposed included 22 detention basins, 10.5 kilometres of channel improvements, 53 pool/riffle structures and 18 kilometres of revegetation.<sup>405</sup> These measures were calculated to provide protection against a 1% AEP flood.<sup>406</sup> However, the Toowoomba City Council reduced the number of basins, but increased their size on the basis of expert engineering and landscaping investigations coupled with detailed design plans and reports.<sup>407</sup> The final proposal under the strategy is for the construction of six detention basins on West Creek and three on East Creek.<sup>408</sup> The Commission's consideration is confined to the detention basins, proposed and existing.

The construction of the basins is not yet complete. The method of construction has been sequential, starting at the top of West Creek and working downstream. The aim is an accrued mitigation affect on flooding in Toowoomba city.<sup>409</sup>

As at 21 October 2011, five detention basins along West Creek and one on East Creek were in place.<sup>410</sup> The final basin for West Creek will be built once the land designated for it reverts to council control after the expiry of private leases in March 2012.<sup>411</sup>

WBM Engineering and Environmental Consultants were engaged by Toowoomba City Council in early 2005 to review the contents of the 1998 strategy.<sup>412</sup> As a result, the Gowrie Creek System Flood Risk and Mapping Study was presented to the Toowoomba City Council in mid-2007.<sup>413</sup> Focussing on flood risk and the accurate mapping of design floods,<sup>414</sup> the study confirmed that the existing detention basins, and those yet to be built, were necessary to minimise the number of properties affected by a 1% AEP flood in the creek catchments.<sup>415</sup> Further design work for two detention basins to be built along East Creek was recommended as part of this study.<sup>416</sup>

The Toowoomba City Council's last capital works plan, produced in 2007, did not allocate any funding over following financial years for the works suggested under the 1998 strategy and the subsequent 2007 study, and no further basins have been built.<sup>417</sup> The general manager of the Toowoomba Regional Council's Water and Waste Services Group has explained that the former council's decision not to allocate more funding for the financial years up to and including 2010/2011 was the result of the need for investigation in relation to the East Creek basins and the unavailability, pending the expiration of the relevant leases, of the land for the West Creek basin.<sup>418</sup>

Prior to the January 2011 flooding, the Toowoomba Regional Council considered the detention basins and channel improvements to have substantially increased the stormwater capacity of West Creek.<sup>419</sup>

The 10 January 2011 flooding in Toowoomba exceeded 1% AEP flood levels.<sup>420</sup> A technical report prepared by BMT WBM for the purpose of assessing the flooding found that the magnitude of the event meant that even if all mitigation measures had been complete, overtopping of crossings and damage to property would still have occurred.<sup>421</sup> Despite this, the presence of the structural flood mitigation measures in the Gowrie Creek catchment did assist in easing the flooding on 10 January 2011.<sup>422</sup>

Toowoomba Regional Council is continuing the 20 to 25 year implementation of the 1998 strategy to achieve the 'ultimate catchment development design goal' of containing a 1% AEP flood.<sup>423</sup> Further works in accordance with this strategy are planned, with funds allocated in the 2011/2012 council budget to continue work on two East Creek basins, and to commence work on the final West Creek basin once the requisite land reverts to the council.<sup>424</sup>

The Toowoomba Regional Council has relied on assistance from the Queensland and Commonwealth governments to implement this program. Its most recent application to the Commonwealth Government for funds was unsuccessful.<sup>425</sup> The council has advised the Commission that it does not have the means to accelerate or expand the program without financial assistance.<sup>426</sup>

## 17.9.2 DERM's dam safety and failure impact assessment

DERM, which is responsible for dam safety regulation, has considered assessing the East Creek and West Creek detention basins to ascertain whether they are referable dams. A referable dam is a dam assessed as posing a risk to the safety of two or more people should it fail.<sup>427</sup> The dam safety regulator can impose dam safety conditions on referable dams to reduce the risk of dam failure.<sup>428</sup> Under the *Water Supply (Safety and Reliability) Act 2008*, a failure impact assessment is required to assess and identify the population at risk, in order to determine whether a dam should be considered referable.<sup>429</sup> A preliminary failure impact assessment report was prepared in May 2004 for four of the detention basins along West Creek.<sup>430</sup> The report commented that assessing the failure impacts of the basins was complex but, on the basis of the available data, concluded that one or more of the four basins were likely to be referable dams.<sup>431</sup> The report recommended further hydraulic and hydrologic modelling be done to confirm the status of these basins.<sup>432</sup> It also suggested the basins might need to be investigated as a system, capable of failure individually or in series with others.<sup>433</sup>

The then Department of Natural Resources and Water carried out further investigations on the West Creek detention basins as a response to this report. A 2005 report by the department identified the need to complete a full failure impact assessment accompanied by further surveying work. It also pointed to the need for a sophisticated hydraulic model, and an assessment of the cascade failure risk of the other basins further upstream in West Creek.<sup>434</sup> This report also suggested that the Alderley Street detention basin was a referable dam under the Act.<sup>435</sup> It is unclear what further assessment of these detention basins, if any, was carried out in the period between these investigations in 2005 and the January 2011 flood.

DERM commenced investigations after the flooding of 10 January 2011 to assess the flood mitigation structures serving the relevant Toowoomba catchments and their performance during the flood. Inspections of the detention basins determined that none failed during the event, although many of the basins and associated ponds were overtopped, with some minor erosion.<sup>436</sup> The inspection report recommended that DERM reassess whether a failure impact assessment, including an examination of the risk of cascade failure, should be carried out for any one, or all, of the structures.<sup>437</sup>

Toowoomba council has engaged engineers to undertake a failure impact assessment for the West Creek detention basins.<sup>438</sup> DERM has advised the Commission this assessment indicates no person's safety would be at risk if the West Creek detention basins failed.<sup>439</sup> DERM has commenced a review of this assessment and indicates discussions with Toowoomba council will occur once the review is complete.<sup>440</sup>

## Recommendations

- 17.29 Toowoomba Regional Council should engage external consultants to carry out failure impact assessments on the detention basins along East Creek.
- 17.30 Toowoomba Regional Council and the Department of Environment and Resource Management should continue to co-operate to assess the referable dam status of existing detention basins and any future detention basins constructed in the West Creek and East Creek catchment areas.

## 17.10 Other DERM dam functions

DERM is the department responsible for the administration of the *Water Supply (Safety and Reliability) Act 2008*,<sup>441</sup> the Act which regulates referable dams (dams which pose a risk to the safety of two or more people should they fail).<sup>442</sup> Two of their important dam-related functions, the review and approval of flood mitigation manuals and the review of flood event reports are dealt with in sections 17.2 and 17.3 above. Others are dealt with below.

### 17.10.1 Response to Bureau of Meteorology forecast

The Bureau of Meteorology provided a seasonal forecast to the Queensland Cabinet in October 2010, warning of a 75 per cent chance of above average rainfall in south-east Queensland and an active cyclone season.<sup>443</sup> DERM's Director-General was also briefed in that month as a member of the state disaster management group.<sup>444</sup> He discussed the weather outlook with the DERM executive management group in a meeting on 25 October 2010.<sup>445</sup> DERM officers took steps to update the department's disaster management plan and ensure key staff were available over the holiday period.<sup>446</sup>

Each division of DERM was invited to nominate issues to include in a summer issues briefing paper being prepared by the Department of Premier and Cabinet.<sup>447</sup> DERM chose five issues to include in its part of the briefing note, which was endorsed by the executive management group of DERM on 22 November 2010.<sup>448</sup> The five issues were the discharge of poor quality water from mines and other water storages; damage to national parks; downstream flooding in south-east Queensland; failure of dams resulting in loss of life and loss of water supply; and environmental damage.<sup>449</sup>

In response to the summer issues briefing, two actions were taken which were the subject of examination in the Commission's interim report:

- Water agencies, on request of the Minister, considered the possibility of lowering the full supply level of Wivenhoe and Somerset dams to 75 per cent and North Pine Dam to 95 per cent to assist in flood mitigation. In the result, the Minister decided not to lower the water level of either dam in mid-December 2010. This issue was discussed in detail in the Commission's interim report in section 2.4 *Temporary alteration of full supply level*.
- Communication procedures between participants in the South East Queensland Water Grid regarding releases from Wivenhoe and Somerset dams were formalised through the production of a draft communication protocol. For further details, see section 2.6.10 *Communications* in the Commission's interim report.

The summer issues briefing identified an audit of the currency of emergency action plans at all referable dams as an appropriate response to the risk of dam failure.<sup>450</sup> The Minister signed correspondence to all dam operators requesting that they assure DERM of the currency of their emergency action plan by 30 November 2010.<sup>451</sup> In the event that an assurance was not provided, compliance action was foreshadowed.<sup>452</sup> Seven dams failed to produce current emergency action plans by the required date.<sup>453</sup> Discussions between DERM and the owners of these seven dams have continued, and a show cause notice was issued to one.<sup>454</sup> The audit and follow-up actions undertaken by DERM prior to the 2010/2011 wet season<sup>455</sup> were appropriate.

The Commission considers that the summer issues briefing did not capture some critical issues. DERM should have taken steps to consider:

- Seqwater's ability to comply with the flood mitigation manuals relevant to Wivenhoe, Somerset and North Pine dams. (In fact, Seqwater's schedule of authorities<sup>456</sup> included an unregistered engineer, in breach of the manuals, a point which would have been readily discoverable by DERM. See section 2.5.6 *Registration of flood engineers* of the Commission's interim report.)
- whether the operators of referable dams around the state were able to comply with their emergency action plans
- whether communication procedures between referable dam operators and local disaster management groups were adequate to enable local groups to perform their role and warn communities
- the flood mitigation capacities of referable dams around the state, to determine if any action should be taken at any dam, for example the lowering of a full supply level.

Dam operators are primarily responsible for ensuring that their dams comply with applicable manuals and emergency procedures and that their communication protocols are adequate. However, as the regulator of referable dams under the *Water Supply (Safety and Reliability) Act 2008*, it was incumbent upon DERM to consider the preparedness of those dams and ensure operators were meeting their responsibilities.

In respect of the last point, the State of Queensland has submitted that DERM has responsibility only for dam safety and providing data from gauges to assist in flood warning, not for ensuring dams provide appropriate flood mitigation.<sup>457</sup> If that is correct, it points to an unfortunate hiatus in government oversight of the issue. All dams, even those without gates, provide some measure of flood mitigation. It would be appropriate for DERM to consider the efficacy of the operation of those dams in terms of flood mitigation. See section 17.10.6 below, for discussion about responsibility for flood mitigation across the Queensland Government.

## 17.10.2 Review and approval of emergency action plans

Emergency action plans have no status in the legislation governing referable dams in Queensland.<sup>458</sup> The dam safety conditions set by DERM for each dam contain a requirement that the dam have an emergency action plan.<sup>459</sup> The conditions also require a twelve-monthly review of the plan and a five yearly comprehensive review.<sup>460</sup> DERM must be informed of amendments, or that no amendments are required after review.<sup>461</sup>

DERM requires dam owners to submit copies of their emergency action plans to it, but it does not perform a substantive review of them. It reviews the parties listed in the plan, the scope of emergencies addressed, and the currency of the document,<sup>462</sup> and keeps a copy on file.<sup>463</sup> The audit of emergency action plans undertaken in advance of the 2010/2011 wet season, discussed above in section 16.8.1, was similarly limited.

DERM advised the Commission that all referable dams have emergency action plans, except in cases where: a dam is yet to have safety conditions applied; where the due date for a dam's provision of its emergency action plan is yet to occur; where a dam is currently being decommissioned;<sup>464</sup> or where the dam owner's property contains the whole of the population at risk.<sup>465</sup>

However, a case brought to the attention of the Commission, that of Gordonbrook Dam, demonstrated that DERM processes have not always ensured that all dams had emergency action plans. Reports prepared by independent engineers in 2008 in respect of dam safety and spillway adequacy indicated that the dam did not have key documentation, including an emergency action plan, standard operating procedures, an operating and maintenance manual or a data book.<sup>466</sup> There was a disaster management plan, but it lacked the information essential in an emergency action plan.<sup>467</sup> Other issues were raised in the reports, and DERM engaged with the dam operator to resolve them from 2008 to 2010. DERM did not, however, take steps to ensure Gordonbrook Dam had

the necessary operational and emergency documentation until October 2010. Gordonbrook Dam is a referable dam with a population at risk of about 10.<sup>468</sup> It should maintain an emergency action plan; DERM should have taken action to remedy the situation earlier.

The Commission made recommendations about the content of the warnings procedures in emergency action plans in section 4.1.4 of its interim report. The plans reviewed by the Commission approached the matter of warnings in varying ways;<sup>469</sup> implementation of the recommendations may assist in providing some consistency in the future. The *Water Supply (Safety and Reliability) Act 2008* has been amended since the interim report to allow the Director-General to impose safety conditions that include requirements about giving information about flow to the local community immediately downstream of a dam.<sup>470</sup>

The Gordonbrook Dam example, and the varied approach to warnings, indicates that it would be appropriate for the existence and content of emergency action plans to be regulated by legislation and reviewed by government departments. In particular, the Commission considers it would be appropriate for there to be:

- a legislative obligation on referable dam owners to have an emergency action plan approved by an appropriate government agency, and to review it periodically
- substantive reviews of referable dams' emergency action plans completed by an appropriate government agency.

The government should, in consultation with dam owners and operators, consider the administrative arrangements surrounding this obligation to establish an efficient scheme for the submission and approval of plans.

Reviews should be substantive in the sense of considering the effectiveness of each plan's procedures as a response to emergencies. This would considerably extend the scope of DERM's current review. The government agency given the responsibility for review might be assisted by the production of guidelines to dam owners about what must be included. There are some guidelines in the Dam Safety Management Guidelines produced by DERM<sup>471</sup> and the Australian Government publication Emergency Management Planning for Floods Affected by Dams.<sup>472</sup> More guidance might be required. The criteria for the substantive review of emergency action plans should be determined by the agency which is charged with their review and approval in consultation with DERM, Emergency Management Queensland and dam operators. The criteria for warnings procedures should be informed by the Commission's interim report, section 4.1.4 *Warnings about dam spillway outflow*. Whatever criteria are established, the reviewer must assess the plan against them and against its purpose: to deal effectively with emergencies.

The dam safety regulator does not consider DERM to be the appropriate agency to review and approve emergency action plans; he suggests that Emergency Management Queensland approve them, and local disaster management groups conduct reviews.<sup>473</sup> The Queensland Government submitted that DERM would be the most appropriate agency, with Emergency Management Queensland providing advice and input.<sup>474</sup> The important thing is that the substance of the plans is reviewed by persons with the relevant expertise. That would include at least dam safety and emergency management considerations. The Queensland Government should determine which agency is appropriate to perform the review and approval of emergency action plans.

## Recommendations

- 17.31 The Queensland Government should legislate to oblige each owner of a referable dam to have an emergency action plan approved by the appropriate Queensland Government agency. Such plans should be reviewed periodically.
- 17.32 The Queensland Government should, in consultation with the Department of Environment and Resource Management and Emergency Management Queensland, determine which agency is appropriate to review and approve emergency action plans for referable dams.
- 17.33 Prior to each wet season, the Department of Environment and Resource Management should audit the compliance of each owner of a referable dam with the obligation to have an emergency action plan approved by the Queensland Government.

### 17.10.3 Dam safety audits

Section 354 of the *Water Supply (Safety and Reliability) Act 2008* empowers the Director-General of DERM to impose dam safety conditions. DERM has imposed conditions for most referable dams in Queensland. Referable dam owners have a number of responsibilities under their respective dam safety conditions, including five-yearly inspections of their dam by registered engineers.<sup>475</sup>

DERM conducts desktop audits of referable dam owners' compliance with dam safety conditions. DERM considers that compliance demonstrates preparedness for future wet seasons.<sup>476</sup> An example of the type of matter considered in a dam safety audit is whether a current emergency action plan exists.<sup>477</sup> If any deficiencies are detected during the dam safety audit process, it is then the responsibility of the dam owner to rectify these deficiencies.<sup>478</sup>

The number of audits that can be conducted in any one year is limited by resource and budget constraints.<sup>479</sup> Over the last few years between 11 and 13 audits have been completed each year.<sup>480</sup> Eighty-five of Queensland's 106 referable dams have been the subject of a dam safety audit since 2007.<sup>481</sup> The dam safety regulator considers that such audits should be conducted every three to five years.<sup>482</sup> He indicated that DERM would perform more frequent audits on dams which had 'inexperienced or recalcitrant' owners.<sup>483</sup>

According to the dam safety regulator, the dam safety audits were originally targeted at the major dam owners whose dams presented particular hazards to downstream communities, or put high populations at risk.<sup>484</sup> Once it had established that these owners were generally in compliance with dam safety conditions, DERM turned its attention to smaller dams.<sup>485</sup> These smaller dams generally have a lower population at risk.<sup>486</sup> The smaller dams are, however, generally older and built to lower standards, with owners generally less familiar with dam safety requirements.<sup>487</sup>

DERM has applied a system of prioritisation to determine which dams to audit since the inception of the dam safety audit program in 2007. This prioritisation has been based entirely on the size of the population at risk and hazards for downstream communities in the event of dam failure.<sup>488</sup>

The Commission considers that DERM should conduct a risk assessment, using its results to make decisions about when each referable dam will be audited. A number of relevant factors should be considered in determining the order of these audits.

#### *Recommendation*

17.34 The Department of Environment and Resource Management should prioritise dam safety audits according to risk. The risk assessment should be informed by criteria including:

- structure and materials used in construction
- age of the dam
- time since last inspection
- occurrence of a flood event since last audit and the size of that flood event
- population at risk if the dam were to fail
- experience and capability of dam owner
- dam owner compliance history
- time since last audit.

## 17.10.4 Interaction between DERM and disaster management personnel

DERM links with various levels of Queensland's disaster management hierarchy. For example, the Director-General of DERM and the director of dam safety at DERM sit on the state disaster co-ordination committee and provide information to this body as required.

In 2010/2011, DERM ensured Emergency Management Queensland had copies of all emergency action plans for dams.<sup>489</sup> That was appropriate, and should occur for every wet season.

DERM staff have previously presented papers to Emergency Management Queensland at various conferences or workshops, and visited local disaster management groups to educate them on dam safety issues.<sup>490</sup> These discussions can usefully inform local groups of the possible consequences of dam failure for downstream communities, and appropriate emergency responses to such an eventuality. Such education may lead to faster, more integrated responses when flooding occurs.

It appears that DERM has not made presentations to Emergency Management Queensland or local disaster management groups for some time. The dam safety regulator stated that these activities should be conducted again.<sup>491</sup> It is particularly surprising that such presentations were not considered or conducted prior to the 2010/2011 wet season, given the severity of the seasonal forecast provided by the Bureau of Meteorology to the Queensland Government in October 2010. DERM should make those presentations before each wet season, particularly if a wet season is forecast with a greater than 50 per cent change of above median rainfall.

### *Recommendations*

- 17.35 The Department of Environment and Resource Management and Emergency Management Queensland should ensure that each has copies of current emergency action plans for all dams in Queensland.
- 17.36 The Department of Environment and Resource Management should conduct periodic dam safety information and education sessions with emergency management personnel including those from Emergency Management Queensland, local and district disaster management groups and local councils. Priority should be given to sessions if the Bureau of Meteorology forecasts a wet season with a greater than 50 per cent chance of above median rainfall.

## 17.10.5 Management of non-commercial water assets

DERM owns and is responsible for managing a group of 'non-commercial water assets'. These are typically items of water infrastructure, such as dams, weirs and pipelines, over which the Queensland Government has retained ownership following the corporatisation of SunWater in 2000, or which have reverted to state control upon the cessation of mining tenements.<sup>492</sup>

DERM's current portfolio of non-commercial water assets comprises 10 dams, 12 weirs, one pipeline and a system of levees on the lower Mary River near Maryborough.<sup>493</sup> The Commission has made enquiries of DERM as to the effect of flooding during the 2010/2011 wet season on these assets. Specifically, the department was asked whether flooding of the assets increased the level of flooding on any nearby property, whether any of the assets pose a risk to life or property when affected by flooding and whether DERM has taken or will take steps to manage those risks.<sup>494</sup>

DERM has advised the Commission that, in all cases, its non-commercial water assets experienced increased water levels during the 2010/2011 wet season, but functioned normally.<sup>495</sup> No adverse impacts, such as structural damage, were caused to the assets during the 2010/2011 wet season.<sup>496</sup>

The only reported consequence of flooding associated with the non-commercial water assets was with respect to the Mary River levees; on 25 January 2011 an owner of property adjacent to the Mary River advised DERM that water from the Mary River had flooded his cane fields on 20 January.<sup>497</sup> DERM inspected the area on 27 January 2011 and found that the inundation was not caused by a malfunction of the levee system. DERM advised the Commission it would continue monitoring the levees.<sup>498</sup>

One non-commercial water asset, Ibis Dam at Irvinebank in far north Queensland, is in breach of current safety standards and poses a risk to life and safety.<sup>499</sup> Specifically, the dam is assessed as being capable of safely handling only seven per cent of its acceptable flood capacity. It has a population at risk of 75 people.<sup>500</sup> The dam is within DERM's very high risk category.<sup>501</sup>

On 19 September 2011, the Office of the Water Safety Regulator (a different division of DERM) issued an information notice that had the effect of requiring DERM in its capacity as dam owner and manager to either upgrade or 'decommission' the dam by 1 October 2012.<sup>502</sup> (Decommissioning a dam involves removing or otherwise modifying parts of its structure to make it incapable of storing water, either temporarily or permanently.<sup>503</sup>)

DERM is currently considering options for the long term management of Ibis Dam.<sup>504</sup> In the interim, DERM has:

- revised the dam's emergency action plan
- reviewed the dam's operating requirements
- held community information sessions to make the public aware of the safety concerns
- engaged independent engineers to review the dam's stability, structural integrity and spillway capacity so as to ascertain and mitigate the dam's safety risks.<sup>505</sup>

Four of DERM's other non-commercial water assets are referable dams, like Ibis Dam. DERM inspects these dams, being Crooks Dam, Wyndham Dam, Copperfield Dam and Corella Dam, on a weekly basis.<sup>506</sup> DERM has also advised the Commission that it has recently reviewed the emergency action plans for each of these dams in accordance with the Commission's interim report recommendations about communication with downstream communities.<sup>507</sup>

There is no evidence that DERM's non-commercial water assets functioned other than as expected during the 2010/2011 floods or that DERM's management of these assets is in any way deficient.

### **17.10.6 A broader flood mitigation responsibility?**

It appears that no Queensland Government agency has wide ranging responsibility for flood mitigation. Such responsibility would include oversight of structural measures such as dams, levees and vegetation as a complement to non-structural measures such as land planning systems and emergency management. The Queensland Flood Risk Management Activities Audit completed in November 2010 indicated that flood risk management activities are spread across a multitude of agencies and departments. The fact that no single agency has overarching responsibility is likely to lead to inconsistency and gaps in policy.

The audit tried to address gaps it perceived in flood risk responsibility. However, the audit was silent on key flood mitigation issues such as the ability of Seqwater to comply with its flood mitigation manuals in respect of Wivenhoe, Somerset and North Pine dams.

The Queensland Government submitted that it had, as a result of that audit, designated the Department of Local Government and Planning as its lead agency for flood mitigation issues. To support that claim, it provided correspondence between relevant Ministers and Directors-General of that department, DERM and the Department of Community Safety.<sup>508</sup> It is not immediately apparent from that correspondence that there is a single lead agency; it merely indicates that the Department of Local Government and Planning has agreed to be the Queensland representative on the National Flood Risk Advisory Group and lead the current review of State Planning Policy 1/03.

The Commission's terms of reference did not permit this potentially important issue to be taken further in the course of this inquiry. It may be that government should consider a separate investigation directed at determining whether one agency should be responsible for flood mitigation.

## (Endnotes)

- 1 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, section 2.5.8 and 2.10.6.
- 2 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, section 2.1.4.
- 3 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, section 2.1.5.
- 4 Seqwater – Baroon Pocket Dam, Cedar Pocket Dam, Borumba Dam, Cooloolabin Dam, Ewen Maddock Dam, Lake MacDonald/Six Mile Creek Dam, Poona Dam, Wappa Dam; SunWater – Boondooma Dam, Fred Haigh Dam, Paradise Dam, Wuruma Dam, Bjelke-Petersen Dam, Cania Dam, Isis Balancing Storage, Woongarra Balancing Storage; Wide Bay Water Corporation – Lenthalls Dam; South Burnett Regional Council – Gordonbrook Dam; Newcrest Mining – Perry River Dam; Stanwell Corporation – Meandu Creek Dam, Cooling Water Dam, Ash Dam, Black Creek Dam, Drains Reclaim Dam.
- 5 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, Section 2.5 [p52]; Queensland Floods Commission of Inquiry, *Interim Report*, 2011, Section 2.10 [p88].
- 6 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p60].
- 7 *Approval of Flood Mitigation Manual Notice (No 01) 2011*, Vol 358, No 40, Queensland Government Gazette, 1 October 2011.
- 8 *Approval of Flood Mitigation Manual Notice (No 02) 2011*, Vol 358, No 46, Queensland Government Gazette, 11 October 2011.
- 9 *Approval of Flood Mitigation Manual Notice (No 03) 2011*, Vol 358, No 75, Queensland Government Gazette, 14 November 2011.
- 10 Statement of James Pruss, 21 November 2011 [p2: para 12]; Statement of James Pruss, 21 November 2011, Annexure JP4 [p17]; Statement of James Pruss, 21 November 2011 [p2: para 8].
- 11 Statement of James Pruss, 21 November 2011 [p2-3: para 12(b)].
- 12 Statement of James Pruss, 21 November 2011, Annexure JP4 [p22].
- 13 Statement of James Pruss, 21 November 2011 [p5: para 23(b)]; Statement of James Pruss, 21 November 2011 [p4: para 19(d)].
- 14 Statement of James Pruss, 21 November 2011 [p5: para 23(b)].
- 15 Statement of James Pruss, 21 November 2011 [p2: para 12]; Statement of James Pruss, 21 November 2011, Annexure JP4 [p13]; Statement of James Pruss, 21 November 2011 [p2: para 6].
- 16 Statement of James Pruss, 21 November 2011 [p5: para 24(a)]; Statement of James Pruss, 21 November 2011 [p2: para 5].
- 17 Statement of James Pruss, 21 November 2011 [p2: para 6].
- 18 Which focuses on flood damages in downstream areas. See Statement of James Pruss, 21 November 2011, Annexure JP4 [pA-8].
- 19 Seqwater, Wivenhoe Dam and Somerset Dam Optimisation Study Progress Report, Revision 4, 12 December 2011 [p12].
- 20 See section 2.3.2 *A comprehensive study of the Brisbane River catchment*.
- 21 Statement of James Pruss, 21 November 2011, Annexure JP4 [pA-2]; Seqwater, Wivenhoe Dam and Somerset Dam Optimisation Study Progress Report, Revision 4, 12 December 2011 [p12].
- 22 November 2011.
- 23 October 2011.
- 24 Statement of Peter Allen, 24 November 2011, Annexures PHA-48g; PHA-50g.
- 25 See Statement of Peter Allen, 24 November 2011, Annexures PHA-48, PHA-50.
- 26 See section 374 of the *Water Supply (Safety and Reliability) Act 2008*.
- 27 Amongst other requirements. Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p30].
- 28 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p26, 28].
- 29 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p32].
- 30 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p8]. Only

- 'judged likely' is used in the North Pine Manual: Seqwater, *Manual of Operational Procedures for Flood Mitigation at North Pine Dam*, Revision 6, October 2011 [p6].
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- 31 Section 374 of the *Water Supply (Safety and Reliability) Act 2008*.
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- 32 For example: Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p23, 24].
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- 33 Queensland Floods Commission of Inquiry, *Interim Report*, Recommendation 2.9, 2011 [p59].
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- 34 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p21].
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- 35 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p25].
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- 36 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p27, 29, 31].
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- 37 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p42].
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- 38 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p25].
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- 39 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p29].
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- 40 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p27, 29].
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- 41 Statement of Peter Allen, 24 November 2011, Attachment PHA-48e [p5].
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- 42 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p29].
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- 43 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p33].
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- 44 Exhibit 24, Seqwater, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam, 2 March 2011 [p158-159].
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- 45 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p14]; Seqwater, *Manual of Operational Procedures for Flood Mitigation at North Pine Dam*, Revision 6, October 2011 [p12].
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- 46 Queensland Floods Commission of Inquiry, *Interim Report*, section 2.5.6, 2011 [p58].
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- 47 Exhibit 24, Seqwater, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam, 2 March 2011 [p33-35].
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- 48 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [14: section 2.4].
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- 49 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p 14: section 2.5].
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- 50 Exhibit 24, Seqwater, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam, 2 March 2011 [p33-35].
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- 51 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p17]; Seqwater, *Manual of Operational Procedures for Flood Mitigation at North Pine Dam*, Revision 6, October 2011 [p15].
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- 52 Statement of Peter Allen, 24 November 2011, Attachment PHA 48-e [p4]. For a description of this use of quantitative precipitation forecasts, see section 2.6.5 'With forecast' and 'without forecast' model runs in the Commission's Interim Report: Queensland Floods Commission of Inquiry, *Interim Report*, Section 2.6.5, 2011 [p64].
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- 53 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p7-8].
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- 54 Exhibit 29. Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 5, August 2010 [p19: section 8.4].
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- 55 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p92].
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- 56 Exhibit 17, Statement of Robert Ayre, 23 March 2011 [p45: para 210 – p47: para 220].
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- 57 Exhibit 17, Statement of Robert Ayre, 23 March 2011 [p46: para 217 – 218].

- 58 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p21].
- 59 See for example Transcript, John Tibaldi, 2 February 2012, Brisbane [p5055: lines 10-55]; Transcript, John Ruffini, 11 February 2012, Brisbane [p6073: line 30]; [p6074: line 1 - p6075: line 35]; Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: line 35-55]; Transcript, Rob Ayre, 11 February 2012, Brisbane [p6105: line 21 – p6106: line 5].
- 60 See, for example, Mr Tibaldi's difficulty in determining whether the flood engineers had used strategy W2 section 16.10.2 *Mr Tibaldi's methodology*. See also Transcript, John Ruffini, 11 February 2012, Brisbane [p6074: line 1 – p6075: line 35]; Transcript, Rob Ayre, 11 February 2012, Brisbane [p6111: line 25 – p6112: line 32]; Transcript, John Tibaldi, 11 February 2012, Brisbane [p6126: line 45 – p6127: line 40].
- 61 Submission of John Craigie, 14 February 2012.
- 62 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5316: line 38 – p5317: line 30].
- 63 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5316: line 38 – p5317: line 30].
- 64 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5124: line 4].
- 65 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5190: line 55 – p5191: line 10].
- 66 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p27].
- 67 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p28].
- 68 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011.
- 69 See, for example, Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p4: para 28 – p6: para 29] and Exhibit 24, Seqwater, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam, 2 March 2011, Appendix A; Transcript, John Tibaldi, 2 February 2012, Brisbane [p5054: line 2]; Transcript, John Tibaldi, 3 February 2012, Brisbane [p5166: line 12]; [p5171: line 5]; Transcript, Robert Ayre, 4 February 2012, Brisbane [p5250: line 5-30]; Transcript, Terrence Malone, 6 February 2012, Brisbane [p5400: line 12]; Transcript, John Ruffini, 6 February 2012, Brisbane [p5444: line 13]; Transcript, John Ruffini, 11 February 2012, Brisbane [p6083: line 20]; Transcript, Terrence Malone, 11 February 2012, Brisbane [p6098: line 23]; Transcript, Robert Ayre, 12 February 2012, Brisbane [p6108: line 12 – p6109: line 11].
- 70 Submission of John Craigie, 14 February 2012 [p4-6].
- 71 Statement of Peter Allen, 24 November 2011, Attachment PHA-48a.
- 72 Australian Height Datum. See Exhibit 396, Department of Environment and Resource Management, Moreton Resources Operations Plan 2009, December 2009 [p99]; Seqwater, *Manual of Operational Procedures for Flood Mitigation at North Pine Dam*, Revision 6, September 2011 [p5].
- 73 Australian Height Datum.
- 74 Exhibit 24, Seqwater, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam, 2 March 2011 [p3].
- 75 To describe the flood storage compartment in this fashion is consistent with the manner in which the flood storage compartment of Wivenhoe Dam has been described (see Exhibit 24, Seqwater, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam, 2 March 2011). The January 2011 Flood Event Report on the operation of North Pine Dam, (see Exhibit 30, Seqwater, January 2011 Flood Event Report on the operation of North Pine Dam, March 2011) [p4], however, describes the flood storage compartment as the volume of water between full supply level and the radial gate opening trigger level (p4), which, under Revision 5 of the North Pine manual, is a vertical height of five centimetres. The same description was used by then senior flood operations engineer, Robert Ayre, in his first statement: Exhibit 17, Statement of Robert Ayre, 23 March 2011 [p19: para 96].
- 76 Transcript, Peter Allen, 18 May 2011, Brisbane [p2076: line 21].
- 77 Note that at a water level of 42.047 metres, water will escape through the spillway above the gates. See: Seqwater, *Manual of Operational Procedures for Flood Mitigation at North Pine Dam*, Revision 6, October 2011, Appendix C.

- 78 Section 370, *Water Supply (Safety and Reliability) Act 2008*.
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- 79 Section 371(2),(3), *Water Supply (Safety and Reliability) Act 2008*.
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- 80 Section 372, 373, *Water Supply (Safety and Reliability) Act 2008*.
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- 81 Section 374, *Water Supply (Safety and Reliability) Act 2008*.
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- 82 Statement of Peter Allen, 24 November 2011 [p28: para 155 – p29: para 158; p30: para 165-168].
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- 83 Transcript, Peter Allen, 16 May 2011, Brisbane [p2083: line 37].
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- 84 Transcript, Peter Allen, 16 May 2011, Brisbane [p2088: line 38].
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- 85 Transcript, Peter Allen, 16 May 2011, Brisbane [p2088: line 55].
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- 86 Exhibit 391, DS 5.1 Flood Mitigation for a Dam, Version 1, 28 October 2010 [p2].
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- 87 Exhibit 391, DS 5.1 Flood mitigation manual for a dam, 28 October 2010, Attachment C [p1].
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- 88 Transcript, John Bradley, 16 May 2011, Brisbane [p2029: line 28]; Transcript, Peter Allen, 16 May 2011, Brisbane [p2082: line 42].
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- 89 Transcript, Peter Allen, 16 May 2011, Brisbane [p2083: line 49]; see also Transcript, John Bradley, 16 May 2011, Brisbane [p2026: line 32].
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- 90 Exhibit 391, DS 5.1 Flood mitigation manual for a dam, 28 October 2010, Attachment C [p2]; Transcript, John Bradley, 16 May 2011, Brisbane [p2029: line 13].
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- 91 Transcript, John Bradley, 16 May 2011, Brisbane [p2028: line 8].
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- 92 Department of Environment and Resource Management, DS 5.1 Flood mitigation manual for a dam, Version 2, 16 September 2011, [www.derm.qld.gov.au/about/policy/documents/3991/wir\\_2009\\_3991.pdf](http://www.derm.qld.gov.au/about/policy/documents/3991/wir_2009_3991.pdf).
- 
- 93 Department of Environment and Resource Management, DS 5.3 Processing a flood mitigation manual for a dam following review, Version 1, 16 September 2011, [www.derm.qld.gov.au/about/policy/documents/4884/wir\\_2011\\_4884.pdf](http://www.derm.qld.gov.au/about/policy/documents/4884/wir_2011_4884.pdf)
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- 94 Department of Environment and Resource Management, DS 5.1 Flood mitigation manual for a dam, Version 2, 16 September 2011, [www.derm.qld.gov.au/about/policy/documents/3991/wir\\_2009\\_3991.pdf](http://www.derm.qld.gov.au/about/policy/documents/3991/wir_2009_3991.pdf), Attachment C; Department of Environment and Resource Management, DS 5.3 Processing a flood mitigation manual for a dam following review, Version 1, 16 September 2011, [www.derm.qld.gov.au/about/policy/documents/4884/wir\\_2011\\_4884.pdf](http://www.derm.qld.gov.au/about/policy/documents/4884/wir_2011_4884.pdf), Attachment C.
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- 95 Department of Environment and Resource Management, DS 5.1 Flood mitigation manual for a dam, Version 2, 16 September 2011, [www.derm.qld.gov.au/about/policy/documents/3991/wir\\_2009\\_3991.pdf](http://www.derm.qld.gov.au/about/policy/documents/3991/wir_2009_3991.pdf), Attachment C [p6]; Department of Environment and Resource Management, DS 5.3 Processing a flood mitigation manual for a dam following review, Version 1, 16 September 2011, [www.derm.qld.gov.au/about/policy/documents/4884/wir\\_2011\\_4884.pdf](http://www.derm.qld.gov.au/about/policy/documents/4884/wir_2011_4884.pdf), Attachment C [p7].
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- 96 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p1: para 5].
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- 97 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p1: para 5]; Queensland Dam Safety Management Guidelines, 26 February 2002, Chapter 9, 9.5.
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- 98 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p3: para 9].
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- 99 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p3: para 9].
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- 100 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p3: para 9].
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- 101 Exhibit 327, Wivenhoe Dam Emergency Action Plan [p9].
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- 102 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p8].
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- 103 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p3: para 8(c)]; Attachment PHA-19.
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- 104 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p3: para 8(d)].
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- 105 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p4: para 12]. See Exhibit 24, Seqwater, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam; Exhibit 30, Seqwater, January 2011 Flood Event Report on the operation of North Pine Dam.
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- 106 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p3: para 8(d), (f)]; Attachment PHA-20.
- 107 See section 2.10.3 of the Commission's interim report.
- 108 Exhibit 1128, Statement of Peter Allen, 12 September 2011, Attachment PHA-19.
- 109 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p2: para 7]; Statement of Peter Allen, 24 November 2011 [p25: para 128].
- 110 Statement of Peter Allen, 24 November 2011 [p5: para 30].
- 111 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p2: para 8; p3: para 10].
- 112 Statement of Peter Allen, 24 November 2011 [p22: para 120; p23: para 121].
- 113 For example, Submission of the Mid Brisbane River Irrigators, 11 March 2011; Submission of Ms Jocelyn Bailey, undated; Exhibit 41, Statement of Ms Jenny Moore, 7 April 2011.
- 114 Statement of Terry Wall, 9 June 2011 [p7; para 24].
- 115 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p1].
- 116 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p4].
- 117 Submission of Barrie Dunning, 24 February 2011 [p3].
- 118 Exhibit 41, Statement of Jenny Moore, 7 April 2011, Annexure 1.
- 119 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p6].
- 120 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p3].
- 121 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p3].
- 122 Statement of Dr Bruce Abernethy, 16 November, Annexure BA-1 [p3].
- 123 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p3].
- 124 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p4].
- 125 Statement of Terry Wall, 9 June 2011, Annexure TWW-7.
- 126 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p4].
- 127 Statement of Terry Wall, 9 June 2011, Annexure TWW-7.
- 128 Statement of Terry Wall, 9 June 2011, Annexure TWW-7; Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p4].
- 129 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p7].
- 130 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1 [p7].
- 131 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p4].
- 132 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1 [p3]; Office of the Chief Scientist, Understanding Floods: Questions and Answers, July 2011, Question 3.
- 133 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1 [p4].
- 134 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p4-6].
- 135 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p6].
- 136 Statement of Graham Bell, 29 October 2011 [p1: para 4-5], Statement of Jocelyn Bailey, 24 October 2011 [p3: para 23].
- 137 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p11].
- 138 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p11].
- 139 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p11].
- 140 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p11].
- 141 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1 [p8: para 26].
- 142 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p12].
- 143 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1.
- 144 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1 [p8: para 27].
- 145 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1 [p4: para 12].

- 146 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1 [p8: para 27].
- 147 Statement of Dr Bruce Abernethy, 7 October 2011, Annexure BA-1 [p11].
- 148 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1 [p8].
- 149 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p11: section 3.6]; Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p20: section 3.6].
- 150 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p19: section 3.2]; Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p10: section 3.2].
- 151 Exhibit 24, Seqwater, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam, March 2011, table 9.1.1 [p166].
- 152 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1 [p8: para 26].
- 153 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1 [p8: para 27].
- 154 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1 [p8: para 27].
- 155 Statement of Dr Bruce Abernethy, 16 November 2011, Annexure BA-1 [p8: para 27].
- 156 Statement of Terry Wall, 9 June 2011 [p8: para 31]; Submission of Seqwater, 25 November 2011 [p3].
- 157 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p8].
- 158 All references to metres in this section 16.3 are references to elevation level unless otherwise stated.
- 159 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p18].
- 160 Statement of Andrew Krotewicz, 13 September 2011 [para 13(ii)].
- 161 Exhibit 426, Statement of Barton Maher, 1 April 2011 [p3: para 14].
- 162 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p81]; Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 8, September 2011, Appendix G [p80]; Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009, Appendix E [p61].
- 163 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6, Appendix 10.
- 164 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p25]; Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 8, September 2011 [p28]; Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p27].
- 165 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p27]; Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 8, September 2011 [p27]; Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p25-26].
- 166 For background on the real time flood model used by the flood engineers during the January 2011 event, see section 2.6.4 *The real time flood model* of the Commission's interim report.
- 167 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p23]; Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 8, September 2011 [p23]; Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p19].
- 168 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p23]; Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 8, September 2011 [p23]; Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p19].

- 169 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6, Appendix 10.
- 170 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p18].
- 171 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p18].
- 172 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p18].
- 173 Statement of Andrew Krotewicz, 13 September 2011 [para 3].
- 174 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p18].
- 175 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p18].
- 176 Statement of Andrew Krotewicz, 3 November 2011 [para 8.1].
- 177 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p12].
- 178 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6, Appendix 10.
- 179 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p4].
- 180 Exhibit 24, Seqwater, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam, 2 March 2011 [p158-159].
- 181 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p4]. Statement of Andrew Krotewicz dated 13 September 2011, Annexure ATK-6, Appendix 10.
- 182 Again assuming a level of EL 75 metres. Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6, Appendix 10.
- 183 For a consideration of the operation of Wivenhoe Dam in strategy W4, see section 2.7.8 of the interim report.
- 184 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-1 [clause 3.1(a), 3.2].
- 185 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-1 [clause 7.2].
- 186 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-1 [clause 7.2].
- 187 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-2.
- 188 Statement of Andrew Krotewicz, 3 November 2011 [para 4.5-4.7], Statement of John Tibaldi, 12 September 2011 [para 6].
- 189 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-10. Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6, Appendix 10.
- 190 Statement of Andrew Krotewicz, 3 November 2011 [para 4.7]; Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p5].
- 191 Statement of Andrew Krotewicz, 3 November 2011 [para 5.1-5.3].
- 192 Statement of Andrew Krotewicz, 3 November 2011 [para 5.4].
- 193 Statement of Andrew Krotewicz, 3 November 2011 [para 5.1-5.3]; Statement of Andrew Krotewicz, 13 September 2011, Annexures ATK-6, ATK-9.
- 194 Statement of Andrew Krotewicz, 3 November 2011 [para 6.2-6.6].
- 195 Statement of Andrew Krotewicz, 3 November 2011 [para 6.31].
- 196 Statement of Andrew Krotewicz, 3 November 2011 [para 6.2-6.6].
- 197 Exhibit 24, Seqwater, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam, 2 March 2011; Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p13].
- 198 Statement of Andrew Krotewicz, 3 November 2011 [para 6.6].
- 199 Exhibit 24, Seqwater, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam, 2 March 2011; Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6 [p13].
- 200 At its peak, Wivenhoe Dam's level was more than 70cm below that required to trigger the first of the fuse plugs.
- 201 Statement of Andrew Krotewicz, 3 November 2011 [para 6.6].
- 202 Statement of Andrew Krotewicz, 3 November 2011 [para 7.1].
- 203 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-4 [p10].
- 204 Statement of Andrew Krotewicz, 13 September 2011 [para 3.1].
- 205 Submission of Tarong Energy, 8 April 2011, Appendix 4 [clause 2.1].

- 206 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-5 [clause 3.2.1].
- 207 Statement of Andrew Krotewicz, 13 September 2011, Annexure ATK-6, Appendix 11.
- 208 Statement of Andrew Krotewicz, 3 November 2011 [para 9.1-9.3].
- 209 Statement of John Tibaldi, 12 September 2011 [para 9].
- 210 Statement of Robert Ayre, 7 September 2011 [p6; para 5].
- 211 Statement of Robert Ayre, 7 September 2011 [p2; para 5].
- 212 Statement of Andrew Krotewicz, 13 September 2011 [para 12-13].
- 213 National Electricity Rules, November 2011, Chapter 4.
- 214 Submission of Australian Energy Market Operator, 16 December 2011.
- 215 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [para 76].
- 216 GHD Report: South East Queensland Water Board – Safety Review, Somerset Dam, Annexure BM-1, Document no. 24 [p3] to Statement of Barton Maher, 12 September 2011.
- 217 Exhibit 397, Statement of Peter Allen, 4 April 2011 [p5: para 19].
- 218 GHD Report, South East Queensland Water Board – Safety Review – Somerset Dam, September 1995, Document no. 24, Annexure BM-1 [p48] to Statement of Barton Maher, 12 September 2011.
- 219 New South Wales Department of Commerce Report, Somerset Dam – Stability of Abutment Monoliths, May 2005, Document no. 33, Annexure BM-1 [p11] to Statement of Barton Maher, 12 September 2011.
- 220 GHD Report, South East Queensland Water Board – Safety Review – Somerset Dam, September 1995, Document no. 24, Annexure BM-1 [p46] to Statement of Barton Maher, 12 September 2011.
- 221 GHD Report, South East Queensland Water Board – Safety Review – Somerset Dam, September 1995, Document no. 24, Annexure BM-1 [p32-33] to Statement of Barton Maher, 12 September 2011.
- 222 See, for example, the reports of GHD, SMEC and the New South Wales Department of Commerce, Document nos. 24, 33, 38, Annexure BM-1 to Statement of Barton Maher, 12 September 2011.
- 223 SMEC Report, Somerset Dam Investigation, July 2008, Document no. 38, Annexure BM-1 [p3] to Statement of Barton Maher, 12 September 2011.
- 224 SMEC Report, Somerset Dam Investigation, July 2008, Document no. 38, Annexure BM-1 [p9] to Statement of Barton Maher, 12 September 2011.
- 225 GHD Report, SMEC Report and New South Wales Department of Commerce Report, Document nos. 24, 33, 38, Annexure BM-1 to Statement of Barton Maher, 12 September 2011.
- 226 GHD Report, SMEC Report and New South Wales Department of Commerce Report, Document nos. 24, 33, 38, Annexure BM-1 to Statement of Barton Maher, 12 September 2011.
- 227 SMEC Report, Somerset Dam Investigation, July 2008, Document no. 38, Annexure BM-1 [p10] to Statement of Barton Maher, 12 September 2011.
- 228 SMEC Report, Somerset Dam Investigation, July 2008, Document no. 38, Annexure BM-1 [p10] to Statement of Barton Maher, 12 September 2011.
- 229 New South Wales Department of Commerce Report, Somerset Dam – Stability of Abutment Monoliths, May 2005, Document no. 33, Annexure BM-1 to Statement of Barton Maher, 12 September 2011.
- 230 New South Wales Department of Commerce Report, Somerset Dam – Stability of Abutment Monoliths, May 2005, Document no. 33, Annexure BM-1 [p3] to Statement of Barton Maher, 12 September 2011.
- 231 New South Wales Department of Commerce Report, Somerset Dam – Stability of Abutment Monoliths, May 2005, Document no. 33, Annexure BM-1 [p2] to Statement of Barton Maher, 12 September 2011.
- 232 New South Wales Department of Commerce Report, Somerset Dam – Stability of Abutment Monoliths, May 2005, Document no. 33, Annexure BM-1 [p10] to Statement of Barton Maher, 12 September 2011.
- 233 New South Wales Department of Commerce Report, Somerset Dam – Stability of Abutment Monoliths, May 2005, Document no. 33,

- Annexure BM-1 [p10] to Statement of Barton Maher, 12 September 2011.
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- 234 New South Wales Department of Commerce Report, Somerset Dam – Stability of Abutment Monoliths, May 2005, Document no. 33, Annexure BM-1 [p22] to Statement of Barton Maher, 12 September 2011.
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- 235 New South Wales Department of Commerce Report, Somerset Dam – Stability of Abutment Monoliths, May 2005, Document no. 33, Annexure BM-1 [p19] to Statement of Barton Maher, 12 September 2011.
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- 236 Seqwater, Somerset Dam Annual Dam Safety Inspection, November 2009, Document no. 40, Annexure BM-1 [p17] to Statement of Barton Maher, 12 September 2011.
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- 237 Seqwater, Somerset Dam Annual Dam Safety Inspection 2011, October 2011. See also Tenth Statement of John Tibaldi, 22 December 2011 [para 5].
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- 238 See also Tenth Statement of John Tibaldi, 22 December 2011 [para 4(f)].
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- 239 New South Wales Department of Commerce Report, Somerset Dam – Stability of Abutment Monoliths, May 2005, Document no. 33, Annexure BM-1 [p21] to Statement of Barton Maher, 12 September 2011.
- 
- 240 Statement of Barton Maher, 12 September 2011 [p2: para 13].
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- 241 Statement of Barton Maher, 12 September 2011 [p3].
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- 242 Somerset Dam: Five Year Comprehensive Dam Safety Inspection Report, Annexure BM-1 [Document no. 41: p22] to Statement of Barton Maher, 12 September 2011.
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- 243 Statement of Barton Maher, 12 September 2011 [p3: para 21].
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- 244 Statement of Barton Maher, 12 September 2011 [p3: para 20].
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- 245 Statement of Barton Maher, 12 September 2011 [p4: para 23].
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- 246 Exhibit 24, Seqwater, January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam, 2 March 2011 [p172].
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- 247 Statement of Barton Maher, 12 September 2011 [p2: para 7].
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- 248 Similarly, the cracking in Somerset Dam was not mentioned in the evidence of flood engineers about the operation of Somerset Dam. See Transcripts, 11 April 2011, Brisbane [p77] – 15 April 2011, Brisbane [p467].
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- 249 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p40]; Exhibit 24, January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam, 2 March 2011 [p219].
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- 250 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p40]; Somerset – Wivenhoe Interaction Study, October 2009 [p7].
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- 251 Exhibit 24, Seqwater, January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam, 2 March 2011 [p159, 172].
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- 252 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, Section 2.10.7 [p93-94]. There is also a crossing at Grant St, Whiteside; however, it appears to serve only a small local population.
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- 253 Submission of State of Queensland, 7 November 2011 [p11].
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- 254 See for example, Statement of Daryl Brown [p1]; Submission of Jocelyn Bailey [p1]; Submission of Bruce and Cheryl McDade [p2]; Submission of Merven Hoppner [p4]; Submission of Darren Zanow [p9]; Exhibit 310, Statement of Dr Peter Hackney, 10 April 2011, Attachment 1; Transcript, Dr Peter Hackney, 9 May 2011, Brisbane [p1515: line 26].
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- 255 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p26].
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- 256 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p26].
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- 257 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p20].
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- 258 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p26].
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- 259 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p26].
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- 260 Queensland Floods Commission of Inquiry, *Interim Report*, 2.10.7: North Pine River Crossings, 2011 [p93].
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- 261 Seqwater, 2010/2011 Wet Season Flood Events Report on the Operation of North Pine Dam, 2011 [p76].
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- 262 Submission of State of Queensland, 7 November 2011 [p9].
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- 263 Submission of State of Queensland, 7 November 2011 [p4].
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- 264 The Department of Transport and Main Roads has indicated that the cost of improving flood immunity in the Moggill and Ipswich West region through the construction of a new bridge and road upgrades is likely to be between \$134 and \$380 million: Submission of State of Queensland, 7 November 2011 [p3].
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- 265 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, 2.10.7: *North Pine River Crossings*, 2011.
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- 266 Queensland Floods Commission of Inquiry, *Interim Report*, Recommendation 2.29, 2011 [p94].
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- 267 Submission of State of Queensland, 7 November 2011 [p3]; Exhibit 1010, Statement of Miles Vass, 8 September 2011, Annexure G [p3].
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- 268 Submission of State of Queensland, 7 November 2011 [p3]; Exhibit 1010, Statement of Miles Vass, 8 September 2011, Annexure G [p3].
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- 269 Submission of Seqwater, 9 September 2011 [p1].
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- 270 Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 9, November 2011 [p22, 27]; Seqwater, *Manual of Operational Procedures for Flood Mitigation at North Pine Dam*, Revision 6, October 2011 [p20].
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- 271 Exhibit 327, Wivenhoe Dam Emergency Action Plan, September 2010.
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- 272 Exhibit 314, North Pine Dam Emergency Action Plan, September 2010.
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- 273 Exhibit 327, Wivenhoe Dam Emergency Action Plan, September 2010, Appendix C; Exhibit 314, North Pine Dam Emergency Action Plan, September 2010, Appendix C.
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- 274 Submission of State of Queensland, 7 November 2011 [p12].
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- 275 The situation report accords with the template the Commission recommended should be adopted: Queensland Floods Commission of Inquiry, *Interim Report*, 2.6.10: Communications, 2011.
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- 276 Queensland Floods Commission of Inquiry, *Interim Report*, Recommendation 2.23, 2011 [p70].
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- 277 Queensland Floods Commission of Inquiry, *Interim Report*, Recommendation 4.19, 2011 [p139].
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- 278 Transcript, Peter Care, 12 October 2011, Maryborough [p3974: line 30]. Wide Bay Water Corporation is wholly owned by the Fraser Coast Regional Council: Exhibit 787, Statement of Peter Care, 14 September 2011 [p4: para 7].
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- 279 Section 341, *Water Supply (Safety and Reliability) Act 2008*.
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- 280 Statement of Peter Allen, 24 November 2011 [p20: para 110].
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- 281 Submission of Esther Allan.
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- 282 Transcript, Peter Care, 12 October 2011, Maryborough [p3974: line 38]; Statement of Peter Allen, 24 November 2011 [p20: para 111]; Exhibit 787, Statement of Peter Care, 14 September 2011 [p6: para 16 and 17].
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- 283 Exhibit 787, Statement of Peter Care, 14 September 2011 [p7: para 21].
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- 284 Exhibit 787, Statement of Peter Care, 14 September 2011 [p8: para 27].
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- 285 Exhibit 787, Statement of Peter Care, 14 September 2011 [p8: para 27]; Transcript, Peter Care, 12 October 2011, Maryborough [p3974: line 57].
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- 286 Statement of Peter Allen, 24 November 2011 [p20: para 112].
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- 287 Statement of Peter Allen, 24 November 2011 [p20: para 112].
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- 288 Exhibit 787, Statement of Peter Care, 14 September 2011 [p8: para 27, 28]; Transcript, Peter Care, 12 October 2011, Maryborough [p3975: line 1].
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- 289 Transcript, Peter Care, 12 October 2011, Maryborough [p3975: line 7]; Statement of Peter Care, 24 November 2011 [p1: para 4].
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- 290 Transcript, Peter Care, 12 October 2011, Maryborough [p3975: line 7].
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- 291 Exhibit 787, Statement of Peter Care, 14 September 2011 [p12: para 58].
- 292 Statement of Peter Care, 24 November 2011 [p2: para 6].
- 293 Exhibit 787, Statement of Peter Care, 14 September 2011 [p9: para 37].
- 294 SunWater, Options for the Raising of Lenthalls Dam – Supplementary Report, December 2000, Appendix D [p3]; Statement of Peter Care, 24 November 2011 [p1: para 4].
- 295 Statement of Peter Care, 24 November 2011 [p4: para 23].
- 296 The ‘trigger event’ in the emergency action plan revision in effect during the 2010/2011 wet seasons is defined as the point at which the lake level is approaching RL 26.10 metres and either further rain is forecast or the lake level is rising; Exhibit 787, Statement of Peter Care, 14 September 2011 [p9: para 38].
- 297 Exhibit 787, Statement of Peter Care, 14 September 2011, Annexure 3.
- 298 Exhibit 787, Statement of Peter Care, 14 September 2011, Annexure 3.
- 299 Exhibit 787, Statement of Peter Care, 14 September 2011 [p10: para 42].
- 300 Exhibit 787, Statement of Peter Care, 14 September 2011, Annexure 3.
- 301 Exhibit 787, Statement of Peter Care, 14 September 2011, Annexure 3.
- 302 Transcript, Peter Care, 12 October 2011, Maryborough [p3976: line 23]; Exhibit 788, GHD, Lenthalls Dam Flooding Draft Report, February 2009 [p28].
- 303 Exhibit 788, GHD, Lenthalls Dam Flooding Draft Report, February 2009.
- 304 Exhibit 788, GHD, Lenthalls Dam Flooding Draft Report, February 2009 [p28].
- 305 Exhibit 787, Statement of Peter Care, 14 September 2011 [p10: para 46].
- 306 Exhibit 787, Statement of Peter Care, 14 September 2011 [p13: para 62]; Annexure 4.
- 307 Exhibit 787, Statement of Peter Care, 14 September 2011, Annexure 9.
- 308 Exhibit 787, Statement of Peter Care, 14 September 2011 [p13: para 66].
- 309 On 6 March 2010, 8 March 2010 and 9 March 2010.
- 310 Lenthalls Dam Event Log, March 2010.
- 311 Exhibit 787, Statement of Peter Care, 14 September 2011 [p13: para 66].
- 312 Lenthalls Dam Event Log, March 2010.
- 313 Exhibit 787, Statement of Peter Care, 14 September 2011 [p13: para 66]; Lenthalls Dam Event Log, March 2010.
- 314 Exhibit 787, Statement of Peter Care, 14 September 2011 [p13: para 66]; Lenthalls Dam Event Log, March 2010.
- 315 Exhibit 787, Statement of Peter Care, 14 September 2011 [p14: para 75].
- 316 Exhibit 787, Statement of Peter Care, 14 September 2011 [p14: para 75].
- 317 Exhibit 787, Statement of Peter Care, 14 September 2011 [p14: para 75]; Exhibit 787, Statement of Peter Care, 14 September 2011 [p15: para 77]; Lenthalls Dam Event Log, 12 December 2010.
- 318 Exhibit 787, Statement of Peter Care, 14 September 2011 [p15: para 77].
- 319 Exhibit 787, Statement of Peter Care, 14 September 2011 [p14: para 76].
- 320 Exhibit 787, Statement of Peter Care, 14 September 2011 [p15: para 77].
- 321 Exhibit 787, Statement of Peter Care, 14 September 2011 [p15: para 77].
- 322 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 88].
- 323 Exhibit 787, Statement of Peter Care, 14 September 2011 [p15: para 80].
- 324 Exhibit 787, Statement of Peter Care, 14 September 2011 [p15: para 80 – 81].
- 325 Exhibit 787, Statement of Peter Care, 14 September 2011 [p15: para 82].
- 326 Exhibit 787, Statement of Peter Care, 14 September 2011 [p15: para 82].
- 327 Exhibit 787, Statement of Peter Care, 14 September 2011 [p15: para 82].
- 328 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 83].
- 329 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 83].

- 330 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 83, 85].
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- 331 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 84].
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- 332 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 85].
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- 333 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 85].
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- 334 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 86].
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- 335 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 86].
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- 336 Exhibit 791, GHD, Lenthalls Dam Flooding December 2010 Event, June 2011 [p1 and 5].
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- 337 Exhibit 787, Statement of Peter Care, 14 September 2011 [p17: para 95]; Exhibit 791, GHD, Lenthalls Dam Flooding December 2010 Event, June 2011 [p5].
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- 338 Exhibit 787, Statement of Peter Care, 14 September 2011 [p17: para 97].
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- 339 Exhibit 787, Statement of Peter Care, 14 September 2011 [p17: para 97].
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- 340 Exhibit 787, Statement of Peter Care, 14 September 2011 [p17: para 95].
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- 341 Exhibit 787, Statement of Peter Care, 14 September 2011 [p17: para 95].
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- 342 Exhibit 787, Statement of Peter Care, 14 September 2011 [p19: para 114].
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- 343 Exhibit 787, Statement of Peter Care, 14 September 2011 [p17: para 99].
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- 344 Exhibit 787, Statement of Peter Care, 14 September 2011 [p17: para 99].
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- 345 Exhibit 787, Statement of Peter Care, 14 September 2011 [p18: para 100-101].
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- 346 Exhibit 787, Statement of Peter Care, 14 September 2011 [p18: para 101].
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- 347 Exhibit 787, Statement of Peter Care, 14 September 2011 [p18: para 101].
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- 348 Exhibit 787, Statement of Peter Care, 14 September 2011 [p18: para 101].
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- 349 Transcript, Peter Care, 12 October 2011, Maryborough [p3974: line 50]; Exhibit 787, Statement of Peter Care, 14 September 2011 [p9: para 37].
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- 350 Transcript, Peter Care, 12 October 2011, Maryborough [p3977: line 54].
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- 351 Transcript, Peter Care, 12 October 2011, Maryborough [p3977: line 50]; Exhibit 787, Statement of Peter Care, 14 September 2011 [p10: para 46]; Annexure 5.
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- 352 Exhibit 787, Statement of Peter Care, 14 September 2011 [p10: para 47].
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- 353 Exhibit 789, GHD, Report for Lenthalls Dam Raising: Lintel seal adjustment for crest gates, November 2008.
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- 354 Exhibit 787, Statement of Peter Care, 14 September 2011 [p11: para 48; p12: para 57]; Transcript, Peter Care, 12 October 2011, Maryborough [p3978: line 21].
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- 355 Exhibit 787, Statement of Peter Care, 14 September 2011 [p12: para 57]; Transcript, Peter Care, 12 October 2011, Maryborough [p3978: line 44]; Exhibit 790, GHD, Report for Lenthalls Dam Spillway Crest Gates Wet Testing Procedure, March 2009.
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- 356 Exhibit 787, Statement of Peter Care, 14 September 2011 [p12: para 57]; Transcript, Peter Care, 12 October 2011, Maryborough [p3978: line 55].
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- 357 Statement of Peter Care, 24 November 2011 [p5: para 28].
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- 358 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 88].
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- 359 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 89].
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- 360 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 90].
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- 361 Exhibit 787, Statement of Peter Care, 14 September 2011 [p17: para 91].
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- 362 Exhibit 787, Statement of Peter Care, 14 September 2011 [p19: para 109].
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- 363 Exhibit 787, Statement of Peter Care, 14 September 2011 [p19: para 110]; Exhibit 792, GHD, Report for Lenthalls Dam – Crest Gate Operational Issues and Modifications, June 2011 [p27].
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- 364 Exhibit 787, Statement of Peter Care, 14 September 2011 [p19: para 113].
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- 365 Statement of Peter Care, 24 November 2011 [p2: para 6].
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- 366 Statement of Peter Care, 24 November 2011, Annexure 1 [p3].
- 367 Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 83].
- 368 Exhibit 787, Statement of Peter Care, 14 September 2011 [p17: para 95].
- 369 Exhibit 791, GHD, Lenthalls Dam Flooding December 2010 Event, June 2011. [p21]; Exhibit 787, Statement of Peter Care, 14 September 2011 [p17: para 96].
- 370 Exhibit 791, GHD, Lenthalls Dam Flooding December 2010 Event, June 2011. [p21]; Exhibit 787, Statement of Peter Care, 14 September 2011 [p17: para 96].
- 371 Statement of Peter Care, 24 November 2011 [p2: para 11]; Transcript, Peter Care, 12 October 2011, Maryborough [p3982: line 5].
- 372 Statement of Peter Care, 24 November 2011 [p3: para 12].
- 373 Statement of Peter Care, 24 November 2011 [p3: para 13].
- 374 Statement of Peter Care, 24 November 2011 [p3: para 14].
- 375 Statement of Peter Care, 24 November 2011 [p3: para 15-16].
- 376 Statement of Peter Care, 24 November 2011 [p2: para 7]; [p5: para 26]; Annexure 1.
- 377 Exhibit 787, Statement of Peter Care, 14 September 2011 [p14: para 75]; Exhibit 787, Statement of Peter Care, 14 September 2011 [p15: para 82]; Exhibit 787, Statement of Peter Care, 14 September 2011 [p16: para 86]; Exhibit 787, Statement of Peter Care, 14 September 2011 [p17: para 97].
- 378 Statement of Peter Care, 24 November 2011 [p2: para 6].
- 379 Statement of Peter Care, 24 November 2011 [p1: para 3].
- 380 Transcript, Peter Care, 12 October 2011, Maryborough [p3982: line 14].
- 381 Statement of Peter Care, 24 November 2011 [p2: para 9].
- 382 Statement of Peter Care, 24 November 2011 [p2: para 6, 9].
- 383 Transcript, Peter Care, 12 October 2011, Maryborough [p3981: line 48].
- 384 Statement of Peter Allen, 24 November 2011 [p20-21: para 115 and 116].
- 385 Statement of Peter Care, 24 November 2011 [p6: para 33(a)].
- 386 Statement of Peter Allen, 24 November 2011 [p21: para 116].
- 387 Statement of Peter Allen, 24 November 2011 [p21: para 116].
- 388 Statement of Peter Allen, 24 November 2011 [p22: para 118].
- 389 Exhibit 787, Statement of Peter Care, 14 September 2011 [p13: para 69].
- 390 Exhibit 787, Statement of Peter Care, 14 September 2011 [p14: para 70].
- 391 Exhibit 787, Statement of Peter Care, 14 September 2011 [p14: para 71].
- 392 Statement of Peter Care, 24 November 2011 [p3: para 17].
- 393 Statement of Peter Care, 24 November 2011 [p4: para 22].
- 394 Exhibit 787, Statement of Peter Care, 14 September 2011 [p9: para 36]; Transcript, Peter Care, 12 October 2011, Maryborough [p3975: line 24].
- 395 Submission of Peter Sheridan; Submission of D. Stack; Submission of Frank Ondrus, President of Householders' Options to Protect the Environment Inc.
- 396 See definition of detention basin in Glossary.
- 397 Exhibit 990, Statement of Peter Allen, 16 September 2011 [p1: para 5]; Exhibit 75, BMT WBW Pty Ltd, Technical report on the Toowoomba flood of 10 January 2011 – Prepared for Local Government Association of Australia, April 2011 [p2-1].
- 398 Exhibit 75, BMT WBW Pty Ltd, Technical report on the Toowoomba flood of 10 January 2011 – Prepared for Local Government Association of Australia, April 2011 [p2-1].
- 399 Statement of Kevin Flanagan, 21 October 2011 [p3: para 5].
- 400 Exhibit 217, Statement of Kevin Flanagan, 30 March 2011 [p2: para 9].
- 401 Statement of Kevin Flanagan, 21 October 2011 [p3: para 7].

- 402 Statement of Kevin Flanagan, 21 October 2011 [p5: para 16].
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- 403 Statement of Kevin Flanagan, 21 October 2011 [p3: para 5].
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- 404 Statement of Kevin Flanagan, 21 October 2011 [p3: para 5].
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- 405 Statement of Kevin Flanagan, 21 October 2011 [p3: para 8].
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- 406 Statement of Kevin Flanagan, 21 October 2011 [p3: para 8].
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- 407 Statement of Kevin Flanagan, 21 October 2011 [p3: para 9].
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- 408 Statement of Kevin Flanagan, 21 October 2011 [p4: para 9].
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- 409 Exhibit 217, Statement of Kevin Flanagan, 30 March 2011 [p2: para 11].
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- 410 Statement of Kevin Flanagan, 21 October 2011 [p4: para 9].
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- 411 Statement of Kevin Flanagan, 21 October 2011 [p4: para 11].
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- 412 Statement of Kevin Flanagan, 21 October 2011 [p4: para 12].
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- 413 Statement of Kevin Flanagan, 21 October 2011 [p4: para 12].
- 
- 414 Exhibit 75, BMT WBW Pty Ltd, Technical report on the Toowoomba flood of 10 January 2011 – Prepared for Local Government Association of Australia, April 2011 [p6-1].
- 
- 415 Statement of Kevin Flanagan, 21 October 2011 [p5: para 13].
- 
- 416 Statement of Kevin Flanagan, 21 October 2011 [p5: para 15].
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- 417 Statement of Kevin Flanagan, 21 October 2011 [p5: para 15].
- 
- 418 Statement of Kevin Flanagan, 21 October 2011 [p5: para 15].
- 
- 419 Statement of Kevin Flanagan, 21 October 2011 [p5: para 18].
- 
- 420 Exhibit 67, Dr Phillip Jordan, SKM, *Hydrological advice to Queensland Floods Commission of Inquiry*, 12 April 2011 [p23]; Exhibit 75, BMT WBW Pty Ltd, Technical report on the Toowoomba flood of 10 January 2011 – prepared for Local Government Association of Australia, April 2011 [p9-1].
- 
- 421 Exhibit 75, BMT WBW Pty Ltd, Technical report on the Toowoomba flood of 10 January 2011 – prepared for Local Government Association of Australia, April 2011 [p9-1].
- 
- 422 Exhibit 75, BMT WBW Pty Ltd, Technical report on the Toowoomba flood of 10 January 2011 – prepared for Local Government Association of Australia, April 2011 [p5-3: 9-1].
- 
- 423 Statement of Kevin Flanagan, 21 October 2011 [p6: para 20].
- 
- 424 Statement of Kevin Flanagan, 21 October 2011 [p6: para 23].
- 
- 425 Statement of Kevin Flanagan, 21 October 2011 [p9: para 32].
- 
- 426 Statement of Kevin Flanagan, 21 October 2011 [p9: para 33].
- 
- 427 Section 341 of the *Water Supply (Safety and Reliability) Act 2008*.
- 
- 428 Exhibit 990, Statement of Peter Allen, 16 September 2011 [p2: para 8].
- 
- 429 Exhibit 990, Statement of Peter Allen, 16 September 2011 [p2: para 10].
- 
- 430 Exhibit 990, Statement of Peter Allen, 16 September 2011, PHA-34(a).
- 
- 431 Exhibit 990, Statement of Peter Allen, 16 September 2011, PHA-34(a).
- 
- 432 Exhibit 990, Statement of Peter Allen, 16 September 2011, PHA-34(a).
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- 433 Exhibit 990, Statement of Peter Allen, 16 September 2011, PHA-34(a).
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- 434 Exhibit 990, Statement of Peter Allen, 16 September 2011, PHA-34(d).
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- 435 Exhibit 990, Statement of Peter Allen, 16 September 2011, PHA-34(d).
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- 436 Exhibit 990, Statement of Peter Allen, 16 September 2011, PHA-34(g).
- 
- 437 Exhibit 990, Statement of Peter Allen, 16 September 2011, PHA-34(f).
- 
- 438 Statement of Peter Allen, 24 November 2011 [p31: para 177].
- 
- 439 Statement of Peter Allen, 24 November 2011 [p31: para 178].
- 
- 440 Statement of Peter Allen, 24 November 2011 [p31: para 180].
-

- 441 Administrative Arrangements Order (No. 1) 2011 [p25].
- 
- 442 Section 341, *Water Supply (Safety and Reliability) Act 2008*.
- 
- 443 See, for more information, sections 1.1 and 2.4.4 of the Commission's interim report.
- 
- 444 Exhibit 390, Statement of John Bradley, 4 April 2011 [p2: para 9].
- 
- 445 Exhibit 390, Statement of John Bradley, 4 April 2011 [p3: para 14].
- 
- 446 Exhibit 390, Statement of John Bradley, 4 April 2011 [p3: para 14].
- 
- 447 Statement of Debbie Best, 12 September 2011 [p2: para 11-13].
- 
- 448 Submission of the State of Queensland, Department of Environment and Resource Management, DERM-07, Departmental Disaster Management Plan, Attachment 2.
- 
- 449 Statement of Debbie Best, 12 September 2011 [p3: para 14].
- 
- 450 Submission of the State of Queensland, Department of Environment and Resource Management, DERM-07, Attachment 2.
- 
- 451 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, Volume 1, SR-7.
- 
- 452 Submission of the State of Queensland, Department of Environment and Resource Management, DERM-07, Attachment 2.
- 
- 453 Springfield Lakes – High Level Dam, Springfield Lakes – Low Level Dam, Moody Creek Detention Dam, Lake Mitchell Dam, Forest Lake Dam, Gordonbrook Dam, Environment Dam; see Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p15: para 53].
- 
- 454 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p15: para 53].
- 
- 455 Statement of Debbie Best, 12 September 2011; Exhibit 11, Statement of Stephen Robertson, 1 April 2011, SR-7; Submission of the State of Queensland, Department of Environment and Resource Management, DERM-07, Attachment 2.
- 
- 456 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p7: section 2.6].
- 
- 457 Submission of the State of Queensland, Department of Environment and Resource Management, DERM-06 [p4]; Statement of Debbie Best, 12 September 2011 [p3: para 18].
- 
- 458 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p1: para 5].
- 
- 459 For general information about emergency action plans see section 4.14 of the Queensland Floods Commission of Inquiry, *Interim Report*, 2011.
- 
- 460 Statement of Peter Allen, 24 November 2011 [p14: para 73].
- 
- 461 Statement of Peter Allen, 24 November 2011 [p10: para 42].
- 
- 462 Statement of Peter Allen, 24 November 2011 [p18: para 101].
- 
- 463 Exhibit 1128, Statement of Peter Allen, 12 September 2011 [p1: para 5].
- 
- 464 Decommissioning a dam involves removing or otherwise modifying parts of its structure to make it incapable of storing water, either temporarily or permanently: Department of Natural Resources and Mines, *Queensland Dam Safety Management Guidelines*, February 2002 [p45: para 10.2].
- 
- 465 Statement of Peter Allen, 24 November 2011 [p10: para 43].
- 
- 466 Statement of Peter Allen, 24 November 2011 [p3-4]; Worley Parsons, *Gordonbrook Comprehensive Dam Safety Report*, February 2008; Statement of Andrew Grant, 16 September 2011.
- 
- 467 Worley Parsons, *Gordonbrook Comprehensive Dam Safety Report*, February 2008 [p3].
- 
- 468 Statement of Peter Allen, 24 November 2011 [p3: para 10].
- 
- 469 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p137].
- 
- 470 See section 354(4)(b) of the *Water Supply (Safety and Reliability) Act 2008*, as amended by clause 35 of the *Disaster Readiness Amendment Act 2011*.
- 
- 471 Department of Natural Resources and Mines, *Queensland Dam Safety Management Guidelines*, February 2002.
- 
- 472 Commonwealth of Australia, *Emergency Management Planning for Floods Affected by Dams*, 2009.
- 
- 473 Statement of Peter Allen, 24 November 2011 [p18: para 109].
-

- 474 Correspondence from Crown Law, 18 January 2012 [p1].
- 
- 475 Statement of Peter Allen, 24 November 2011 [p14: para 72].
- 
- 476 Statement of Peter Allen, 24 November 2011 [13: para 62].
- 
- 477 Statement of Peter Allen, 24 November 2011 [p14: para 64].
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- 478 Statement of Peter Allen, 24 November 2011 [p13: para 68].
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- 479 Statement of Peter Allen, 24 November 2011 [p13: para 65].
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- 480 Statement of Peter Allen, 24 November 2011 [p13: para 65].
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- 481 Statement of Peter Allen, 24 November 2011 [p13: para 70].
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- 482 Statement of Peter Allen, 24 November 2011 [p13: para 70].
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- 483 Statement of Peter Allen, 24 November 2011 [p13: para 70].
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- 484 Statement of Peter Allen, 24 November 2011 [p13: para 66].
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- 485 Statement of Peter Allen, 24 November 2011 [p13: para 66; p13: para 67].
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- 486 Statement of Peter Allen, 24 November 2011 [p13: para 67].
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- 487 Statement of Peter Allen, 24 November 2011 [p13: para 67].
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- 488 Statement of Peter Allen, 24 November 2011 [p13: para 66].
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- 489 Statement of Peter Allen, 24 November 2011 [p14: para 79].
- 
- 490 Statement of Peter Allen, 24 November 2011 [p18: para 100].
- 
- 491 Statement of Peter Allen, 24 November 2011 [p18: para 100].
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- 492 Statement of Darren Moor, 2 November 2011 [p1: para 4].
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- 493 Statement of Darren Moor, 2 November 2011 [p1: para 5].
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- 494 Statement of Darren Moor, 2 November 2011, Annexure DBM-1.
- 
- 495 Statement of Darren Moor, 2 November 2011 [p2: para 8].
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- 496 Statement of Darren Moor, 2 November 2011 [p2: para 9-10; p3: para 14].
- 
- 497 Statement of Darren Moor, 2 November 2011 [p2: para 13].
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- 498 Statement of Darren Moor, 2 November 2011 [p3: para 14].
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- 499 Statement of Darren Moor, 2 November 2011 [p3-4: para 19].
- 
- 500 Statement of Darren Moor, 2 November 2011 [p4: para 27].
- 
- 501 Statement of Darren Moor, 2 November 2011 [p5: para 28].
- 
- 502 Statement of Darren Moor, 2 November 2011 [p5: para 28].
- 
- 503 Department of Natural Resources and Mines, Queensland Dam Safety Management Guidelines, February 2002 [p45: para 10.2].
- 
- 504 Statement of Darren Moor, 2 November 2011 [p7: para 47].
- 
- 505 Statement of Darren Moor, 2 November 2011 [p5: para 30-31, 34-36; p6: para 38 – p7: para 46].
- 
- 506 Statement of Darren Moor, 2 November 2011 [p4: para 25].
- 
- 507 Statement of Darren Moor, 2 November 2011 [p7: para 54; p8: para 61, 65].
- 
- 508 See correspondence from Crown Law, 18 January 2012, attaching: Letter, Stephen Robertson MP and Kate Jones MP, to Stirling Hinchliffe MP, 27 October 2010; Letter, Paul Lucas MP to Kate Jones MP, 28 March 2011; Letter, Paul Low, Acting Director-General of Department of Local Government and Planning, to Jim McGowan, Director-General, Department of Community Safety, undated; Letter, Paul Low, Acting Director-General of Department of Local Government and Planning, to John Bradley, Director-General, Department of Environment and Resource Management, undated; Letter, Kate Jones MP, to Paul Lucas MP, 17 June 2011.
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# Appendices

## Appendix 1: Terms of Reference

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[NO. 12

*Commissions of Inquiry Act 1950*

### COMMISSIONS OF INQUIRY ORDER (No.1) 2011

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#### 1. Short Title

This Order in Council may be cited as *Commissions of Inquiry Order (No.1) 2011*.

#### 2. Appointment of Commission

UNDER the provisions of the *Commissions of Inquiry Act 1950*, Her Excellency the Governor, acting by and with the advice of the Executive Council, hereby appoints the Honourable Justice Catherine Holmes to make full and careful inquiry in an open and independent manner with respect to the following matters:-

- a) the preparation and planning by federal, state and local governments; emergency services and the community for the 2010/2011 floods in Queensland,
- b) the performance of private insurers in meeting their claims responsibilities,
- c) all aspects of the response to the 2010/2011 flood events, particularly measures taken to inform the community and measures to protect life and private and public property, including:
  - immediate management, response and recovery;
  - resourcing, overall coordination and deployment of personnel and equipment;
  - adequacy of equipment and communications systems; and
  - the adequacy of the community's response.

- d) the measures to manage the supply of essential services such as power, water and communications during the 2010/2011 flood events,
- e) adequacy of forecasts and early warning systems particularly as they related to the flooding events in Toowoomba, and the Lockyer and Brisbane Valleys,
- f) implementation of the systems operation plans for dams across the state and in particular the Wivenhoe and Somerset release strategy and an assessment of compliance with, and the suitability of the operational procedures relating to flood mitigation and dam safety,
- g) all aspects of land use planning through local and regional planning systems to minimise infrastructure and property impacts from floods,
- h) in undertaking its inquiries, the Commission is required to:
  - take into account the regional and geographic differences across affected communities; and
  - seek public submissions and hold public hearings in affected communities.

### 3. Commission to report

AND directs that the Commissioner make full and faithful report concerning the aforesaid subject matter of inquiry, and make recommendations which she considers appropriate, feasible and cost effective to improve:

- the preparation and planning for future flood threats and risks, in particular the prevention of the loss of life;
- the emergency response in natural disaster events; and
- any legislative changes needed to better protect life and property in natural disaster events.

and transmit an interim report to the Honourable the Premier and Minister for the Arts by 1 August 2011, on matters associated with flood preparedness to enable early recommendations to be implemented before next summer's wet season, and a final report by 17 January 2012.

### 4. Report to be made public

AND further directs that the Reports transmitted to the Honourable the Premier and Minister for the Arts be made public upon their transmission to the Honourable the Premier and the Minister for the Arts.

### 5. Deputies to the Commission

Under Section 27 of the *Commissions of Inquiry Act 1950*, Her Excellency the Governor, acting by and with the advice of the Executive Council approves the appointment of Mr James O'Sullivan AC and Mr Phillip Cummins as Deputies to the abovementioned Commission.

**6. Application of Act**

The provisions of the *Commissions of Inquiry Act 1950* shall be applicable for the purposes of this inquiry except for section 19C – Authority to use listening devices.

**7. Conduct of Inquiry**

The Commissioner may hold public and private hearings in such manner and in such locations as may be necessary and convenient. The Commissioner may:

- a) hold hearings constituted by the Commissioner, whether sitting alone or with one or both of her Deputies; or
- b) authorise her Deputies or either of them to hold hearings or exercise powers pursuant to Section 28 of the *Commissions of Inquiry Act 1950*.

## ENDNOTES

1. Made by the Governor in Council on 17 January 2011.
2. Published in an Extraordinary Gazette 17 January 2011.
3. Not required to be laid before the Legislative Assembly.
4. The administering agency is the Department of the Premier and Cabinet.

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*Commissions of Inquiry Act 1950*

## COMMISSIONS OF INQUIRY AMENDMENT ORDER (No.1) 2011

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| 3. | Amendment of Order ..... | 1 |

**1. Short Title**

This Order in Council may be cited as *Commissions of Inquiry Amendment Order (No. 1) 2011*.

**2. Amended Order**

The *Commissions of Inquiry Order (No. 1) 2011* is amended as set out in this order.

**3. Amendment of Order**

At Clause 3, '17 January 2012'—

*omit, insert—*

'24 February 2012'.

## ENDNOTES

1. Made by the Governor in Council on 26 May 2011.
2. Published in an Extraordinary Gazette on 26 May 2011.
3. Not required to be laid before the Legislative Assembly.
4. The administering agency is the Department of the Premier and Cabinet.

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*Commissions of Inquiry Act 1950*

## COMMISSIONS OF INQUIRY AMENDMENT ORDER (No.1) 2012

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3.	Amendment of Order.....	1

## 1. Short Title

This Order in Council may be cited as *Commissions of Inquiry Amendment Order (No.1) 2012*.

## 2. Amended Order

The *Commissions of Inquiry Order (No. 1) 2011* is amended as set out in this order.

## 3. Amendment of Order

- (a) At Clause 3, '24 February 2012'—  
*omit, insert—*  
'16 March 2012'.
- (b) At Clause 3, 'Premier and Minister for the Arts'—  
*omit, insert—*  
'Premier and Minister for Reconstruction'.
- (c) At Clause 4, 'Premier and Minister for the Arts'—  
*omit, insert—*  
'Premier and Minister for Reconstruction'.

## ENDNOTES

1. Made by the Governor in Council on 25 January 2012.
2. Published in an Extraordinary Gazette on 25 January 2012.
3. Not required to be laid before the Legislative Assembly.
4. The administering agency is the Department of the Premier and Cabinet.

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25 January 2012

## Appendix 2: Leave to appear

Entities granted leave to appear as a party at the Commission

Party	Terms of Reference granted
State of Queensland	2(a) preparation and planning 2(c) all aspects of the response 2(d) essential services 2(e) forecasts and early warning systems 2(f) dam management, specifically for Wivenhoe and Somerset dams 2(g) land use planning
Local Government Association of Queensland Ltd (representing local councils)	2(a) preparation and planning 2(c) all aspects of the response 2(d) essential services 2(e) forecasts and early warning systems ( <i>Balonne, Goondiwindi and Moreton Bay regional Councils</i> ) 2(g) land use planning
Brisbane City Council	2(a) preparation and planning 2(c) all aspects of the response 2(d) essential services 2(e) forecasts and early warning systems 2(f) dam management, specifically for Wivenhoe and Somerset dams 2(g) land use planning
Ipswich City Council	2(a) preparation and planning 2(c) all aspects of the response 2(d) essential services 2(e) forecasts and early warning systems 2(f) dam management, specifically for Wivenhoe and Somerset dams 2(g) land use planning
The Commonwealth	2(a) preparation and planning 2(b) performance of private insurers 2(c) all aspects of the response 2(e) forecasts and early warning systems 2(f) dam management, specifically for Wivenhoe and Somerset dams 2(g) land use planning
Seqwater	2(c) all aspects of the response 2(d) essential services 2(f) dam management, specifically for Wivenhoe and Somerset dams
SunWater Ltd	2(a) preparation and planning 2(c) all aspects of the response 2(d) essential services 2(e) forecasts and early warning systems 2(f) dam management, specifically for Wivenhoe and Somerset dams
Burnett Water Pty Ltd	2(a) preparation and planning 2(c) all aspects of the response 2(d) essential services 2(e) forecasts and early warning systems 2(f) dam management, specifically for Wivenhoe and Somerset dams
Tarong Energy	2(d) essential services 2(f) dam management, specifically for Wivenhoe and Somerset dams

<b>Party</b>	<b>Terms of Reference granted</b>
Ergon Energy	2(a) preparation and planning 2(c) all aspects of the response 2(d) essential services
CS Energy	2(a) preparation and planning 2(c) all aspects of the response 2(d) essential services 2(f) dam management
Energex Ltd	2(c) all aspects of the response 2(d) essential services
Queensland Police Union of Employees	2(c) all aspects of the response
Fernvale Community Action Group	2(f) dam management, specifically for Wivenhoe and Somerset dams
Mid Brisbane River Irrigators	2(f) dam management, specifically for Wivenhoe and Somerset dams
United Firefighters Union of Australia	2(c) all aspects of the response
Mirvac Ltd	2(g) land use planning ( <i>re Tennyson development</i> )
Mirvac Funds Ltd	
Queensland Resources Council	2(f) dam management, specifically for Wivenhoe and Somerset dams 2(g) land use planning (in relation to mining only)
MMG Century Limited	2(a) preparation and planning 2(c) all aspects of the response 2(d) essential services 2(f) dam management
Arrow Energy Pty Ltd	2(a) preparation and planning 2(c) all aspects of the response 2(d) essential services 2(f) dam management
Ensham Resources	2(a) preparation and planning 2(c) all aspects of the response 2(d) essential services 2(f) dam management
RACQ Insurance	2(b) performance of private insurers
Insurance Council	2(b) performance of private insurers
Suncorp Group Ltd	2(b) performance of private insurers
AAMI	2(b) performance of private insurers
CGU Australia Ltd	2(b) performance of private insurers
NRMA	2(b) performance of private insurers
IAG Australia	2(b) performance of private insurers
<b>Individuals granted leave to appear as a party</b>	
Mr Robert Ayre	2(f) dam management
Mr John Tibaldi	2(f) dam management
Mr Terrence Malone	2(f) dam management
Mr John Ruffini	2(f) dam management

## Appendix 3: *Interim Report recommendations*

### Chapter 2 Dams

- 2.1 Seqwater should review all arrangements for the operation of the dams during flood events for the entire wet season by 30 September each year, and ensure that all parties are adequately prepared, in the process ensuring that:
  - Seqwater can comply with every aspect of the Wivenhoe and North Pine manuals
  - the flood operations centre is ready and capable of operating during any flood event of whatever duration, including in terms of communications, equipment, rostering of and facilities for staff
  - the flood operations centre has available to it all tools, studies, equations and data necessary for it to be fully appraised of the consequences of its operation of the dams, including:
    - hydrodynamic model of the Brisbane River downstream of the Wivenhoe Dam
    - hydrodynamic model of the Bremer River
    - copy of damage curves from Brisbane Valley Damage Minimisation Study 2007
    - equations for flow out of fuse plugs, if initiated.
- 2.2 It should be accepted that control over temporary alteration of the full supply level of Wivenhoe, Somerset and North Pine dams is solely the function of the Queensland Government acting through the responsible Minister.
- 2.3 The regulatory framework by which the responsible Minister can effect a temporary alteration to full supply level should be simplified.
- 2.4 For the purposes of making any decision about a temporary alteration to full supply level, the Minister should receive advice from:
  1. Seqwater, as to the flood mitigation impacts of such an alteration
  2. the Water Grid Manager, as to the security of water supply implications of such an alteration
  3. the Water Commission, as to both the flood mitigation impacts and the security of water supply implications of such an alteration
  4. DERM as to an analysis of the above advice, its own advice as to dam safety, the regulatory framework and any other matter within its expertise.
- 2.5 If the Bureau of Meteorology makes a similar seasonal forecast to that made for the 2010/2011 wet season, expressed with equal or greater confidence, for the 2011/2012 wet season, the Queensland Government should temporarily reduce the full supply level of Wivenhoe Dam to 75 per cent, with a concomitant adjustment to the trigger levels for the strategies in the Wivenhoe manual.
- 2.6 The requirements of the chief executive of DERM as to training of operational personnel should be provided to Seqwater on a regular and formal basis.
- 2.7 Seqwater should ensure all staff and engineers who may be involved in flood operations are involved in formal training exercises which address the full range of possible operating situations.
- 2.8 Seqwater should:
  1. conduct an interim review of the Wivenhoe manual
  2. have the draft manual assessed by independent expert peer reviewers
  3. consider the expert peer reviews
  4. submit the draft manual to DERM for approval under the Act so that it can be approved before 1 October 2011.
- 2.9 The following matters require particular attention during the interim review of the Wivenhoe manual:
  - definition of what ‘best forecast rainfall’ means
  - prescription about how forecast rainfall information is to be used by the flood engineers

- definition of ‘predicted lake level’ and the use of consistent language throughout the Wivenhoe manual about predicted lake levels
  - clarification of options for transition to strategies W2 or W3 from strategy W1
  - clarification of the rules for drawdowns of the dams following flood events
  - removal of the term ‘non-damaging flows’ (and similar terms) to describe flows below 4000 m<sup>3</sup>/s at Moggill
  - clarification of whether W3 allows the flood engineers to release water which would create a flow at Moggill of over 4000 m<sup>3</sup>/s
  - precise definition of the maximum mechanical capability of the gate opening mechanism
  - clarification of how part 8.6 should be followed in strategy W4, including clarifying the use of the word ‘generally’.
- 2.10 Seqwater should act immediately to establish:
1. a steering committee to oversee the long term review of the Wivenhoe manual including senior representatives of at least DERM, Seqwater, the Water Commission, the Water Grid Manager, Brisbane City Council, Ipswich City Council and Somerset Regional Council
  2. a technical review committee comprised of independent experts in at least hydrology, meteorology and dam operations to examine all technical work completed as part of the review.
- 2.11 The steering committee should ensure the scientific investigations and modelling outlined in recommendation 2.12 and 2.13 are completed. It should also assess the need for any other work to be done, and instigate any other investigations or work considered necessary for a full and proper review of the Wivenhoe manual.
- 2.12 The following scientific investigations should be carried out prior to modelling work under the supervision of the steering committee and reviewed by the technical review committee:
1. review of the design hydrology:
    - a. using a stochastic or Monte Carlo or probabilistic approach
    - b. taking into account observed variability in temporal and spatial patterns of rainfall
    - c. taking into account observed variability in relative timings of inflows from the dams and downstream tributaries.
  2. production of a digital terrain model incorporating a bathymetric survey of all critical sections of creeks and rivers upstream and downstream of the dam relevant to flood modelling
  3. assessment of the reliability of the 24 hour, the three day and the five day rainfall forecasts
  4. consideration of whether and how weather radar can be incorporated into decision making
  5. requesting information from the Bureau of Meteorology as to its willingness to provide ensemble forecasts
  6. consideration as to whether and how ensemble forecasts can be incorporated into decision making.
- 2.13 The following modelling work should be carried out under the supervision of the steering committee and reviewed by the technical review committee:
1. modelling across the range of full supply levels, operating strategies and flood events (historical, design and synthetic) in each case assessing the consequences in terms of risk to life and safety and economic, social and environmental damage. In terms of operating strategies, using a full range of strategies including:
    - a. a stepped change from W3 to W4
    - b. moving to a higher rate of release earlier in W1
    - c. bypassing W1
    - d. altering maximum release rates under W3
    - e. operating the gates in conjunction with the initiation of any of the fuse plugs in order to achieve a lower rate of discharge
  2. simulations to test the robustness of relying on the 24 hour, the three day and the five day rainfall forecasts

3. development of a probability distribution for the time between closely spaced flood peaks in the catchment using historical records.
- 2.14 The Commission recommends that a review be conducted of the number and distribution of ALERT gauges within the Wivenhoe and Somerset catchments. This review should include an assessment of the usefulness and cost effectiveness of installing more gauges, particularly at high elevations in the catchment. Such an assessment would appropriately involve the Bureau of Meteorology, DERM and Seqwater, and the relevant local councils.
- 2.15 Seqwater should:
- immediately recruit and train additional flood engineers to ensure at least five flood engineers are available for flood operations
  - establish a formal flood event operation training program for junior engineers to ensure the flood operations centre will be staffed by appropriately qualified and experienced personnel in the medium and long term.
- 2.16 In addition to the on duty flood engineer(s), Seqwater should ensure that the flood operations centre is staffed by a trainee flood engineer on each shift (in addition to the technical assistants) to conduct the modelling.
- 2.17 Seqwater should ensure that, during major flood events, flood engineers do not have responsibility for, and are not required to, organise food, sleeping arrangements or access to facilities, such as power supply and communications equipment.
- 2.18 An accurate record should be kept of reasons for key decisions, including changes in strategy and releases. Documents relevant to key decisions should also be kept, including:
- each version of the gate operations spreadsheet which contains a different input gate operation scenario
  - all graphical depictions of model runs produced
  - a version of the gate operations spreadsheet which contains the gate operation scenario which will be implemented marked so that it is clear it is the one agreed to be implemented.
- 2.19 Seqwater should ensure that all telephone calls within the flood operations centre are digitally recorded to create an accurate record of decision-making during major flood events.
- 2.20 Seqwater should develop procedures which require the flood engineers to check the entries in the flood operations centre's flood event log at a near contemporaneous time, such as the end of their shift, to ensure accuracy and the recording of significant events. Seqwater should make sure that the operation of the flood operations centre enables the flood engineers to comply with that procedure.
- 2.21 Seqwater should produce a template situation report in consultation with the flood engineers and recipient agencies. As part of this process, consideration should be given as to whether the quality and timeliness of the dissemination of information about flood operations would be improved if a single document, rather than a situation report and a technical situation report, were used for the purpose of communicating flood operations to all concerned parties. The template situation report should include, at a minimum, dedicated space for the following:
- meteorological observations and situation, including forecasts
  - identification of the current operating strategy
  - the strategy, aims and objectives of the flood engineers
  - actual and expected releases
  - any other comments.
- 2.22 Seqwater should create a regular forum for discussion between all operational staff of the flood operations centre and Bureau staff to:
- increase the knowledge of flood operations centre staff about the Bureau's products, abilities, advice and operations
  - reach agreement as to the frequency and type of information to be shared between the Bureau and the flood operations centre during a flood event

- discuss advances in technology and science in areas including forecasting, data collection and modelling
  - build relationships between the staff of both organisations.
- 2.23 Seqwater should give consideration to creating a communications position within the flood operations centre filled by an engineer with experience in dam operations and emergency management processes.
- 2.24 Seqwater should give consideration to posting information about current and future releases on its website during flood events as one method of ensuring accurate and timely information is available to the public.
- 2.25 Seqwater should:
1. conduct an interim review of the North Pine manual
  2. have the draft manual assessed by independent expert peer reviewers
  3. consider the expert peer reviews
  4. submit the draft manual to DERM for approval under the Act so that it can be approved before 1 October 2011.
- 2.26 Particular attention should be paid during the interim review of the North Pine manual to clarifying the circumstances in which pre-releases under part 8.4 are permitted.
- 2.27 Seqwater should act immediately to establish:
1. a steering committee to oversee the long term review of the North Pine manual including senior representatives of at least DERM, Seqwater, the Water Commission, the Water Grid Manager, Brisbane City Council and the Moreton Bay Regional Council
  2. a technical review committee comprised of independent experts in at least hydrology, meteorology and dam operations to examine all technical work completed as part of the review.
- 2.28 The steering committee should:
1. oversee the continuation of Seqwater's *North Pine Dam Acceptable Flood Study Investigations* in accordance with the scope and program of activities advised to the Commission as at 6 May 2011
  2. determine whether any hydrological studies, in addition to those undertaken as part of the *North Pine Dam Acceptable Flood Study Investigations*, are required
  3. ensure that modelling across a range of full supply levels and operating strategies, including variations of the gate increments and gate opening intervals is undertaken
  4. ensure all of the above work is reviewed by the technical review committee.
- 2.29 The Moreton Bay Regional Council should investigate options for the upgrade of Youngs Crossing and undertake a cost-benefit analysis of these to determine an outcome which best serves the public interest.
- 2.30 The Moreton Bay Regional Council should consult with Seqwater and the local police, ambulance and fire and rescue services to make arrangements for emergency vehicles to access Vores Road and Grant Street, Whiteside, when Vores Road is closed by the flooding of Whiteside Creek.

## Chapter 3 Disaster frameworks, preparation and planning

- 3.1 The state disaster management group should include representatives of the Australian Defence Force and the Australian Red Cross in its planning and preparation for the next wet season.
- 3.2 Risk management is fundamentally important to disaster management. The Queensland Government should, before the next wet season, ensure that the state-wide natural hazard risk assessment is completed and its results provided to local governments.
- 3.3 Emergency Management Queensland should, as part of its review of local disaster management planning guidelines, consider whether consistent activation terminology should be adopted.
- 3.4 Every local government susceptible to flooding should ensure that, before the next wet season, its local disaster management plan:
- is consistent with the *Disaster Management Act 2003*

- addresses local risks and circumstances
  - can be used easily in the event of a disaster.
- 3.5 Every person who is required to work under a local disaster management plan should be familiar with the plan before the next wet season.
- 3.6 Every local government should publish its disaster management plan (and relevant sub-plans) on its website before the next wet season.
- 3.7 Emergency Management Queensland should proceed with its proposed reviewing system before the next wet season.
- 3.8 Each district disaster co-ordinator should ensure that, before the next wet season, the disaster management plan of every local government in the co-ordinator's district susceptible to flooding:
- is consistent with the *Disaster Management Act 2003*
  - addresses local risks and circumstances
  - can be used easily in the event of a disaster.
- 3.9 In order to assist district disaster co-ordinators in this task, and to ensure consistency and effectiveness, Emergency Management Queensland should:
- provide a standardised approach for district disaster co-ordinators to follow, with all necessary guidance
  - generally oversee the reviewing process
  - before the next wet season, review a selection of local disaster management plans of local governments susceptible to flooding, which have already been reviewed at the district level.
- 3.10 Emergency Management Queensland should assess the effectiveness of the review system before the end of 2011, and report its results to the Commission by 31 December 2011.
- 3.11 Emergency Management Queensland should endeavour to ensure that before the next wet season:
- training is provided to those involved in disaster management at the local and district levels to ensure that the respective roles of all agencies, and in particular local government and the Queensland police, during an event are clearly understood
  - training is provided to all local disaster co-ordinators
  - training is provided to SES volunteers
  - local disaster management groups are given practical training based on the event of large-scale flooding across different local government regions (as in Exercise Orko).
- 3.12 If training cannot be provided to every local government and disaster district before the next wet season, priority should be given according to each region's susceptibility to flooding.
- 3.13 Before the next wet season, local governments susceptible to flooding should conduct community education programs which provide local information about (at least) the following topics:
- the measures households should take to prepare for flooding
  - the roles and functions of the SES and details of how to contact and join it
  - whom to contact if assistance is needed during a flood
  - contact details for emergency services in the area
  - the types of warnings that are used in the area, what they mean and what to do in the event of a warning
  - where and how to obtain information before, during and after a disaster
  - what is likely to happen during a disaster (for example, power outages and road closures)
  - evacuation
  - measures available for groups who require particular assistance (for example, the elderly, ill and people with a disability).

- 3.14 To ensure consistency, the Queensland Government should assist local governments to develop and deliver the community education programs.
- 3.15 Before the next wet season, the Queensland Government should conduct a public education campaign about the dangers of driving into floodwaters.
- 3.16 The campaign should use various media and be designed to reach as many people as possible.
- 3.17 The National Emergency Management Committee should, as part of its education initiatives, consider developing a national public education campaign about the dangers of driving into floodwaters, using various media and commencing, if possible, before the next wet season.
- 3.18 The Queensland and Commonwealth governments should liaise to ensure a consistent message is delivered to the public.

## Chapter 4 Forecasts, warnings and information

- 4.1 In issuing warnings for a district or region, local and state authorities should use a range of different warning mechanisms effective for the particular district or region, including methods which do not rely on electricity.
- 4.2 Councils should prepare SMS alert templates covering a range of different flood scenarios before the wet season.
- 4.3 SMS alerts should direct recipients to websites or contact numbers providing more detailed information about flood locations and predictions, the location of evacuation centres and evacuation routes.
- 4.4 Councils and Emergency Management Queensland should work together to ensure the approval process does not cause delays in delivering SMS alerts.
- 4.5 Wherever possible, Emergency Management Queensland should consult with local disaster management groups before sending emergency alerts to residents. Emergency Management Queensland should inform the local disaster management group, as soon as it can, about any message already sent to residents in that local disaster management group's area.
- 4.6 Individuals and businesses should be encouraged to acquire battery operated radios for use in emergencies.
- 4.7 Councils should ensure that residents are aware of the frequency of the radio station or stations in their local area that will disseminate flood warnings and other information during disasters.
- 4.8 Councils that have not already done so should consider how social media may be used effectively to provide accurate information about flood levels and local conditions to residents during a flood event.
- 4.9 A siren may be appropriate in smaller towns or rural communities susceptible to flash flooding. If councils rely on sirens to warn residents, they should ensure that the community understands the meaning of the siren.
- 4.10 Councils, with the assistance of the Bureau of Meteorology, should examine the feasibility of and priorities for installing additional river height and rainfall gauges in areas of identified need.
- 4.11 Councils, with the assistance of the Bureau of Meteorology, should consider the susceptibility of their regions to flash flooding, and whether it is feasible and necessary to acquire and operate an automated local evaluation in real time system (ALERT system) for particular waterways.
- 4.12 The Queensland Government should consider assisting less well-resourced councils to fund the installation of an ALERT system where a case is made for its adoption.
- 4.13 Councils should ensure that residents and businesses can clearly understand the impact of predicted flood levels on their property. This may include one or more of the following methods:
  - information on rates notices about flooding at individual properties
  - geospatial mapping, available to the public, that depicts inundation at certain river heights
  - flood markers
  - flood flag maps and floodwise property reports
  - colour coded maps

- information that relates gauge heights with the level of flooding to be expected at a property.
- 4.14 In the course of flood events, warnings referring to gauge heights should include information about the location of the gauge.
- 4.15 Each local disaster management group should include in its meetings a representative of the operator of any dam upstream of its region which contributes water to flooding.
- 4.16 Dam operators should plan to contact people identified by their emergency action plans about dam outflow in sufficient time for them to be able to respond to the information.
- 4.17 Dam operators should ensure each emergency action plan includes a clear statement as to the frequency of, and circumstances in which, warnings will be issued to people listed in the emergency action plan.
- 4.18 Dam operators should assess the effectiveness of using SMS and/or email as a bulk instantaneous communication to all people on the notification list while individually contacting those whom it is essential to inform immediately.
- 4.19 Seqwater should consider consolidating its communication arrangements and responsibilities in a single document for each dam it operates.
- 4.20 The operator of each dam should, upon request, provide to any person on the notification list in the emergency action plan an explanation of the arrangements as to the type and frequency of communications required by that plan.
- 4.21 Operators of dams should assess their current compliance with the DERM *Queensland Dam Safety Management Guidelines* (February 2002), the ANCOLD *Guidelines on Dam Safety Management* (August 2003), and the Australian Government *Emergency Management Planning for Floods Affected by Dams* (2009) and if appropriate, comply with those guidelines.
- 4.22 Operators should include in their emergency action plan a description of the type of information that will be provided to those on the notification list.
- 4.23 Operators of dams should publicise, in a newspaper circulating in the local area and by posting a notice on its website every year before the wet season, the opportunity for local residents immediately downstream of a dam to be included on the existing notification list, and:
- consider whether an applicant for notification is so close to the dam that the warning time before water from the dam affects them is less than that available through the emergency management system
  - consider whether they can be effectively notified by SMS or email
  - if it is necessary to contact the applicant personally, agree with him or her a mode for that communication.
- 4.24 The operator of any referable dam and the local disaster management group should develop a common understanding as to their respective roles in a flood event and the type and frequency of information the dam operator will provide to it and local residents.
- 4.25 The Department of Transport and Main Roads, in its capacity as the primary provider of information about road conditions to the public, should continue to improve the accuracy of road condition information and the timeliness of its distribution to the public and other agencies.
- 4.26 The Department of Transport and Main Roads should identify and include local road names when reporting road conditions.
- 4.27 The Queensland Government should work with the New South Wales Government to co-ordinate road condition reporting procedures to inform local councils and road users of interstate road conditions in a variety of different ways.
- 4.28 In rural and remote areas where telecommunications are not effective, measures that do not rely on internet and mobile telephone services should be implemented to inform the travelling public of road conditions ahead, for example:
- signs with detailed information

- providing tourist information centres and tourist radio stations with information on road conditions.
- 4.29 The Bureau of Meteorology should endeavour to make clear the areas actually covered by its warnings, and specify what may be expected in particular areas, so that the relevance and significance of any warning is obvious to residents of the area at risk.
- 4.30 Councils should continue to take responsibility for issuing flash flooding warnings. However, where the Bureau of Meteorology becomes aware of weather conditions likely to cause flash flooding that is likely to endanger life or property in a particular council's region, it should, performing its functions in the public interest, directly communicate that information to the relevant council.
- 4.31 Councils should advise the Bureau of Meteorology of any information they possess about flash flooding (or the immediate prospect of it) likely to endanger life or property in their region, and of any warnings they issue about such flash flooding. The Bureau of Meteorology should consider in each case whether any such warning should be re-published (whether as a warning emanating from the Bureau itself or as attributed to the relevant council) on the Bureau's website, or whether it should provide a link to any council warning or other information regarding flash flooding provided by councils or disaster management agencies.
- 4.32 Where the Bureau of Meteorology has information which leads it to anticipate flash flooding likely to endanger life or property in a specific area, it should publish a warning to that effect on its website.
- 4.33 The Bureau of Meteorology should do its best to develop working relationships with all councils, particularly for the purpose of exchanging information in severe weather and flood events.
- 4.34 The Bureau of Meteorology should expand its volunteer rainfall and river height networks to incorporate residents of the Lockyer Valley, particularly property owners living on watercourses who can provide manually obtained readings of water heights where no automatic gauge is available, or can confirm automatic gauge readings where there is concern about their accuracy.
- 4.35 The Bureau of Meteorology should consider identifying amateur weather-watch groups it considers credible and likely to have useful local knowledge, and establish means (similar to those available to the storm spotters) by which they can expeditiously communicate with the Bureau.
- 4.36 Somerset Regional Council, in consultation with Seqwater and the Bureau of Meteorology, should consider how warnings can be provided to residents living near the Brisbane River at Fernvale about the expected level of flooding in their area.

## Chapter 5 Emergency response

- 5.1 When a local government cannot effectively manage its response to a disaster, disaster management personnel from local governments in a position to assist should be deployed to help the local disaster management group.
- 5.2 Local governments should consider adopting uniform disaster management software, to enable inter-council assistance to be given more easily and effectively.
- 5.3 To ensure effective co-ordination in larger-scale disasters, deployment of personnel (and other resources) between local governments should be facilitated through the Council to Council (C2C) program.
- 5.4 The C2C program should be incorporated into the state disaster management arrangements and operate within the structure of the state disaster co-ordination centre.
- 5.5 The state disaster management group, Emergency Management Queensland and the Local Government Association of Queensland should do further work before the next wet season to ensure that during a disaster:
- the C2C program meets requests for assistance as efficiently as possible
  - local governments and other prospective participants understand how the C2C program works.
- 5.6 As part of their planning before the next wet season, local disaster management groups should identify communities which, because of distance, the potential for isolation by disaster, or any other reason, may require specific disaster management arrangements, and take steps to establish them. Such arrangements may include forming disaster management sub-groups in those communities.

- 5.7 Whatever form arrangements take, they should seek to ensure that, in the event that flooding causes isolation:
    - there are lines of communication between the local disaster management group and the community
    - the community has the basic resources it needs to cope with its situation
    - the local disaster management group is aware of what supplies the community may need in prolonged disaster, and can respond to requests for assistance in a timely way
    - potential evacuation routes and centres are known.
  - 5.8 Where a local government forms a sub-group of its disaster management group:
    - the responsibilities of the sub-group must be clearly defined within the local disaster management arrangements
    - each member of the sub-group must clearly understand his or her role.
- The Commission recommends that sub-groups and local disaster management groups set out their respective roles and responsibilities in writing.
- 5.9 Until the All Hazards Information Management System is in place and allows the status of requests for assistance to be tracked, other means should be used to keep local disaster management groups informed of the progress of requests for assistance.
  - 5.10 A clear protocol should be developed for managing the participation of local and district disaster management groups in the state level teleconferences, to govern and make more efficient participation in the teleconferences.
  - 5.11 The Queensland Fire and Rescue Service should increase the number of swift water technicians (Level 2) to at least meet the quota for the approved number of rescue technicians in each region.
  - 5.12 The Queensland Fire and Rescue Service should consider whether the approved number of swift water technicians in each region is appropriate to meet the demands of that region.
  - 5.13 The Queensland Fire and Rescue Service should revise the Operations Doctrine to clarify:
    - how many Level 2 swift rescue technicians and Level 1 support personnel are required to safely perform a swift water rescue
    - the options available to an incident controller at a swift water incident with fewer than the required personnel and what considerations they should take into account in their decision-making.
  - 5.14 The Queensland Fire and Rescue Service should consider providing Level 1 swift water rescue training to all auxiliary firefighters stationed in areas susceptible to flooding.
  - 5.15 The Queensland Fire and Rescue Service should ensure all rural fire service volunteers and auxiliary firefighters stationed outside areas susceptible to flooding receive Awareness Level swift water rescue training.
  - 5.16 The Queensland Fire and Rescue Service should identify areas that are likely to require, but do not have, swift water capability during the wet season and consider how it can best provide a permanent capability to any such area.
  - 5.17 The memorandum of understanding between the Queensland Fire and Rescue Service and Emergency Management Queensland should be finalised.
  - 5.18 The joint helicopter operations training program contemplated by the memorandum should be devised and provided to all relevant staff of the Queensland Fire and Rescue Service and Emergency Management Queensland.
  - 5.19 The Queensland Fire and Rescue Service should purchase waterproof radio equipment that:
    - is appropriate for swift water and normal fire fighting environments
    - will attach securely to firefighters in a way that does not hamper their operations.
  - 5.20 The Queensland Fire and Rescue Service should work towards providing hands-free means of communications to swift water technicians for in-water operations.

- 5.21 The Queensland Fire and Rescue Service should ensure that rescue technicians on deployment are provided with individual radios, rather than sharing a communications pack.
- 5.22 Permanent urban appliances should carry at least five personal floatation devices to ensure there is a floatation device for each firefighter and a spare for rescues.
- 5.23 Every rescue appliance should carry personal floatation devices suitably sized for children or infants.
- 5.24 The Queensland Fire and Rescue Service should consider upgrading all personal floatation devices to a type which allows the firefighter to release himself or herself from an attached rope in the event of getting caught, or in other life threatening situations.
- 5.25 The Queensland Fire and Rescue Service should investigate the feasibility of acquiring motorised inflatable work platforms with guarded propellers to improve the safety of swift water rescue.
- 5.26 Queensland Fire and Rescue Service should review whether it has enough vehicles capable of traversing floodwaters.
- 5.27 The Queensland Fire and Rescue Service should ensure all station officers are informed about the locations and availability of additional equipment and how to obtain it.
- 5.28 The Queensland Fire and Rescue Service should ensure that staff in Ipswich can rapidly obtain additional swift water rescue equipment in the case of an emergency.
- 5.29 The Queensland Fire and Rescue Service should consider isolating repeaters during a large scale emergency response. If this solution is found to be feasible, it should be implemented as protocol as soon as possible. If it is not, the Queensland Fire and Rescue Service should explore other solutions to the issue of the fire communications network being overloaded and firefighters resorting to localised networks during large scale emergency response situations.
- 5.30 The Queensland Fire and Rescue Service needs to define clearly what its protocol is for volunteer firefighters in disaster scenarios other than fire when they are the only or primary rescue service in a community.
- 5.31 The Queensland Fire and Rescue Service should clarify in practical terms the role of firefighters in sandbagging, the provision of road blocks and similar activities.
- 5.32 Before the next wet season, councils, SES controllers and Emergency Management Queensland should work together to identify and address deficiencies in the ability of the SES to respond effectively to flooding. At the very least, suitable flood boats and flood boat training should be provided to SES units which require them.
- 5.33 The Queensland Government and councils should take measures, as soon as possible, to attract more SES volunteers, particularly in areas susceptible to flooding which do not have sufficient numbers. New SES units should be established where possible.
- 5.34 The Commission acknowledges that it may not be possible to recruit and train sufficient numbers of SES volunteers to the extent needed before the next wet season. However, this should not prevent steps being taken as soon as possible to identify the factors impeding the recruitment and retention of SES volunteers, action being taken to address them, and the commencing of recruitment activity.
- 5.35 Before the next wet season, the Department of Public Works should ensure that Smart Service Queensland can manage a significant increase in calls to the 132 500 number, to at least the level that occurred during the 2010/2011 floods.
- 5.36 As a matter of priority, the Emergency Helicopter Network requires a system of ‘single point tasking’; that is, a central organisation exercising command and control of all helicopters in the Emergency Helicopter Network, according to availability, task, priority and location. This is a change, which will require all the government agencies concerned to consider the operational needs, resources, protocols, guidelines and training required for its implementation. Ideally, those steps should be completed and the change made before the next wet season.
- 5.37 At the very least, by the beginning of the wet season, an interim structure needs to be formally in place under which one organisation is informed of the status, location, capabilities and allocated task of each helicopter

in the Emergency Helicopter Network at any given time. The deployment of helicopters should be made through this organisation.

- 5.38 Queensland Police Service call-takers across the state should be trained to a uniform standard, consistent with the standard of the training provided by the Brisbane Police Communications Centre.
- 5.39 Emergency Management Queensland should finalise the draft evacuation guidelines for approval by the state disaster management group as soon as possible, addressing the issues identified from the 2010/2011 floods.
- 5.40 Each council should develop an evacuation sub-plan in accordance with the Emergency Management Queensland guidelines. This includes involving local groups and people in the planning process.
- 5.41 Councils with existing evacuation sub-plans should review them to ensure they address the issues identified from the 2010/2011 floods.
- 5.42 Where flooding is governed by a particular watercourse, the evacuation sub-plan should identify triggers in the form of those water level heights at which it is known that preparation for evacuation will be necessary.
- 5.43 It is a matter for councils whether or not they choose to publicise the location of evacuation centres before a disaster but there is a good deal to be said for doing so, particularly in smaller communities where the options are limited. Whether or not councils publicise the location of evacuation centres before a disaster, they should include in their disaster education programs information on evacuation procedures, and how to ascertain evacuation centre locations and safe evacuation routes.
- 5.44 During floods, councils should as quickly as possible provide people in the relevant areas with advice as to the location of and routes to evacuation centres.
- 5.45 That advice should be given using as many mechanisms as appropriate, including text message, radio and door knocking.
- 5.46 Councils should identify a range of evacuation centres as part of their disaster preparation and planning.
- 5.47 Councils should audit identified evacuation centres to ensure the facilities and location are appropriate, preferably in consultation with the Australian Red Cross and the Department of Communities.
- 5.48 Councils should be aware of what facilities are available at each evacuation centre, at particular times of the year.
- 5.49 Councils should identify areas that are susceptible to isolation, including locations in which community groups established informal evacuation centres during the 2010/2011 floods, with a view to incorporating evacuation centres at those locations into their evacuation sub-plans.
- 5.50 Councils should identify community groups who may take responsibility for establishing and operating evacuation centres in the future.
- 5.51 The identified groups and councils should, before the next wet season, establish cooperative arrangements as to how the centres should operate, and to ensure the centres have appropriate facilities.
- 5.52 Councils should recognise that community groups may establish makeshift evacuation centres during a disaster. When this occurs, councils need to identify and establish communications with the centres as soon as possible.
- 5.53 Councils should develop plans for the effective and timely re-supply of makeshift centres.
- 5.54 The Queensland Government should investigate the possibility of providing indemnity or obtaining insurance for makeshift evacuation centres established in good faith, and in the absence of official alternatives, to meet community needs.
- 5.55 All councils should consider entering a memorandum of understanding for evacuation centres with the Australian Red Cross which clearly sets out the roles and responsibilities of the parties in planning and responding to evacuation requirements in a disaster.
- 5.56 Each council with a memorandum of understanding with the Australian Red Cross should consider undertaking practice exercises with the Australian Red Cross to ensure both parties understand their respective roles and responsibilities.

- 5.57 Local disaster management groups and district disaster management groups of which the Australian Red Cross is not currently a member should include the Australian Red Cross in disaster preparation and planning as well as response, whether as a member or otherwise (see also recommendation 3.1).
- 5.58 Local and district disaster management groups should notify the Australian Red Cross of their evacuation needs as soon as possible in a disaster.
- 5.59 Disaster response agencies should use the National Registration Inquiry System.
- 5.60 During a disaster, councils and the Queensland Police Service should encourage individuals to self-register with the National Registration Inquiry System.
- 5.61 Councils should include information about the National Registration Inquiry System as part of their community education.
- 5.62 In areas susceptible to flooding, councils should identify facilities housing people who may require assistance to evacuate. Councils should work with the operators of these facilities to ensure they have appropriate evacuation plans and that they are aware of the council's disaster management arrangements.
- 5.63 Councils should identify the specific evacuation needs of these facilities, such as increased timeframes for withdrawal or transport by ambulance.
- 5.64 Councils should include the location, contact details, and specific evacuation needs of these facilities in their evacuation sub-plans.
- 5.65 Councils should identify organisations (for example, Meals on Wheels and Bluecare) that provide services to people in the community who may be unable to evacuate without assistance. Councils should include the contact details of these organisations in their evacuation sub-plans.
- 5.66 Councils should work with these service providers to identify: the number of people who may require assisted evacuation; the general nature of their needs, including any necessary medical supplies and equipment; warning message formats and dissemination; increased timeframes needed for evacuation; transportation requirements; and shelter requirements. Councils should include this information in their evacuation sub-plans.
- 5.67 Facilities housing people who may be unable to evacuate without assistance should develop evacuation plans to ensure residents are provided with appropriate transportation, emergency accommodation, trained carers and medical support if necessary. Where possible, residents of those facilities should be relocated to other similar facilities or accommodation other than evacuation centres. These plans should be developed in consultation with councils and relevant agencies such as Queensland Health.
- 5.68 Facilities housing people who may be unable to evacuate without assistance should prepare disaster recovery plans, particularly for the provision of back up power and emergency supplies, including medical oxygen and common medications, to minimise the need for evacuation where there is no direct threat from natural disaster.
- 5.69 The Queensland Government and councils should ensure information about emergency preparedness, warnings and evacuation is available in the different languages of ethnic groups in the community and in Auslan.
- 5.70 As part of their community education strategy, councils should ensure tourists are made aware of evacuation procedures, how to ascertain evacuation centre locations and safe evacuation routes. That may be done through tourism boards, operators and accommodation providers.
- 5.71 Councils, as part of their community education program for disaster preparation, should encourage pet owners to consider what they will do with their pets if they need to evacuate.
- 5.72 Councils should work with the RSPCA to develop plans about transporting and sheltering pets should they need to be evacuated with their owners.
- 5.73 Animal shelters, zoos, stables, and similar facilities should develop plans for evacuating or arranging for the care of animals in consultation with their local council. Local disaster co-ordinators should be aware of what plans exist.

- 5.74 Alignment of police district boundaries, disaster district boundaries and local government boundaries is unlikely to be feasible in the short-term. However, where police district boundaries are being re-assessed for other reasons, conformity between boundaries of police districts, disaster districts and local government regions, should be a major objective.
- 5.75 Before the 2011/2012 wet season, all local and district disaster management groups should formally adopt the Queensland Re-supply Guidelines and have arrangements in place for the prompt re-supply of towns, properties and residents isolated by floodwaters.
- 5.76 The Department of Employment, Economic Development and Innovation should establish, preferably with the assistance of AgForce, procedures to co-ordinate fodder drops to isolated landowners in future flood events.
- 5.77 The Department of Employment, Economic Development and Innovation should ensure rural communities are aware of the processes and the payment arrangements for fodder drops.
- 5.78 Local governments should investigate the feasibility of permitting local landowners to carry out temporary repairs on flood-damaged public roads to allow access to their properties.
- 5.79 Local governments and the Queensland Government should work with their New South Wales counterparts to set up procedures for co-ordinating emergency responses in the region of the Queensland/New South Wales border.

## Chapter 6 Essential services

- 6.1 Local, district and state disaster management groups should include essential services providers in their disaster planning and preparation and in their meetings at an early stage during disasters.
- 6.2 Power distributors should review network switching options before next wet season (to optimise switching arrangements) so that, where possible, power is disconnected only to those who are flooded.
- 6.3 Power distributors should consider pre-emptively installing generators in areas known to become isolated (but not inundated) during flooding, if the power supply cannot otherwise be maintained.
- 6.4 The control and coordination centre for Water Grid operations should be located where, at the least, it is not susceptible to flooding or to its power supply being interrupted.
- 6.5 Essential service providers should continue to develop ways to share available resources within their respective industries during disasters.
- 6.6 Essential service providers should formalise arrangements to share information about the status of services during a disaster.
- 6.7 Brisbane Markets Limited should contact the Brisbane City Council on a regular basis in the lead-up to and during flooding to seek local flood information. In response, the council should provide readily understood information which, as far as possible, explains the level of flooding to be expected at the Rocklea Markets site.
- 6.8 The Brisbane City Council should attend to the clearing of the flood mitigation channel on the western side of the market site before the next wet season.

## Chapter 7 Lockyer Valley and Toowoomba

- 7.1 The Toowoomba Regional Council should consider amending stage one of the Cooby Dam emergency action plan to extend the five kilometre limit for alerting residents downstream of the Cooby Dam.
- 7.2 Lockyer Valley Regional Council should investigate the feasibility of installing alarm-activating gauges in the creeks at Spring Bluff, Murphys Creek and other communities where communication systems are poor and there is a risk of rapid and unexpected water rise.
- 7.3 Lockyer Valley Regional Council should identify those areas vulnerable to flooding within its region, should identify appropriate evacuation collection points and centres accordingly, and consider whether it should make those known to the community.
- 7.4 Lockyer Valley Regional Council should immediately develop a plan for the removal of debris, man-made and natural, from waterways in the Lockyer Valley and put it into effect so as to minimise the risk should flooding recur in the coming wet season.

## Appendix 4: List of staff at the Commission

The Commissioner, deputy Commissioners and counsel assisting the Commission were supported in their roles by Commission staff, who were drawn from a range of professions. The number of staff varied over time, depending on the level of demand of the work of the Commission.

Name	Position	Name	Position
Ainsworth, Mark	Chief police investigator (Detective Superintendent)	McGarry, Conor	Principal Research Officer
Bailey, Nick	Principal Lawyer	McGee, Sian	Law Clerk
Basil-Jones, Phillip	Web Development Officer	McGree, Katherine	Senior Lawyer
Bignell, Stephen	Police investigator (Detective Sergeant)	Meredith, Daniel	Records Officer
Browne, Paul	Police investigator (Detective Sergeant)	Meredith, Elspeth	Lawyer
Catchpole, Glen	Police investigator (Detective Sergeant)	Moon, Lynette	Records Coordinator
Christiansen, Ben	Law Clerk	Moynihan, Jane	Executive Director
Cooper, Lindsay	Law Clerk	Muir, Stephen	Law Clerk
Cunich, Zoe	Law Clerk	Murray, David	Law Clerk
Curd, Alicia	Temporary Administrative Officer	Mykkeltvedt, Anders	Lawyer
Devane, Jessica	Law Clerk	Nguyen, Dominic	Lawyer
Edmiston, Elizabeth	Media and Communications Officer	Orth, Maioha	Office Manager
Ensby, Julian	Lawyer	Parsons, Shane	Temporary Administrative Officer
Floro, Matthew	Law Clerk	Paton, Linda	Director, Records Management
Goodwin, Tim	Media Director	Pearce, Megan	Senior Lawyer
Grant, Laura	Lawyer	Petersen, Kirsty	Witness Coordinator
Harrold, Ashleigh	Lawyer	Platz, Stephen	Police investigator (Detective Sergeant)
Hayden, Kyla	Director Legal and Research Services	Ponting, Troy	Temporary Administrative Officer
Hedge, Susan	Senior Lawyer	Reid, Mark	Police investigator (Inspector)
Hendy, Lisa	Principal Lawyer	Rolfe, Jaclyn	Lawyer
Hinchliffe, Gerard	Lawyer	Staines, Zoe	Research Officer
Johnson, Michael	Law Clerk	Swemmer, Annelindi	Temporary Administrative Officer
Juhasz, Kate	Principal Lawyer	Tugaga, Ron	Temporary Administrative Officer
Lam, Ross	Law Clerk	Underwood, Joshua	Law Clerk
Lord, Anna	Lawyer	Vickers, Ros	Principal Lawyer
Lynam, Colin	Temporary Administrative Officer	Vlismas, Tony	Police investigator (Detective Sergeant)
MacDonald, Jessica	Associate to Justice Holmes	Walsh, Phillip	Records Officer
MacRae, Deena	Law Clerk	Whitby, Jessica	Law Clerk
		Zangari, Lachlan	Principal Lawyer

## Appendix 5: List of experts engaged by the Commission

1. Dr Bruce Abernethy  
Manager, Southeast Australian Water and Environment Operations  
Sinclair Knight Merz Pty Ltd
2. Mr Mark Babister  
Director (Hydrologist)  
WMWater, Water & Environmental Engineers
3. Mr Paul Grech  
Principal Town planner  
Grech Planners
4. Mr Darren Hopkins  
McGrathNicol Forensic Technology
5. Dr Trevor Johnson  
Director, Engineer (stormwater management)  
Cardno Limited
6. Dr Phillip Jordan  
Senior Hydrologist  
Sinclair Knight Merz Pty Ltd
7. Associate Professor David Laurence  
Consultant mining engineer  
UNSW Global Pty Ltd – Consulting and Expert Opinion Services
8. Dr Michael Leonard  
Research Associate  
School of Civil, Environmental and Mining Engineering  
The University of Adelaide
9. Mr Tony Loveday  
Consultant engineer  
Opus International Consultants Ltd
10. Dr Rory Nathan  
General Manager (Hydrologist)  
Sinclair Knight Merz Pty Ltd
11. Associate Professor Gavin Nicholson  
Queensland University of Technology Business School (Corporate governance)
12. Dr Steve Reynolds  
Town planner  
Humphrey Reynolds Perkins Pty Ltd
13. Mr David Sheehan  
Senior Technical Leader (Hydrologist)  
Sinclair Knight Merz Pty Ltd
14. Mr Greg Vann  
Chief Executive Officer and Director  
Buckley Vann Town Planning Consultants

## Appendix 6: Glossary

**AAMI** is short for Australian Associated Motor Insurance Limited, an insurer which is part of the Suncorp Group Limited.

**Allianz** (otherwise known as Allianz Australia Insurance Limited) is an insurer which is a subsidiary of Allianz Australia Limited.

**Annual Exceedance Probability (AEP)** means the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood discharge of 500m<sup>3</sup>/s has an AEP of 5%, it means that there is a 5% chance (1 in 20 chance) of a 500m<sup>3</sup>/s or larger event occurring in any one year (see ARI).

**Anthill** (as the term is used in this report) is used to describe a development that has been built in such a way that, during flood events, the area either becomes completely isolated or is difficult to reach by ordinary means.

**Appliance** is a term used by the fire service when referring to a vehicle used in its firefighting operations. Appliances include technical rescue vehicles, pumper tankers and fire command vehicles.

**Area hydrology report** is a report about the likely nature and causes of flooding on a regional or area basis (such as Brisbane or Emerald or the Somerset region) rather than property-by-property basis. Some hydrology reports covered particular postcode areas.

**Assessable development** is development for which development approval is needed before it can proceed. The types of development that are assessable are declared under section 232(1) of the *Sustainable Planning Act 2009*: a state planning regulatory provision, a planning scheme, a temporary local planning instrument, master plan or preliminary approval overriding the planning scheme.

**Assessment criteria** means those standards or controls contained in a planning instrument that a development application is assessed against.

**Assessment manager** (with respect to land planning) means the entity that administers and decides a development application under the *Sustainable Planning Act 2009*, but may not always assess all aspects of development for the application. For most development applications the entity is the council.

**Australian Bureau of Meteorology (the Bureau)** is Australia's national weather, climate and water agency.

**Australian Height Datum (AHD)** means a common national surface level datum approximately corresponding to mean sea level.

**ASIC** refers to the Australian Securities and Investments Commission, which is Australia's corporate, markets and financial services regulator, established under the *Australian Securities and Investments Commission Act 2001* (Cth).

**Auxiliary firefighter** is a paid part-time firefighter, located in regional communities across Queensland.

**Average Recurrence Interval (ARI)** means the long term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods with a discharge as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event (see AEP).

**Backflow flooding** is flooding that occurs when the discharge point for a stormwater pipe that collects water from a low-lying area is located near a waterway and that discharge point becomes submerged by a tide, storm surge or floodwater, causing water to pass back through the pipe and out of inlets and manholes. Backflow flooding may occur even if the waterway does not breach its banks.

**Backflow prevention device** is a one-way or non-return valve installed at, or near, the point at which a stormwater pipe discharges into a waterway and designed to allow stormwater to discharge from a pipe into a waterway, but to close and seal to prevent water entering the pipe from the waterway. The purpose of the device is to ensure that, if the water levels rise in the waterway, water does not flow back through the stormwater network and flood low-lying areas (see backflow flooding, duckbill valves and flap gates).

**Bowen basin** is an area in central Queensland which has around 47 operating coal mines and extends over around 60 000 square kilometres between the town of Collinville in the north and Theodore in the south. The Bowen basin encompasses sections of the Fitzroy basin.

**Building Code of Australia** is a nationally uniform set of technical standards for the design and construction of buildings and other structures.

**Building controls** are standards that regulate the construction of buildings, as distinct from planning controls that regulate where buildings are constructed. These standards can be found in the Building Code of Australia and the Queensland Development Code, or in planning instruments.

**Bund** is a raised embankment or structure designed either to store or exclude water.

**Calibrate** (with respect to a hydrologic and hydraulic model) means to check values derived from the model against physical measurements. This is achieved by adjusting parameters (within an acceptable range and in a consistent manner) to best fit the physical measurements.

**Catchment** is the land area drained by a waterway and its tributaries.

**CityCat** is a network of catamaran ferries which form an inner city public transport system operated by the Brisbane City Council on the Brisbane River from Hamilton to the University of Queensland (St Lucia campus).

**CityFerry** is a network of ferries which form an inner city public transport system operated by the Brisbane City Council to connect the northern and southern banks of the Brisbane River.

**Claims officer** is an employee of an insurance company who processes insurance claims made by policy-holders.

**Claims responsibilities** refers to the responsibilities of insurers in handling claims under the contract of insurance, *Insurance Contracts Act 1984* (Cth) and the General Insurance Code of Practice.

**Coal seam gas water** means water contaminated as a result of the process of coal seam gas extraction.

**Code** (with respect to land planning) is part of a planning instrument in which assessment criteria are found.

**Code assessment** involves a basic assessment by the council of the information contained in the application against the applicable assessment criteria set out in codes in a planning scheme. The application must also be assessed against other matters specified in the *Sustainable Planning Act 2009*, including any state planning instruments, such as a state planning policy.

**Code of Practice:** see General Insurance Code of Practice.

**Command and control** (with respect to the State Emergency Service 'SES') refers to the ability to direct SES members and to use SES resources.

**CommInsure** (otherwise known as Commonwealth Insurance Limited) is an insurer which is part of the Commonwealth Bank Group.

**Community infrastructure** is development that provides services vital to the wellbeing of the community (State Planning Policy 1/03).

**Compliance assessment** (with respect to land planning) is the term used for the process of assessment of development that must be authorised by a compliance permit under the *Sustainable Planning Act 2009*. It is typically undertaken by a council.

**Coral bleaching** is a decrease in the algal density of corals which causes them to appear bleached. It is caused by, amongst other things, pollution and increases in water temperatures.

**Council** is a local government as defined in the *Local Government Act 2009*. The terms council and local government are used interchangeably in this report.

**Councillor** is an elected official of a local government (council), including the mayor.

**Council of Australian Governments (COAG)** is Australia's peak intergovernmental forum which comprises the Prime Minister, Premiers and Chief Ministers.

**Culvert** is a short passageway under a road, railway or embankment designed to allow stormwater to flow from one side to the other without being dammed.

**Customer dedicated assets** means electricity infrastructure that is constructed inside customer premises: usually commercial and industrial substations.

**Defined flood event (DFE)** is the flood event adopted by a local government for the management of development in a particular locality.

**Defined flood level (DFL)** is the level of a flood that would occur during a defined flood event (DFE).

**Deployment** (with respect to the SES) means the movement of SES members from their local government area to another area within Queensland or to another state or territory (see SES).

**DERM** is the Queensland Department of Environment and Resource Management.

**Detention basins** are depressions in the ground constructed for the purpose of catching and holding stormwater.

**Development** (with respect to land planning) is carrying out building work, plumbing or drainage work, carrying out operational work, reconfiguring a lot and making a material change of use. Operational work under the *Sustainable Planning Act 2009* includes works such as placing fill on land, constructing barriers in waterways or undertaking road works. Reconfiguring a lot includes undertaking a subdivision. The making of a material change of use can involve starting a new use on land, for example by establishing a use on vacant land or by changing a commercial use to a residential use, or materially increasing the intensity or scale of an existing use.

**Development applicant / Applicant** means the person who or entity that lodges a development application with an assessment manager.

**Development application** means an application for development approval under the *Sustainable Planning Act 2009*.

**Dewatering** (with respect to mining) means the draining of or removal of water from a mine.

**Disaster management** consists of the actions of groups and individuals within the disaster management hierarchy (such as local disaster management groups and local disaster co-ordinators) to manage the adverse effects of a disaster event, including, for example, arrangements for mitigating, preventing, preparing for, responding to and recovering from a disaster.

**Disaster operations** means activities undertaken before, during or after an event happens to help reduce loss of human life, illness or injury to humans, property loss or damage, or damage to the environment, including for example, activities to mitigate the adverse effects of the event. Disaster operations are typically undertaken by specialist response agencies such as the Queensland Police Service, Queensland Fire and Rescue Service, Queensland Ambulance Service and the State Emergency Service.

**Disaster response** is the taking of measures to respond to a disaster before, during and immediately after its onset including issuing warnings, providing medical assistance, evacuating people and establishing emergency food and shelter.

**Discharge** is the rate of flow of water measured in terms of volume per unit of time, for example, cubic metres per second ( $\text{m}^3/\text{s}$ ). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving.

**Distributor-retailer** (with respect to sewerage infrastructure) means the three council-owned bodies established under the *South East Queensland Water (Distribution and Retail Restructuring) Act 2009* to take over the management and operation of sewerage infrastructure and services from councils: UnityWater, Queensland Urban Utilities and Allconnex.

**District disaster co-ordinator (district co-ordinator)** is the person appointed under the *(Disaster Management Act 2003*) to co-ordinate disaster operations in a disaster district, who is also the chairperson of the district group.

**District disaster management group (district group)** is a disaster management group established under the *Disaster Management Act 2003* to perform disaster management activities in a district.

**Duckbill valves / Duckbill check valves** are a type of backflow prevention device consisting of a valve made of a flexible moulded material which is fitted to the outlet of a stormwater pipe or other pipe to prevent backflow flooding (see backflow flooding, backflow prevention device and flap gates).

**Easement** is a right granted by the owner of land to another to make use of the land for a particular purpose.

**Effluent** is sewage in a liquid form that has been treated or partially treated.

**Emergency Management Queensland** is an agency within the Department of Community Safety that has overall responsibility for Queensland's disaster management arrangements (see disaster management).

**Emergency Services Communications and Operational Response Tasking (ESCORT)** is a computer aided despatch system used by the Queensland Police Service to despatch police officers in response to emergency calls.

**Emergency Services Computer Aided Despatch (ESCAD)** is a system used by the Department of Community Safety to despatch emergency services (fire and ambulance officers) in response to emergency calls.

**Environmental authority** means an authority issued under the *Environmental Protection Act 1994*.

**Ephemeral watercourses/streams** are those watercourses that are usually dry, but which flow during times of rainfall.

**Essential services** encompass electrical power, the provision of drinking water, sewerage, stormwater drainage, telecommunications and roads and rail.

**Exempt development** is development that does not require any development approval to proceed. (See section 235(1) of the *Sustainable Planning Act 2009*) It is defined in the *Sustainable Planning Act* as being development that is not assessable, self assessable or prohibited development or development requiring compliance assessment. (See section 231(2) of the *Sustainable Planning Act 2009*).

**Fill** is earthen or other material used to raise ground level.

**Financial Ombudsman Service Limited** is an independent dispute resolution service for financial service providers, including insurers, and their policy-holders. It has other functions which include monitoring insurers' compliance with the General Insurance Code of Practice and reporting systemic issues to ASIC. For more information see the Terms of Reference for the Financial Ombudsman Service.

**Fitzroy basin** means the catchment area encompassing the Fitzroy River, Don River, Dawson River, Comet River, Brown River, Nogoa River, Connors River, Isaac River and Mackenzie River, which is defined in Schedule 1 of the *Water Resource (Fitzroy Basin) Plan 2011* (made under the *Water Act 2000*).

**Fitzroy model conditions** are those conditions developed for inclusion in environmental authorities following severe flooding at the Ensham mine in 2008. The conditions arose from the Fitzroy River Water Quality Issues report and stipulate the quantity and quality of water that can be discharged from mines across the region.

**Flap gates** are a type of backflow prevention device consisting of a circular plate which is connected to the pipe outlet of a stormwater pipe or other pipe to prevent backflow flooding.

**Flash flood** is usually the result of intense local rain and characterised by rapid rises in water levels.

**Flood event** (with regard to Wivenhoe, Somerset or North Pine dams) means a situation where the flood engineer on duty expects the water level in Wivenhoe, Somerset or North Pine dams to exceed the full supply level.

**Flood hazard area**, for the purposes of Queensland Development Code, proposed new part 3.5: 'Construction of buildings in flood hazard areas', 21 November 2011, means an area, whether or not mapped, designated by a local government as a natural hazard management area (flood) under section 13 of the *Building Regulation 2006*.

**Flood map** is a map which depicts the extent of a particular flood or floods, for example the 1% AEP flood or a historical flood.

**Flood overlay map** is a map used in land planning to depict the land constrained by planning controls imposed by a council because of the flood risk associated with the land.

**Floodplain** is an area of land adjacent to a creek, river, estuary, lake, dam or artificial channel, which is subject to inundation by floodwater.

**Floodplain advisory committee** is a committee, usually at a local government level, which assists councils to develop and implement a plan for the management of a floodplain.

**Flood risk** is a term that usually embodies both likelihood of flooding and the consequences of flood. Sometimes, though, it relates only to likelihood. How it is used in this report depends on context. Where the Commission uses expressions such as ‘susceptible to flooding’, ‘vulnerable to flooding’ or ‘at risk of flooding’ it does not use them in any technical sense; they should be regarded as having their ordinary meaning.

**Flood study** is a scientific investigation into flooding in a particular area, usually the catchment of a river system. It may involve hydrologic and hydraulic investigations and a statistical analysis of the frequency with which floods have occurred in the past.

**Flow velocity** means the flow rate of water over an area and is measured in cubic metres per second ( $\text{m}^3/\text{s}$ ) or cumecs.

**Freeboard** is a height allowance buffer that provides for uncertainty in the distance between the expected height of the water surface and the floor above.

**Gauge** is a tool which takes measurements of, for example, rainfall or river height.

**General Insurance Code of Practice** is a voluntary industry code which sets minimum standards for insurers to meet when handling insurance claims and dealing with complaints from policy-holders. It also applies when policy-holders make initial enquiries about insurance policies, and when they are buying and renewing insurance policies.

**Groundwater aquifer** means the layer of earth that holds groundwater.

**Gully** (with respect to stormwater networks) means a gridded box inlet or entry point for stormwater to enter stormwater pipes.

**Habitable rooms** are general living areas and include bedrooms, living rooms, kitchens, family and rumpus rooms but do not include areas such as laundries, bathrooms or garages.

**Hazard** means a source of harm, or a situation with a potential to cause loss.

**Hazardous material** means a substance with the capacity, because of its chemical, physical or biological properties, to cause harm to persons, property or the environment.

**Hydraulic studies/investigations** (with respect to flood studies) means an analysis that estimates the behaviour of flood flow (that is, flow rate, velocity, depth and extent of inundation) as it passes through a floodplain (see flood study).

**Hydrodynamic (hydraulic) model** uses data about the flow in streams and the terrain of a particular area to estimate flood heights, velocities and flow over time. In order to do this the hydrodynamic model solves the equations for the conservation of mass and momentum/energy.

**Hydrologic model (runoff routing model)** uses rainfall data and estimates of the proportion of the rainfall which turns into runoff and the time which the runoff from each part of the catchment takes to flow into the stream to estimate flow in the stream over time.

**Hydrologic study/investigation** (with respect to flood studies) means a study aimed at determining rainfall and associated stream flows in a range of scenarios (see flood study).

**Hydrology** is the term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.

**Hydrostatic pressure** means the pressure exerted by a fluid at rest because of the weight of the fluid.

**Inactive flow or backwater area** means an area so designated by a council as an inactive flow or backwater area under section 13 of the *Building Regulation 2006*.

**Inlet** (with respect to stormwater networks) means an entry point for stormwater to enter stormwater pipes: usually an opening in a park or open area.

**Insurance Australia Group Limited (IAG)** is a group of insurers which includes CGU Insurance Limited and NRMA Insurance.

**Insurance Council of Australia** represents the interests of the Australian general insurance industry. It was established to act as the peak body for general insurance companies in Australia licensed under the *Insurance Act 1973*.

**Insurance Council hydrology report** refers to a hydrology report prepared by a panel of insurers commissioned by the Insurance Council of Australia.

**Interoperability** means the capacity for persons in different organisations or different parts of the same organisation to exchange information.

**Impact assessment** means the assessment of:

- (a) the environmental effects of proposed development; and
- (b) the ways of dealing with the effects under the Sustainable Planning Act 2009.

**Kerbs and channels (or gutters)** are the structures built on the sides of roads that allow the road surface to convey water flow.

**La Niña** refers to the extensive cooling of the central and eastern Pacific Ocean. In Australia (particularly eastern Australia), La Niña events are associated with increased probability of wetter conditions.

**Levee** is a raised embankment or earthworks.

**Light detection and ranging (LiDAR)** means technology that is used to measure geospatial information which may be used to inform the creation of terrain models and maps.

**LN1** is the irrigation drainage system in Emerald which runs from the western edge of Emerald to the Nogoa River. The system is owned and operated by SunWater.

**Local controller** is the person appointed as the local controller of an SES unit (*Disaster Management Act 2003*).

**Local disaster co-ordinator (local co-ordinator)** is a person appointed to co-ordinate disaster operations for a local disaster management group under the *Disaster Management Act 2003*.

**Local disaster management group (local group)** is a local group established by a local government to perform disaster management activities in its area.

**Local disaster management plan (local plan)** is the disaster plan prepared by a local government for its area.

**Local Government Association of Queensland** is the peak body representing local government in its dealings with other governments, unions, business and the community.

**Local laws** are laws made and enforced by a council, rather than the state or federal government.

**Loss assessor** (as the term is used in this report) refers to a person who inspects damaged properties (and often interviews policy-holders) and provides reports to insurers. Some insurers used their own loss assessors (internal loss assessors), others used external loss assessors. Loss assessors are sometimes called loss adjusters.

**Major flooding** is a term used by the Bureau of Meteorology to depict extensive flooding of rural areas and/or urban areas. Properties and towns are likely to be isolated and major traffic routes likely to be closed. Evacuation of people from flood affected areas may be required.

**Mandatory provisions** are those provisions that must be included in new planning schemes prepared under the *Sustainable Planning Act 2009*.

**Material change of use** can involve starting a new use on land, for example by establishing a use on vacant land or by changing a commercial use to a residential use, or materially increasing the intensity or scale of an existing use.

**Mine-affected water** means any water that is contaminated as a result of the process of mining.

**Minimum floor levels** set the height to which habitable and non-habitable rooms should be built. They are usually based on a defined flood level plus a freeboard (see habitable rooms, DFL and freeboard).

**Minor flooding** is a term used by the Bureau of Meteorology to depict flooding that occurs in low-lying areas next to watercourses where inundation may require the removal of stock and equipment. Minor roads may be closed and low-level bridges submerged.

**Model local laws** are template local laws prepared by the Queensland Government for use by councils.

**Moderate flooding** is a term used by the Bureau of Meteorology to depict when the evacuation of some houses may be required and main traffic routes may be covered. The area of inundation is substantial in rural areas, requiring the removal of stock ([www.bom.gov.au](http://www.bom.gov.au)).

**m<sup>3</sup>/s (cumec)** means a rate of flow measured by cubic metre per second.

**Natural Disaster Insurance Review** was established by the Commonwealth Government in March 2011 to independently review issues relating to insurance for flood and other natural disasters. It provided a report to the Federal Government which was released to the public in November 2011.

**Natural Disaster Resilience Program** is a grants program that is administered as a partnership between the Australian and state/territory governments. Its aim is to enhance Australia's disaster resilience through mitigation works and activities. Local governments and disaster groups and agencies are able to seek funding for particular projects.

**New Farm Riverwalk** was a floating walkway that extended approximately 3.5 kilometres parallel to the Brisbane River from New Farm to the Story Bridge.

**Non-habitable rooms** are rooms such as garages, bathrooms and laundries.

**NRMA** or NRMA Insurance is an insurer which is part of the Insurance Australia Group Limited.

**Ombudsman** refers to the Ombudsman for General Insurance who is part of the Financial Ombudsman Service. It also refers to the Financial Ombudsman Service (defined separately).

**Operational work** under the *Sustainable Planning Act 2009* includes works such as placing fill on land, constructing barriers in waterways or undertaking road works.

**O'Sullivan Review** was an independent review of Queensland's disaster management legislation, policies, guidelines and plans, as well as management and accountability in the State Emergency Service (SES). Many of the review's recommendations took effect in November 2010 through amendments to the *Disaster Management Act 2003*.

**Overflow relief gully grate** means a small grate located on residential premises designed to ensure that if there is any backflow into the private sewerage system, the discharge will occur through the overflow relief gully grate outside the house rather than through the bathroom or kitchen fixtures.

**Overflow relief structure** means an outlet which discharges sewage into a waterway in emergency situations or during extreme weather events when the sewerage network is inundated.

**Overland flow path** is a depression in the ground where water accumulates and then flows. It is a component of the stormwater system.

**Overlay** means an extra layer of assessment in planning schemes. The provisions of an overlay code are usually triggered by overlay maps that depict extra information superimposed on a zoning map.

**Overtopping** means the flow of water over the top of a dam or embankment.

**Permit** is a document that authorises a development to take place.

**Planning scheme** is a local planning instrument for regulating development in Queensland. Planning schemes regulate what development must be assessed before it can be undertaken, the type of assessment required and the criteria used in an assessment in each council region. They also contain codes with which self-assessable development must comply.

**Policyholder** is a person who holds an insurance policy and by it contracts with an insurer for coverage against specified events.

**Preliminary approval overriding a planning scheme** is a type of permit for development that overrides the planning scheme and sets criteria against which future development applications must be assessed. (See section 242 of the *Sustainable Planning Act 2009*).

**Prescribed tidal work** is tidal work described in section 14 of the *Coastal Protection and Management Regulation 2003* which is completely or partly within a local government tidal area.

**Private insurer** refers to an insurance company. Where the term ‘insurer’ is used in this report, it denotes a private insurer, not a state government-owned or controlled insurer.

**Probable maximum flood** is an estimate of the largest possible flood that could occur at a particular location, under the most severe meteorological and hydrological conditions.

**Property buy-back** means the purchase of a residential dwelling by a local or state government so that it can be removed from the floodplain.

**QBE** is an insurer whose full name is QBE Insurance (Australia) Limited.

**Queensland Development Code** contains mandatory and non-mandatory Queensland building standards that are used by building certifiers to assess building applications.

**Queensland Planning Provisions** are the standard planning provisions made under the *Sustainable Planning Act 2009* that provide a consistent format and structure for council planning schemes across Queensland.

**Queensland Reconstruction Authority (QRA)** is a Queensland Government authority responsible for rebuilding Queensland communities affected by the 2010/2011 floods and cyclones.

**Q100** is a probability-based design flood event, aimed to reflect typical combinations of flood producing and flood modifying factors which act together to produce a flood event at a specific location of interest that has a 1 in 100 chance of being equalled or exceeded in any one year (1% annual exceedance probability – AEP); it is described as having an average recurrence interval (ARI) of 100 years. It is a theoretical flood model used to inform planning and policy (see AEP and ARI).

**Radio communications black spots** are areas which are not covered by a radio communications network and within which radio communications are consistently difficult or impossible.

**Referable dam** is a dam which has been assessed as posing a risk to the safety of two or more people should it fail.

**Referral agencies** are bodies that have an interest in certain aspects of development and are provided with a development application for assessment of matters within the agency’s jurisdiction. They include Queensland Government agencies, government owned corporations and certain private sector corporations

**Regional plan** is a state planning instrument which is intended to articulate desired land use and development outcomes for a particular region and the ways in which those outcomes can be achieved.

**Requirement** is a document issued by the Commissioner under section 5(1) of the *Commissions of Inquiry Act 1950* requiring a person or entity to produce information to the Commission (such as documents or statements) at a specified time, or to attend an interview and answer questions asked by an authorised person.

**RFA Online** is a task management tool developed by Emergency Management Queensland and is used to co-ordinate requests for assistance received by the SES.

**River architecture** (as the term is used in this report) means structures built along the Brisbane River, such as the New Farm Riverwalk, CityCat terminals, CityFerry terminals and private pontoons.

**Satellite planning systems** means those planning systems which operate separately to the *Sustainable Planning Act 2009*, and are created and regulated by separate legislation.

**Seqwater** means the Queensland Bulk Water Supply Authority, trading as Seqwater.

**SES** is the State Emergency Service.

**SES member** is a person, usually a volunteer, appointed to the SES and available through the SES to assist with various activities including disaster response and relief.

**SES unit** is an SES unit established for a local government region.

**Sewage** is human waste product, sometimes referred to as ‘wastewater’.

**Sewage reflux valve** means a device that can be installed in household sewerage systems to prevent the backflow of sewage into private sewer systems and then into bathroom or kitchen fixtures.

**Sewerage infrastructure or sewerage system** is the infrastructure through which sewage flows, for example pipes, pump stations and treatment facilities. In the material before the Commission it is sometimes referred to as ‘wastewater infrastructure’.

**Shared network infrastructure** means the assets used to distribute electricity throughout Queensland, other than customer dedicated assets (see customer dedicated assets).

**Site-specific hydrology report** is a report by a hydrologist for a specific property.

**State planning policy** is a state level planning instrument that advances the purpose of the *Sustainable Planning Act 2009* by declaring the Queensland Government’s policy about a matter of state interest.

**Stormwater** is the rain water that has not yet entered a river system or soaked into the ground.

**Stream / river gauging station (gauge)** measures the height of the water in a river at a particular location. It may be manual or automated (Office of the Chief Scientist, 2011, Understanding floods: questions and answers).

**Suncorp Group Limited** (usually called the Suncorp Group in this report) is an Australian public company that provides financial services including insurance. A number of insurers are part of the Suncorp Group, including Suncorp Metway Insurance Limited, AAMI, Vero Insurance, GIO, Apia and Shannons.

**Suncorp Metway Insurance Limited** (usually called Suncorp in this report) is an insurer which is part of the Suncorp Group.

**Tailings dams** are constructed to hold wastewaters containing tailings (the waste by-products of extracting metals from mined ores), which are created during the mining process.

**Telemeter gauge** is a gauge that sends river level or rainfall data at periodic intervals to a computer. Data is sent via telephone communication landline, mobile or satellite.

**Turbidity** is the degree of clarity of water. Its measure is the number of small particles of solid matter suspended in a water sample.

**UHF** means ultra high (radio) frequency.

**VHF** means very high (radio) frequency.

**Water storage facilities** (with respect to mining) means, but is not confined to, dams, pits, tanks and tailings dams.





