State Planning Policy

Mitigating the Adverse Impacts of Flood, Bushfire and Landslide

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QFCI

Date: 19/09/11

Exhibit Number: S30

Queensland Government
Department of **Local Government and Planning**
Department of **Emergency Services**

STATE PLANNING POLICY 1/03

Mitigating the Adverse Impacts of Flood, Bushfire and Landslide

Integrated Planning Act 1997

STATE PLANNING POLICY 1/03
Mitigating the Adverse Impacts of Flood, Bushfire and Landslide

The Minister for Local Government and Planning adopted State Planning Policy 1/03 on 19 May 2003.

Making of the State Planning Policy

State Planning Policy 1/03 was made under Schedule 4 of the *Integrated Planning Act 1997*.

Commencement

State Planning Policy 1/03 **took effect on 1 September 2003.**

POSITION STATEMENT

The Queensland Government considers that development should minimise the potential adverse impacts of flood, bushfire and landslide on people, property, economic activity and the environment.

1. PURPOSE OF THE POLICY

1.1 This State Planning Policy ('the SPP') sets out the State's interest in ensuring that the natural hazards of flood, bushfire, and landslide[1] are adequately considered when making decisions about development.

2. APPLICATION OF THE POLICY

2.1 Under the *Integrated Planning Act 1997* (IPA), the SPP has effect when development applications are assessed, when planning schemes are made or amended and when land is designated for community infrastructure.[2]

Development to which the Policy applies

2.2 The SPP applies to development involving the:

- actions or activities described in paragraph A1.1 of Annex 1; and
- community infrastructure described in paragraph A1.2 of Annex 1.

2.3 In addition, the SPP addresses development that has the potential to increase the extent or severity of natural hazards, but this aspect of the SPP applies only when planning schemes are being made or amended.

Areas to which the Policy applies

2.4 The SPP generally applies throughout Queensland. However, the application of the SPP for bushfire and landslide is limited to the local governments listed in Annex 2.

3. USING THE POLICY

3.1 The main outcome statements are depicted in bold type (Outcome 1 to Outcome 6) and must be read in conjunction with the rest of the text.

3.2 This SPP addresses only development issues associated with minimising the potential adverse impacts of flood, bushfire and landslide. To achieve some of the SPP outcomes, development proposals may include works (e.g. filling, firebreaks or retaining structures) that would have unacceptable impacts on the natural environment, heritage or amenity values. Achieving the outcomes of this SPP is not an automatic justification for a development proposal being inconsistent with policies on amenity, conservation or other matters.

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1 See Section 9, Glossary.

2 The SPP 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* describes in more detail how the SPP applies.

3.3 When a planning scheme appropriately reflects the SPP[3], the planning scheme is to be regarded as the local interpretation and expression of the SPP for development assessment purposes.

3.4 Technical terms are described in Section 9, Glossary.

3.5 The SPP 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* ('the SPP Guideline'), as amended from time to time, provides advice about how to implement the SPP, and is declared to be 'extrinsic material' under the *Statutory Instruments Act 1992*.[4]

4. THE NEED TO MITIGATE THE ADVERSE IMPACTS OF NATURAL HAZARDS

4.1 A natural hazard is a naturally occurring situation or condition with the potential for loss or harm to the community or environment. Natural hazards do not have to become natural disasters. Effective land use planning is an important means of reducing the community's vulnerability to natural hazards and promoting resilient communities.

4.2 In Queensland the main natural hazard threats are cyclones/severe storms, floods, storm tide inundation, bushfires, landslide and earthquake. The risks and consequences from these hazards vary around the State depending on the location, the physical characteristics of land and the type of development. Cyclones are particularly potent natural hazards as the consequences of a cyclone can include a combination of flood, storm tide inundation, strong winds and landslide. For the purposes of this SPP, the consequences of cyclones are regarded as separate hazards.

4.3 As the hazards associated with strong winds and earthquakes are not amenable to clear spatial definition, they are difficult to address through land use planning mechanisms. Design and construction standards are the most appropriate mechanisms for mitigating risk from earthquakes and strong winds. The *Standard Building Regulation* specifies construction standards for buildings and most non-building structures. Therefore, strong winds and earthquakes are not addressed by this SPP.

4.4 Storm tide inundation hazard is addressed under the *State Coastal Management Plan – Queensland's Coastal Policy 2001* (State Coastal Plan), and is therefore excluded from this SPP except to the extent that cumulative impacts (e.g. flooding can be exacerbated under storm tide conditions) may need to be considered in determining the extent and severity of hazard under this SPP.

4.5 Natural disasters are a significant and rising cost to the community. They are estimated to have cost Queensland an average of $239 million per year (in 1999 prices) in direct and indirect tangible costs between 1967 and 1999.[5] In addition, there are significant intangible costs associated with loss of life, injury, human suffering, loss of productivity and environmental degradation.

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3 The Minister formally identifies in the planning scheme those SPPs that have been appropriately reflected.

4 Refer to the SPP Guideline for an explanation of 'extrinsic material'.

5 Bureau of Transport Economics Report 103, Economic Costs of Natural Disasters in Australia, Commonwealth of Australia 2001.

4.6 The *Queensland Greenhouse Policy Framework*[6] acknowledges the growing scientific consensus that the enhanced greenhouse effect is changing the world's climate, and that Queensland will be vulnerable to the effects of climate change. Predicted changes include reductions in annual rainfall but increases in rainfall intensity, sea level and coastal erosion, bushfire risk, flood risk and damage to transport infrastructure and low-lying human settlements. The nature of these changes will vary across Queensland. These changes will have significant impacts on the nature and extent of natural hazards and, consistent with the precautionary principle[7], should be considered when undertaking natural hazard assessments or developing natural hazard mitigation strategies. The State Coastal Plan provides general direction for addressing potential impacts of climate change in the coastal zone.

4.7 Inappropriate development in areas susceptible to natural hazards significantly increases the risks (and associated costs) to the community. This SPP aims to minimise these risks by ensuring that the potential adverse impacts of natural hazards are adequately considered when development applications are assessed, when planning schemes are made or amended and when land is designated for community infrastructure.

5. THE POLICY APPROACH

5.1 The SPP requires the identification of *natural hazard management areas*[8] within which minimising risks to the community should be a key consideration in development assessment and the preparation of planning schemes. Until natural hazard management areas are identified in planning schemes, the natural hazard management areas outlined in Annex 3 should be used for development assessment.

5.2 In relation to certain important types of community infrastructure[9], the SPP aims to ensure that they are able to maintain operation during and immediately after major natural hazard events wherever practicable. The SPP applies to these types of community infrastructure anywhere in Queensland[10], not only within natural hazard management areas.

6. DEVELOPMENT OUTCOMES AND DEVELOPMENT ASSESSMENT

6.1 When development applications are assessed against this SPP or land is designated for community infrastructure, regard must be had to Outcomes 1 to 3 and the remainder of Section 6. However, this SPP is not to be used when assessing development applications for building work assessable only against the *Standard Building Regulation.*

6.2 The assessment manager needs certain information when assessing development applications for consistency with Outcomes 1 to 3. If not provided with a development application, such information should be the subject of an information request under the Integrated Development Assessment System (IDAS).[11]

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6 Queensland Greenhouse Policy Framework: A Climate of Change, State of Queensland, September 2001.
7 The precautionary principle is defined in s1.2.3(2) of the *Integrated Planning Act 1997.*
8 See Section 9, Glossary.
9 See paragraph A1.2, Annex 1.
10 Except, in relation to bushfire and landslide, those local government areas not included in Annex 2.
11 See Section 9, Glossary.

Development in natural hazard management areas

6.3 When assessing development applications for the development listed in paragraph A1.1 of Annex 1, regard must be had to Outcomes 1 and 2.

Outcome 1: Within natural hazard management areas, development to which this SPP applies is compatible with the nature of the natural hazard[12], except where:

1. the development proposal is a development commitment[13]; or
2. there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal.

Identifying natural hazard management areas and severity of hazard

6.4 Annex 3 describes the natural hazard management areas for flood, bushfire and landslide that apply to this outcome. Information on the location of natural hazard management areas and, in some instances, the severity[14] of hazard within those areas may be obtained from State or local government. Information on the severity of natural hazards will not always be available, but where it is available it should be provided with the development application. The SPP Guideline provides further information on how to identify natural hazard management areas and the severity of hazard.

6.5 In the case of landslide hazard for which the natural hazard management area may be based on a slope calculation[15], the slope of the development site may need to be determined when preparing a development application.

6.6 The natural hazard management area for flood hazard is dependent on a local government adopting a flood event for the management of development in a particular locality[16] and identifying the affected area in the planning scheme. Until this occurs the SPP does not take effect for development assessment in relation to flood hazard in that locality.

6.7 When assessing applications for development, the assessment manager will need to confirm whether the proposed development is located within a natural hazard management area. The assessment manager will also need to confirm the severity of hazard where such information is available.

Determining development compatibility

6.8 In natural hazard management areas, development that achieves the relevant specific outcomes set out in Annex 4 is compatible with the nature of the natural hazard. Development applications should demonstrate such achievement.

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12 See Section 9, Glossary for a definition of 'nature of the natural hazard'.

13 See Section 9, Glossary.

14 Areas are often classified according to the estimated severity of a particular hazard in that location (e.g. High, Medium, Low severity). Classification in this fashion is not always necessary or appropriate. However, where such information is available it should be used to assist development assessment.

15 Refer to Annex 3.

16 This is referred to as the Defined Flood Event, see Section 9, Glossary.

Development commitments

6.9 A development proposal that is consistent with Outcome 1 because of a development commitment should also achieve Outcome 2.

Overriding need

6.10 In some cases, it may be possible to demonstrate that a proposed development that is incompatible with the nature of the natural hazard would meet a particular public need to an extent that would override some aspects of the risk associated with the natural hazard.

6.11 Determining an overriding need in the public interest will depend on the circumstances of the particular development proposal. The proposal should result in a significant overall benefit to the whole or a significant part of the community in social, economic or environmental terms that outweighs the adverse impacts arising from the development's exposure to natural hazards. Also, the development application should demonstrate that a similar benefit could not be achieved by developing other suitable and reasonably available sites. Increased risk to people is a significant consideration when determining overriding need.[17]

6.12 A development proposal that is consistent with Outcome 1 because of an overriding public need should also achieve Outcome 2.

Outcome 2: Development that is not compatible with the nature of the natural hazard but is otherwise consistent with Outcome 1:

1. minimises as far as practicable the adverse impacts from natural hazards; and
2. does not result in an unacceptable risk[18] to people or property.

6.13 Development achieves Outcome 2 when it is brought as near as practicable to the level required to comply with the specific outcomes in Annex 4, and the development would not result in an unacceptable risk to people or property. Assessment of the latter requirement will require consideration of the on-site and external impacts of the proposed development. Annex 5 specifies the minimum measures required to avoid an unacceptable risk.[19]

Community infrastructure anywhere in Queensland

6.14 When assessing development applications or designating land for community infrastructure described in paragraph A1.2 of Annex 1, regard must be had to Outcome 3. Community infrastructure development that involves any of the actions or activities in paragraph A1.1 of Annex 1 and is located in a natural hazard management area should also achieve Outcomes 1 and 2.

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17 The SPP Guideline provides advice about interpreting 'overriding need'.

18 See Section 9, Glossary.

19 The SPP Guideline provides advice on achieving Outcome 2.

Outcome 3: Wherever practicable, community infrastructure to which this SPP applies is located and designed to function effectively during and immediately after natural hazard events commensurate with a specified level of risk.

6.15 Wherever practicable, community infrastructure should be capable of performing its role in maintaining the health, safety and wellbeing of the community in the event of a natural disaster. However, locating and designing community infrastructure to withstand any natural hazard event, no matter how severe, would be unrealistic. Accordingly, the SPP Guideline sets out appropriate levels of risk for differing types of community infrastructure and provides advice on assessing community infrastructure proposals against Outcome 3. Locating and designing community infrastructure to withstand these specified levels of risk also needs to be weighed against the need for that infrastructure to serve the community effectively in normal circumstances when there is no natural hazard event.

6.16 Where designing the community infrastructure to function effectively at the specified level of risk in Outcome 3 is not practicable, the development should be designed to function at the highest level of risk that is practicable.[20]

7. MAKING AND AMENDING A PLANNING SCHEME

7.1 Planning schemes should aim to achieve Outcomes 1 to 3 by identifying natural hazard management areas and containing appropriate planning strategies and development assessment measures.

Identifying natural hazard management areas

Outcome 4: Natural hazard management areas are identified in the planning scheme.

7.2 Clearly identifying areas potentially affected by flood, bushfire and landslide is necessary to assist in formulating planning strategies and detailed planning measures that minimise risks to people, property, economic activity and the environment. The SPP Guideline provides advice on how to identify natural hazard management areas and severity of hazard (where appropriate). The SPP Guideline also provides advice on including the impacts of climate change when identifying a natural hazard management area.

[20] The SPP Guideline provides advice about deciding appropriate levels of risk in this circumstance.

Reflecting the SPP in planning strategies

Outcome 5: The planning scheme contains planning strategies that aim to:
- ensure that development in natural hazard management areas is compatible with the nature of the natural hazard;
- minimise the impacts from natural hazards on existing developed areas; and
- prevent development from materially increasing the extent or the severity of natural hazards.

7.3 Allocated land uses and associated development within natural hazard management areas should be consistent with Outcomes 1 to 3.

7.4 The planning scheme should include strategies aimed at minimising the impacts of natural hazards on areas of existing development. In particular, new development in existing developed areas should provide the optimum level of protection from natural hazards that is achievable under the circumstances of the particular locality. The SPP Guideline contains advice on how this can be achieved.

7.5 The planning scheme should also include strategies that prevent material increases in the extent or the severity of natural hazards. In relation to flooding, the planning scheme should aim to maintain the flood carrying capacity of rivers, streams and floodways, and the flood storage function of floodplains and waterways. For bushfire hazard, the planning scheme should include strategies that would prevent development (such as plantation forestry) from increasing bushfire risk for existing and planned communities and facilities. The SPP Guideline contains advice on devising these strategies.

Reflecting the SPP in detailed planning scheme measures

Outcome 6: The planning scheme ensures:
a) include a code(s) designed to achieve development outcomes consistent with Section 6; and
b) ensure that development to which this SPP applies is assessable or self-assessable against that planning scheme code(s).

The planning scheme, or planning scheme policy(s), specifies the information expected to be submitted with development applications subject to the code(s).

7.6 The combination of development assessment tables, code(s) and other assessment measures in the planning scheme needs to ensure that all relevant development is assessed against specific development standards that are consistent with Section 6. The SPP Guideline provides further advice on how this can be achieved.

7.7 Section 6 and the SPP Guideline describe the information that should be submitted with development applications. The planning scheme or supporting planning scheme policy(s) should make it clear that where such information is not provided with a development application, that information will be subject to an information request under IDAS.

8. INFORMATION AND ADVICE ON THE POLICY

8.1 Queensland Department of Emergency Services (DES) can provide information and advice on interpreting and implementing the SPP, the relevant contacts in appropriate agencies for specific natural hazard mitigation issues, planning for and managing disaster risks, sources of financial assistance for undertaking disaster risk management studies, hazard studies, developing disaster mitigation plans and the interpretation and use of the Bushfire Risk Analysis maps.

8.2 Queensland Department of Local Government and Planning (DLGP) can provide advice about reflecting the SPP in planning schemes and the operation of IDAS.

8.3 Queensland Department of Natural Resources and Mines (NR&M) can provide advice on landslide and floodplain management issues and the latest climate change science advances.

8.4 Queensland Environmental Protection Agency (EPA) can provide advice and information on storm tide and climate change issues.

9. GLOSSARY

9.1 The following terms are used in the SPP as defined below.

Annual exceedance probability (AEP): the likelihood of occurrence of a flood of a given size or larger in any one year; usually expressed as a percentage. For example, if a peak flood discharge of 500 cubic metres per second has an AEP of 5%, it means that there is a 5% risk (i.e. probability of 0.05 or a likelihood of 1 in 20) of a peak flood discharge of 500 metre^3/second or larger occurring in any one year. The AEP of a flood event gives no indication of when a flood of that size will occur next.

Bushfire: an uncontrolled fire burning in forest, scrub or grassland vegetation, also referred to as wildfire.

Climate change: a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Defined flood event (DFE): the flood event adopted by a local government for the management of development in a particular locality. The DFE is generally not the full extent of flood-prone land.

Development commitment: includes any of the following[21]:

- 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.

[21] Note that a designation in a forward planning document such as a strategic plan or development control plan under a transitional planning scheme is not a development commitment for the purposes of this SPP. Also the SPP does not apply to development assessable only against the *Standard Building Regulation*.

Flood: the temporary inundation of land by expanses of water that overtop the natural or artificial banks of a watercourse i.e. a stream, creek, river, estuary, lake or dam.

Floodplain: an area of land adjacent to a creek, river, estuary, lake, dam or artificial channel, which is subject to inundation by the Probable Maximum Flood (PMF).

Floodway[22]: those areas of the floodplain where a significant discharge of water occurs during the DFE. Floodways are often aligned with naturally defined channels and even if partially blocked would cause a significant redistribution of flood flow, or a significant increase in flood levels. What constitutes a floodway may vary from one floodplain or part of a floodplain to another. Floodways will normally be identified as part of a floodplain management study or flood study where their importance in the overall behaviour of flood flows can be properly taken into account. Where a study to determine floodways using local criteria has not been undertaken, a floodway (for the purposes of this SPP) shall be an area where, at the DFE, the floodwater has:

- a velocity–depth product of 0.3 square metres per second or greater; **or**
- a velocity of 1 metre per second or greater.

Hazardous materials in bulk: hazardous materials as defined in the *Dangerous Goods Safety Management Act 2001* (except that radioactive substances and infectious substances[23] are excluded for the purposes of this SPP) in quantities that:

- would be equivalent to or exceed the minimum quantities set out to determine a Large Dangerous Goods Location in the *Dangerous Goods Safety Management Regulation*; or
- would require a licence for a magazine for the storage of an explosive under the *Explosives Regulation 1955*.

IDAS: Integrated Development Assessment System (IDAS) is a framework that establishes a common statutory system under the *Integrated Planning Act 1997* for making, assessing and deciding development applications, regardless of the nature of development, its location in Queensland or the authority administering the regulatory control.

Landslide: a movement of material downslope in a mass as a result of shear failure at the boundaries of the mass.

Mitigation: any measure intended to reduce the severity of a natural hazard.

Natural disaster: a natural hazard event that severely disrupts the fabric of a community and requires the intervention of the various levels of government to return the community to normality.

Natural hazard: a naturally occurring situation or condition with the potential for loss or harm to the community, property or environment. The natural hazards addressed in this SPP are flood, bushfire and landslide.

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[22] Local governments may adopt an alternative definition of floodway in their planning scheme to provide a more accurate reflection of the flood characteristics in a particular locality. Refer to Appendix 2 for additional information on floodways and their identification.

[23] Radioactive substances are appropriately managed under the *Radiation Safety Act 1999*, and facilities dealing with infectious substances are subject to Australian Standards and the Office of Gene Technology.

Natural hazard management area: an area that has been defined[24] for the management of a natural hazard (flood, bushfire or landslide), but may not reflect the full extent of the area that may be affected by the hazard (e.g. land above the 1% AEP floodline may flood during a larger flood event). Natural hazard management areas for flood, bushfire or landslide are described in Annex 3.

Nature of the natural hazard: the important characteristics of the hazard including the type of hazard and its severity.

Probable maximum flood (PMF): the largest flood that could reasonably occur at a particular location, resulting from the probable maximum precipitation. The PMF defines the extent of flood-prone land. Generally, it is not physically or financially possible to provide general protection against this event.

Risk: a concept used to describe the likelihood of harmful consequences arising from the interaction of hazards, community and the environment.

Unacceptable risk: a situation where people or property are exposed to a predictable hazard event that may result in serious injury, loss of life, failure of community infrastructure, or property damage that would make a dwelling unfit for habitation.

Vegetation clearing[25]: removing or cutting down, ringbarking, pushing over, poisoning or in any way destroying a tree, shrub or other plant (other than grass), but does **not** include:

- lopping, pruning or mowing for maintenance purposes;
- work associated with management practices for the conduct of an agricultural or forestry use[26];
- clearing vegetation for essential management including:
  - for establishing or maintaining a firebreak to protect a building, property boundary or paddock;
  - vegetation that is likely to endanger the safety of a person or property on the land because the vegetation is likely to fall;
  - for maintaining an existing fence, stock yard, shed, road or other built infrastructure; or
  - for maintaining a garden or orchard.

[24] A natural hazard management area may be defined using a different term (e.g. bushfire prone area; flood affected area).

[25] Proposals that involve vegetation clearing may also be required to address relevant requirements of the *Vegetation Management Act 1999*, as well as local laws and the planning scheme. Information and advice on these matters should be sought from NR&M and the local government.

[26] Work associated with forestry and management practices for the conduct of an agricultural use (other than the clearing of native vegetation on freehold land) is exempt development that may not be made assessable or self-assessable under the IPA.

ANNEX 1

Development to which this Policy applies

A1.1 In natural hazard management areas this Policy applies as follows:

a) in natural hazard management areas for **flood, bushfire** or **landslide** to **material changes of use** and associated **reconfigurations of a lot** that:
   - increase the number of people living or working in the natural hazard management area (e.g. residential development, shopping centres, tourist facilities, industrial or commercial uses) except where the premises are only occupied on a short-term or intermittent basis (e.g. by construction/maintenance workers, certain agricultural and forestry workers); or
   - involve institutional uses where evacuating people may be particularly difficult (e.g. hospitals, education establishments, child care, aged care, nursing homes and high security correctional centres); or
   - involve the manufacture or storage of hazardous materials in bulk[27]; or
   - would involve the building or other work described in (b) and (c) below as an intrinsic element of the development proposal; and

b) in natural hazard management areas for **flood**, to **building**[28] or other **work** that involves any physical alteration to a watercourse or floodway including vegetation clearing[29], or involves net filling exceeding 50 cubic metres[30]; and

c) in natural hazard management areas for **landslide**, to **building**[28] or other **work** on potentially unstable slopes that involves:
   - earthworks exceeding 50 cubic metres[30] (other than the placement of topsoil); or
   - vegetation clearing[29]; or
   - redirecting the existing flow of surface or groundwater.

AND

A1.2 Throughout **Queensland**[31] to the following types of **community infrastructure** that provide services vital to the wellbeing of the community:
- police and emergency services facilities including emergency shelters;
- hospitals and associated institutions;
- facilities for the storage of valuable records or items of cultural or historic significance[32];
- 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*; and
- water cycle management infrastructure.

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27 See Section 9, Glossary for a definition of hazardous materials in bulk.

28 Except where the building work is accessible only against the *Standard Building Regulation.*

29 See Section 9, Glossary.

30 This is the threshold for defining earthworks of State interest to which the SPP applies. Local governments may adopt lower thresholds to reflect the particular flooding or landslide hazard characteristics of different localities.

31 Except in relation to bushfire and landslide, those local government areas not included in Annex 2.

32 Including facilities for the storage of public records under the *Public Records Act 2002.*

ANNEX 2

Areas within which the SPP applies for Bushfire and Landslide

A2.1 For **bushfire** the SPP applies in the following local government areas as they were defined on 1 September 2002.

Atherton Shire Council
Banana Shire Council
Bauhinia Shire Council
Beaudesert Shire Council
Bendemere Shire Council
Biggenden Shire Council
Boonah Shire Council
Booringa Shire Council
Bowen Shire Council
Brisbane City Council
Broadsound Shire Council
Bungil Shire Council
Burdekin Shire Council
Burnett Shire Council
Caboolture Shire Council
Cairns City Council
Calliope Shire Council
Caloundra City Council
Cambooya Shire Council
Cardwell Shire Council
Chinchilla Shire Council
Clifton Shire Council
Cook Shire Council
Cooloola Shire Council
Crows Nest Shire Council
Dalrymple Shire Council
Douglas Shire Council
Duaringa Shire Council
Eacham Shire Council
Eidsvold Shire Council
Emerald Shire Council
Esk Shire Council
Etheridge Shire Council
Fitzroy Shire Council
Flinders Shire Council
Gatton Shire Council
Gayndah Shire Council
Gladstone City Council
Gold Coast City Council
Herberton Shire Council
Hervey Bay City Council
Hinchinbrook Shire Council
Inglewood Shire Council
Ipswich City Council
Isis Shire Council
Jericho Shire Council
Johnstone Shire Council
Jondaryan Shire Council
Kilcoy Shire Council
Kilkivan Shire Council
Kingaroy Shire Council
Kolan Shire Council
Laidley Shire Council
Livingstone Shire Council
Logan City Council
Mackay City Council
Mareeba Shire Council
Maroochy Shire Council
Maryborough City Council
Millmerran Shire Council
Mirani Shire Council
Miriam Vale Shire Council
Monto Shire Council
Mount Morgan Shire Council
Mundubbera Shire Council
Murgon Shire Council
Murilla Shire Council
Nanango Shire Council
Nebo Shire Council
Noosa Shire Council
Perry Shire Council
Pine Rivers Shire Council
Pittsworth Shire Council
Redcliffe City Council
Redland Shire Council
Rockhampton City Council
Rosalie Shire Council
Sarina Shire Council
Stanthorpe Shire Council
Tara Shire Council
Taroom Shire Council
Thuringowa City Council
Tiaro Shire Council
Toowoomba City Council
Townsville City Council
Waggamba Shire Council
Wambo Shire Council
Warwick Shire Council
Whitsunday Shire Council
Wondai Shire Council
Woocoo Shire Council

Cherbourg Aboriginal Council
Hope Vale Aboriginal Council
Lockhart River Aboriginal Council
Napranum Aboriginal Council
Palm Island Aboriginal Council
Woorabinda Aboriginal Council
Wujal Wujal Aboriginal Council
Yarrabah Aboriginal Council

A2.2 The areas subject to this SPP are not altered by administrative changes to local government boundaries or names.

A2.3 For **landslide** the SPP applies in the following local government areas as they were defined on 1 September 2002:

Atherton Shire Council
Banana Shire Council
Bauhinia Shire Council
Beaudesert Shire Council
Biggenden Shire Council
Boonah Shire Council
Bowen Shire Council
Brisbane City Council
Broadsound Shire Council
Burdekin Shire Council
Burnett Shire Council
Caboolture Shire Council
Cairns City Council
Calliope Shire Council
Caloundra City Council
Cambooya Shire Council
Cardwell Shire Council
Clifton Shire Council
Cooloola Shire Council
Cook Shire Council
Crows Nest Shire Council
Dalrymple Shire Council
Douglas Shire Council
Duaringa Shire Council
Eacham Shire Council
Emerald Shire Council
Esk Shire Council
Fitzroy Shire Council
Gatton Shire Council
Gayndah Shire Council
Gladstone City Council
Gold Coast City Council
Herberton Shire Council
Hervey Bay City Council
Hinchinbrook Shire Council
Ipswich City Council
Isis Shire Council
Johnstone Shire Council
Jondaryan Shire Council
Kilcoy Shire Council
Kilkivan Shire Council
Kingaroy Shire Council
Kolan Shire Council
Laidley Shire Council
Livingstone Shire Council
Logan City Council
Mackay City Council
Mareeba Shire Council
Maroochy Shire Council
Maryborough City Council
Mirani Shire Council
Miriam Vale Shire Council
Monto Shire Council
Mt Morgan Shire Council
Nanango Shire Council
Nebo Shire Council
Noosa Shire Council
Peak Downs Shire Council
Perry Shire Council
Pine Rivers Shire Council
Redland Shire Council
Rockhampton City Council
Rosalie Shire Council
Sarina Shire Council
Stanthorpe Shire Council
Taroom Shire Council
Thuringowa City Council
Tiaro Shire Council
Toowoomba City Council
Torres Shire Council
Townsville City Council
Wambo Shire Council
Warwick Shire Council
Whitsunday Shire Council
Woocoo Shire Council
Bamaga Island Council
Cherbourg Aboriginal Council
Hope Vale Aboriginal Council
Injinoo Aboriginal Council
Lockhart River Aboriginal Council
Mapoon Aboriginal Council
Napranum Aboriginal Council
New Mapoon Aboriginal Council
Palm Island Aboriginal Council
Umagico Aboriginal Council
Woorabinda Aboriginal Council
Wujal Wujal Aboriginal Council
Yarrabah Aboriginal Council

A2.4 The areas subject to this SPP are not altered by administrative changes to local government boundaries or names.

ANNEX 3

Natural hazard management areas

Flood

A3.1 A natural hazard management area (flood) is land inundated by a Defined Flood Event (DFE)[33] 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[34].

Bushfire

A3.3 A natural hazard management area (bushfire) is:

a) an area identified by a local government in its planning scheme consistent with the conclusions of a bushfire hazard assessment prepared in accordance with Appendix 3 of the SPP Guideline or other methodology approved by the Queensland Fire and Rescue Service (QFRS); or

b) where such a study has not been undertaken, an area identified by a local government in its planning scheme, reflecting the Medium and High hazard area of the Bushfire Risk Analysis maps produced by the QFRS, suitably modified following a visual assessment of the accuracy of the maps by the local government; or

c) where an area has not been identified by a local government, the Medium and High hazard areas on the Bushfire Risk Analysis maps produced by the QFRS.

Landslide

A3.4 A natural hazard management area (landslide) is:

a) an area identified by a local government in its planning scheme consistent with the conclusions of a landslide hazard assessment prepared in accordance with Appendix 4 of the SPP Guideline; or

b) where such a study has not been undertaken, an area identified by a local government in its planning scheme and including all land of 15% and greater slope and other land known or suspected by the local government as being geologically unstable, together with other areas that the local government considers may be adversely affected by a landslide event;[35] or

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[33] See Section 9, Glossary.

[34] Local Governments are encouraged to adopt a DFE and identify natural hazard management areas (flood) in a planning scheme as soon as possible to enable the application of the SPP to development in flood prone areas. Appendix 2 in the SPP Guideline gives examples of simple flood study alternatives that may be appropriate for interim use until comprehensive flood studies are completed, or for longer-term use by low-growth local governments with capacity and resource constraints. Appendix 2 also provides guidance on the key issues to be considered when determining an appropriate DFE.

[35] For example, land below an area known or suspected as being geologically unstable that may be affected by debris flows.

c) where an area has not been identified by a local government, all land with a slope of 15% or greater.[36]

A3.5 The SPP Guideline provides information on methodologies for identifying natural hazard management areas in planning schemes and advice on sources of financial assistance available for such studies.

[36] Refer to the SPP Guideline for a suitable methodology to calculate slope.

ANNEX 4

Compatibility of development in natural hazard management areas with the nature of the hazard

A4.1 This Annex sets out the specific outcomes that should be achieved for development to be compatible with the nature of hazard as required under Outcome 1 of the SPP. Development proposals that demonstrate compliance with each of the specific outcomes that are applicable to the particular development achieve Outcome 1 of the SPP.

A4.2 The SPP Guideline provides advice on how to achieve these specific outcomes.

Natural hazard	Specific outcomes
FLOOD	**1.** Development maintains the safety of people on the development site from all floods up to and including the DFE. **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 (e.g. on-site electricity, gas, water supply, sewerage and telecommunications) maintains its function during a DFE.
BUSHFIRE	**6.** Development maintains the safety of people and property by: **a)** avoiding areas of High or Medium bushfire hazard; or **b)** mitigating the risk through: ι allotment design and the siting of buildings; and ι including firebreaks that provide adequate: ſ setbacks between buildings/structures and hazardous vegetation, and ſ access for fire-fighting/other emergency vehicles; ι providing adequate road access for fire-fighting/other emergency vehicles and safe evacuation; and ι providing an adequate and accessible water supply for fire-fighting purposes. **7.** Public safety and the environment are not adversely affected by the detrimental impacts of bushfire on hazardous materials manufactured or stored in bulk.
LANDSLIDE	**8.** Development maintains the safety of people, property and hazardous materials manufactured or stored in bulk from the risk of landslide.

ANNEX 5

Determining unacceptable risk in accordance with Outcome 2

A5.1 Outcome 1 does not require development proposals that are either a development commitment[37], or satisfy an overriding need in the public interest to be compatible with the nature of the natural hazard. However, Outcome 2 requires such development proposals to achieve the specific outcomes for compliance with Outcome 1 as far as practicable, and not to result in an unacceptable risk to people and property.

A5.2 The following table sets out the minimum outcomes a development should achieve to avoid unacceptable risk. Appendix 5 of the SPP Guideline provides more information (including associated Probable Solutions) on how to achieve these outcomes.

Minimum requirements to satisfy the 'unacceptable risk' test:

Natural hazard	Minimum requirements
FLOOD	Achievement of specific outcomes 1, 2 and 4 in Annex 4.
BUSHFIRE	Achievement of the following elements from specific outcome 6 in Annex 4: ι providing adequate road access for fire-fighting and other emergency vehicles and safe evacuation; and ι providing an adequate and accessible water supply for fire-fighting purposes.
LANDSLIDE	Achievement of specific outcome 8 in Annex 4.

[37] See Section 9, Glossary.

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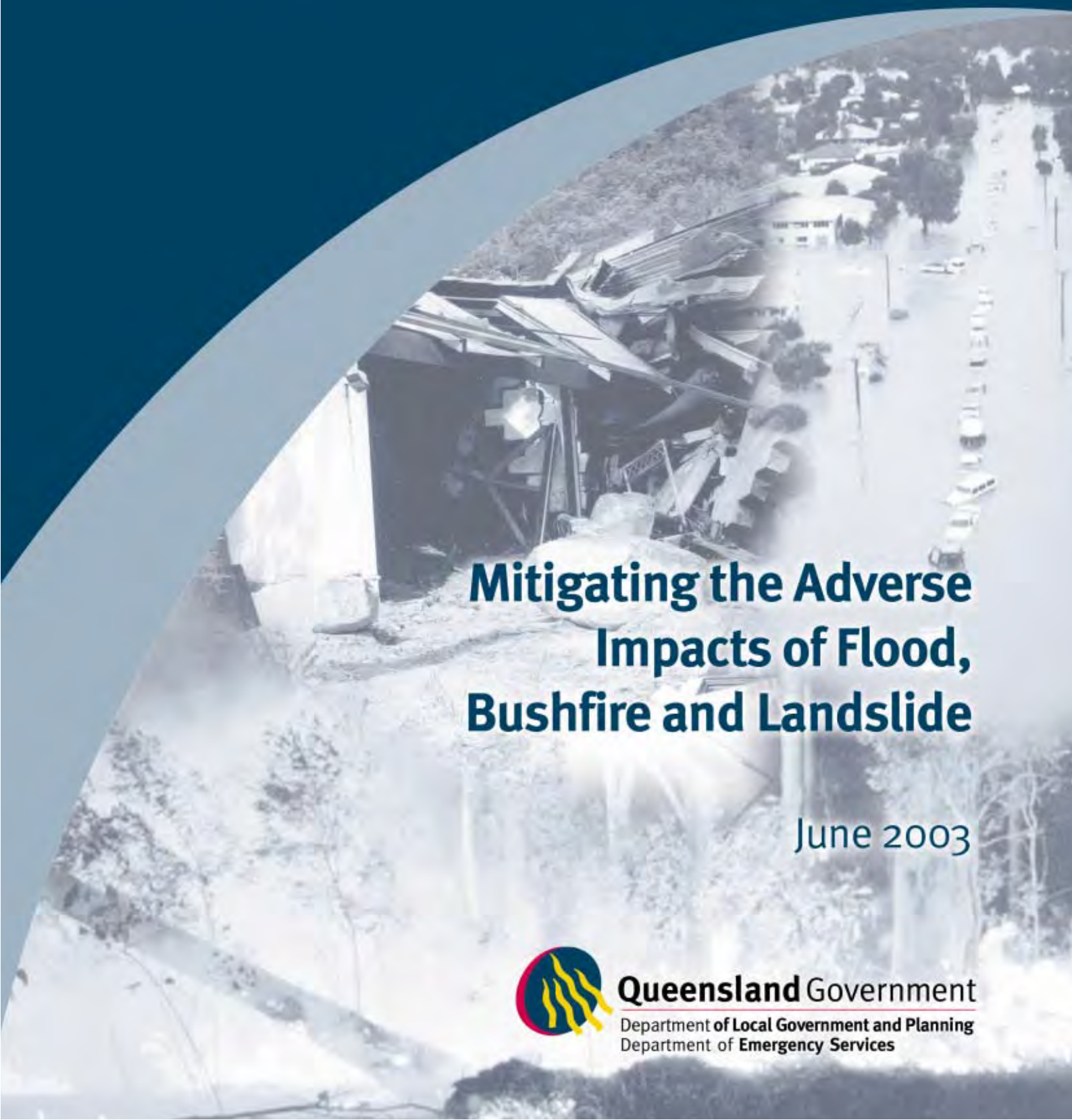
State Planning Policy Guideline



Mitigating the Adverse Impacts of Flood, Bushfire and Landslide

June 2003

Queensland Government
Department of Local Government and Planning
Department of Emergency Services

STATE PLANNING POLICY 1/03
GUIDELINE

Mitigating the Adverse Impacts of Flood, Bushfire and Landslide

TABLE OF CONTENTS

1. PURPOSE OF THE SPP GUIDELINE

1.1 The purpose of the State Planning Policy 1/03 Guideline ('the SPP Guideline') is to provide advice and information on interpreting and implementing the State Planning Policy 1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* ('the SPP'). The SPP is a statutory instrument expressing the State's interest in minimising the adverse impacts of these three natural hazards on people, property, economic activity, and the environment when making decisions about development. The information contained in the SPP Guideline is not intended to be a complete technical guide to the assessment and management of natural hazards.[1]

1.2 The SPP declares this SPP Guideline to be 'extrinsic material' under the *Statutory Instruments Act 1992*, thereby giving the SPP Guideline legal status in assisting in the interpretation of the SPP.[2]

2. SCOPE OF THE SPP

2.1 The SPP aims to ensure that the natural hazards of flood, bushfire and landslide are adequately considered when making decisions about certain development.

2.2 For the purposes of the SPP and SPP Guideline, relevant natural hazards are defined as follows:

- **Flood:** the temporary inundation of land by expanses of water that overtop the natural or artificial banks of a watercourse i.e. a stream, creek, river, estuary, lake or dam.
- **Bushfire:** an uncontrolled fire burning in forest, scrub or grassland vegetation, also referred to as a wildfire.
- **Landslide:** a movement of material downslope in a mass as a result of shear failure at the boundaries of the mass.

2.3 The SPP deals only with certain natural hazards. It does not address technological or biological disasters such as chemical spills, plagues or pestilence, exotic diseases, space debris or bridge collapse. The SPP does not deal with natural hazards already addressed in other instruments, such as storm tide inundation, which is dealt with by the *State Coastal Management Plan – Queensland's Coastal Policy 2001* (State Coastal Plan).[3] The SPP does not deal with earthquake and strong wind as these are addressed by design and construction standards through the *Standard Building Regulation* (SBR).

2.4 Tropical cyclone and severe storm events and the associated risks of damage are difficult to control through land use planning. However, some consequences of cyclones and severe storms can be addressed through land use planning, and other consequences are addressed through building and design standards. For example, flood and landslide, two consequences of cyclones and severe storms, are addressed in the SPP. Strong wind, a further consequence of severe storms and cyclones, is addressed by the SBR.

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1 See Appendix 11 for a list of other information sources.

2 Extrinsic material is defined in the *Statutory Instruments Act 1992* as *'relevant material not forming part of the statutory instrument or the Act under which the statutory instrument was made'*.

3 However, storm tide hazard may need to be considered in determining the extent and severity of flood hazard. See Section 4 of the SPP.

3. APPLICATION OF THE SPP

Effect of the SPP

3.1 Under the *Integrated Planning Act 1997* (IPA), the SPP has the following effect.

Development assessment

3.2 The SPP applies to assessable development[4], except building work that is assessable only under the SBR, in the following ways:

(i) *IPA Planning Schemes* – Where an IPA planning scheme is in force and it does not appropriately reflect the SPP[5], the assessment manager must have regard to the SPP when assessing both code assessable and impact assessable development applications under the Integrated Development Assessment System (IDAS).[6] **[NB. Until the *Integrated Planning and Other Legislation Amendment Act 2003* commences, the assessment manager must have regard to the SPP only when assessing development applications subject to impact assessment.]**

(ii) *Transitional Planning Schemes* – Where a transitional planning scheme is in force, the assessment manager must have regard to the SPP when assessing development applications requiring a development approval under a planning scheme.

(iii) *Schedule 8 of IPA* – For assessable development not addressed by a planning scheme and subject to assessment under the *Integrated Planning Regulation,* the assessment manager must have regard to the SPP when assessing relevant development proposals. For example, in areas under the jurisdiction of Aboriginal and Torres Strait Islander local governments where planning schemes are unlikely to be prepared, the SPP applies only to development that is made assessable by Schedule 8 of the IPA.

Making or amending planning schemes

3.3 The SPP is to be appropriately reflected in planning schemes[7] to ensure that the State's interests in natural disaster mitigation are interpreted in the local context when planning for future development and making decisions on development applications.

3.4 The SPP is appropriately reflected when the planning scheme seeks the same outcomes as the SPP and all aspects of the planning scheme are consistent with the SPP to an extent that satisfies the Minister for Local Government and Planning, acting for the State Government on the advice of the Department of Emergency Services (DES) and the Department of Local Government and Planning (DLGP).

Land designated for community infrastructure

3.5 Under the IPA, the SPP must be considered when designating land for community infrastructure.

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4 Assessable development is defined in the IPA as:
(a) development specified in Schedule 8, Part 1; or
(b) for a planning scheme area – development that is not specified in Schedule 8, Part 1 but is declared under the planning scheme for the area to be assessable development.

5 The SPP is appropriately reflected when the Minister makes a statement to this effect in the planning scheme.

6 See Section 9, Glossary.

7 Local governments making minor scheme amendments that are not related to flooding, bushfire or landslide hazard will not be required to reflect the SPP.

Development to which the SPP applies

3.6 The SPP applies to development described in Annex 1 of the SPP. It should be noted that the SPP applies to the development listed in A1.1 of Annex 1 of the SPP only where the development is proposed within a *natural hazard management area*.[8] However, the SPP applies throughout Queensland[9] for the types of community infrastructure listed in A1.2 of Annex 1 of the SPP. Figure 1 shows how the SPP applies to a community infrastructure proposal depending on its nature and location.

3.7 In addition, the SPP addresses development that may not be listed in Annex 1 or may not be within a natural hazard management area, but has the potential to increase the extent or severity of natural hazards. However, this aspect of the SPP applies only when planning schemes are being made or amended.

Areas to which the SPP applies

3.8 The SPP applies throughout Queensland for flood, and to the local government areas identified in Annex 2 of the SPP for bushfire and landslide. These areas are shown on Maps 1 and 2 on the following pages. The main reason for exempting the local government areas not listed in Annex 2 of the SPP for bushfire is that the predominant vegetation types in these areas are a low bushfire risk and their hazard is considered of local rather than State significance. For landslide, the SPP applies to local governments where there are areas with steep slopes that may place people and property at risk from landslide.

Other considerations

3.9 The scope of the SPP is limited to mitigating the risks from three natural hazards and therefore, the relationship with other policies needs to be considered. Achieving the SPP's outcomes could cause conflicts with other policies, notably those concerning nature conservation and amenity (see Section 3 of the SPP). For example, creating firebreaks could impact on protected vegetation, and designing buildings to site floors and rooms above the Defined Flood Event (DFE)[10] could adversely affect an existing streetscape and/or the amenity of neighbouring properties.

3.10 The SPP should not be used as an automatic justification for overriding other policy considerations in either the planning scheme or other State instruments. Development applications need to be assessed on their merits against all relevant considerations specified in IDAS. Similarly, planning scheme proposals need a broad, balanced assessment to determine what is appropriate in the public interest. In many cases, a development proposal that achieves the outcomes of the SPP but has serious conflicts with a local planning instrument, another State Planning Policy or another State instrument is likely to be considered inappropriate.

3.11 Nothing in the SPP restricts a local government, assessment manager or designator from addressing the planning for and management of the risks associated with the natural hazards addressed in the SPP more stringently or in more detail than required by the SPP.

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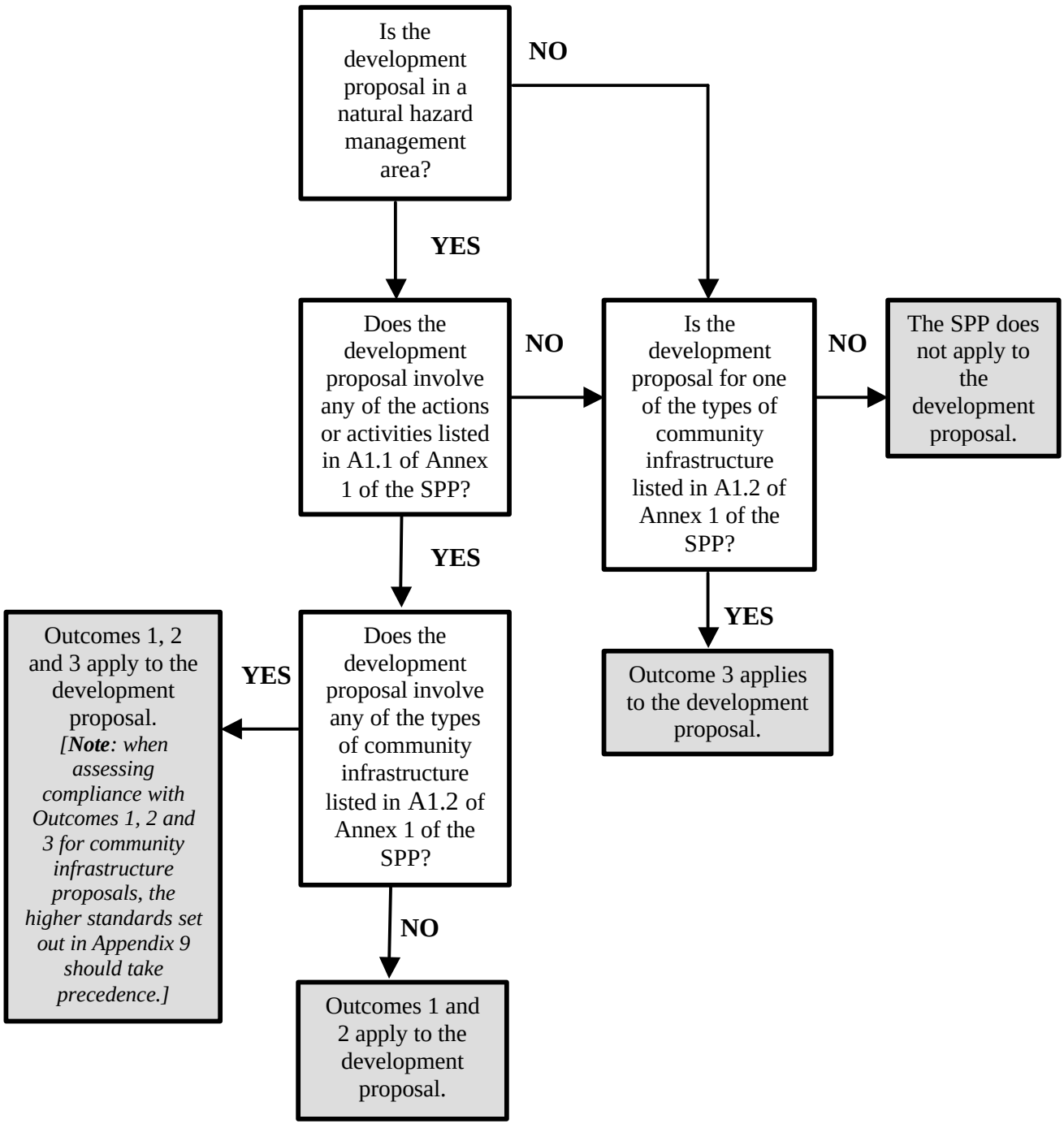
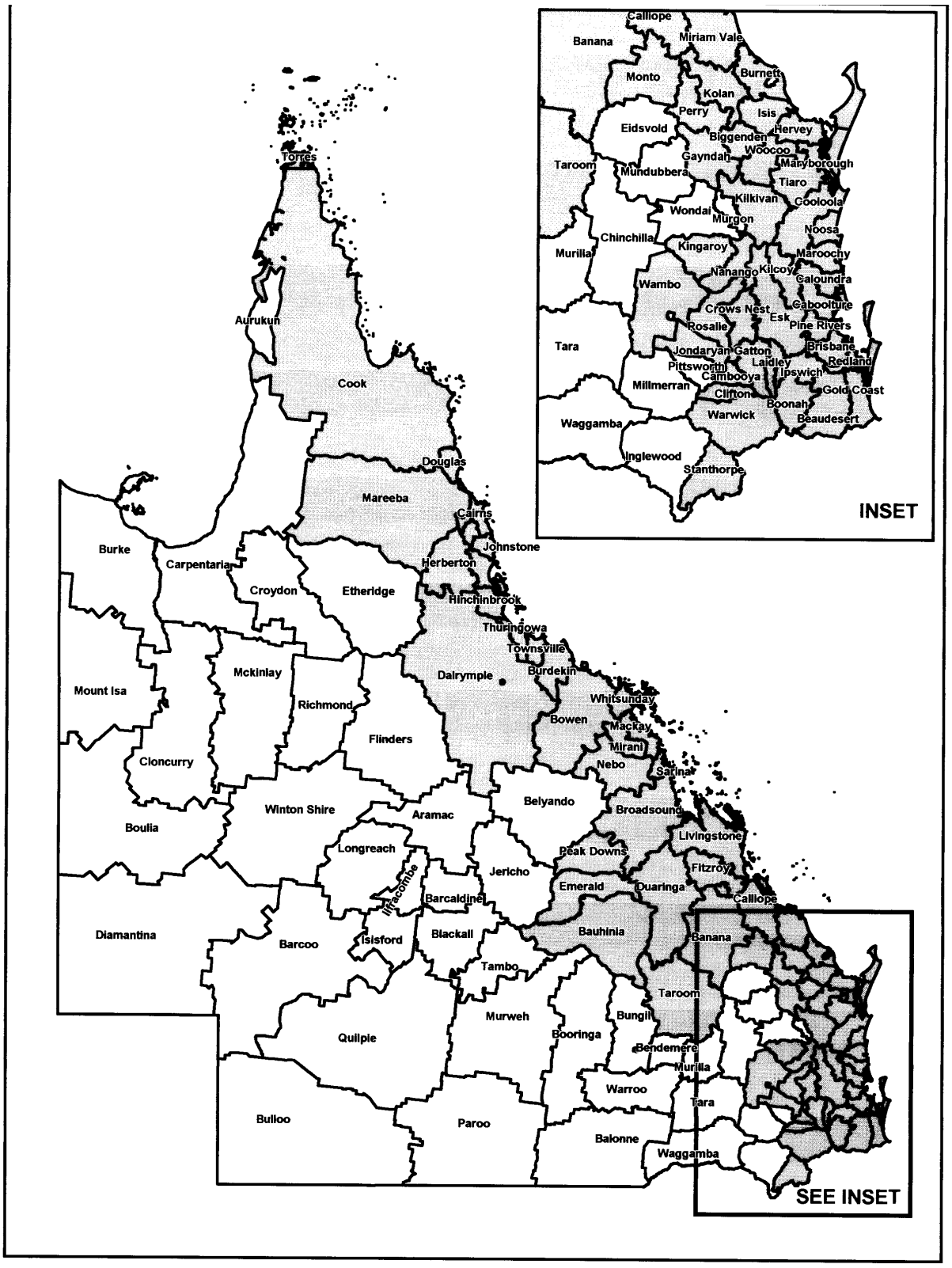
8 See Section 9, Glossary.

9 Except in relation to bushfire and landslide hazard, to those local governments not listed in Annex 2 of the SPP. See Maps 1 and 2 below.

10 See Section 9, Glossary.

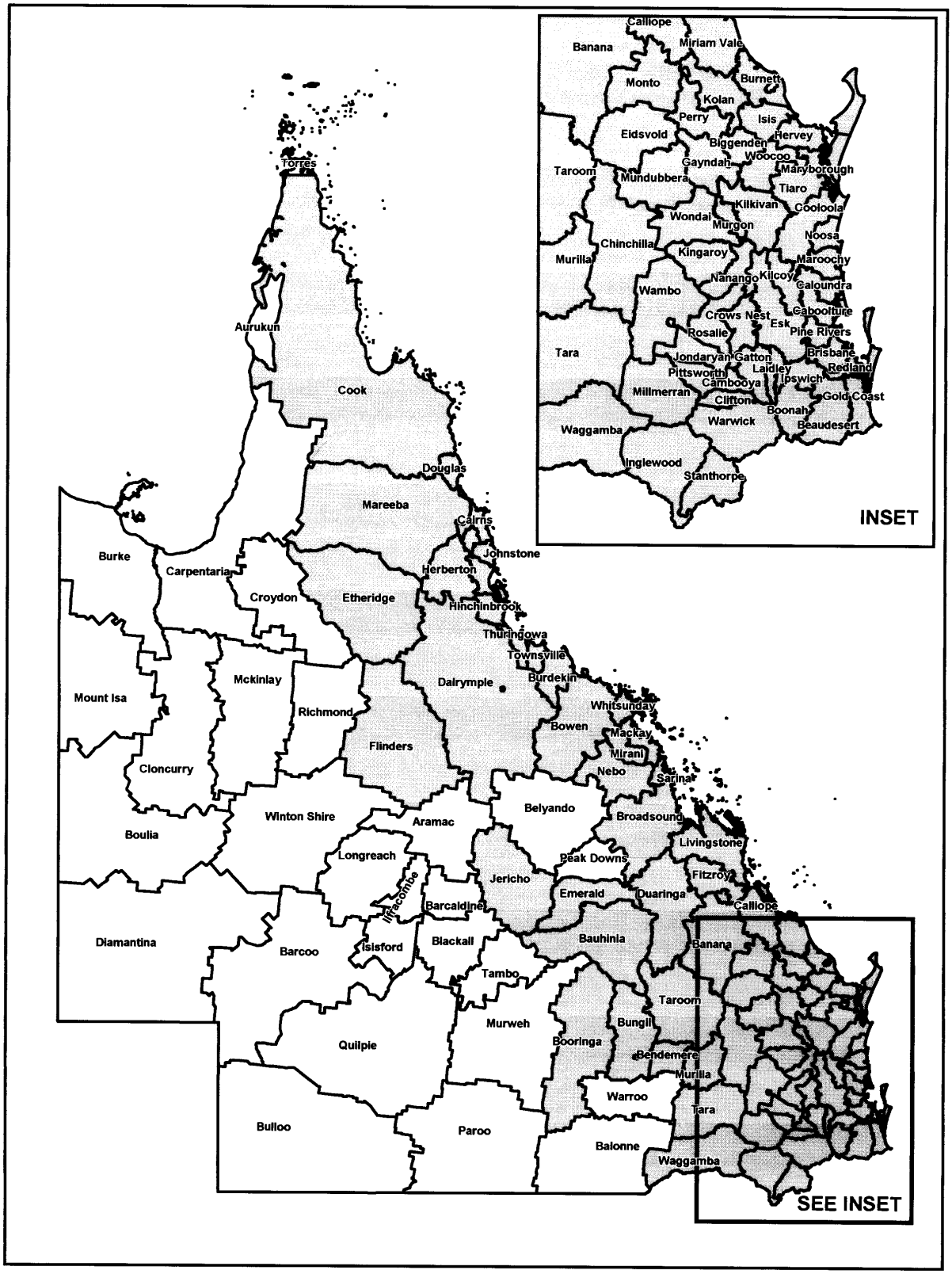
Figure 1: Application of the SPP to development proposals for community infrastructure





Applicable Local Government Areas - LANDSLIPE

Map 1



Applicable Local Government Areas - BUSHFIRE

Map 2

4. THE NEED TO MITIGATE THE ADVERSE IMPACTS OF NATURAL HAZARDS

Natural disasters

4.1 Natural hazards such as floods, bushfires and landslides become natural disasters when they severely disrupt the fabric of a community and require the intervention of the various levels of government to return the community to normality.[11] In the context of this SPP, mitigation means measures taken to reduce the severity of, or eliminate the risk from, a natural hazard. Mitigation is usually thought of in terms of prevention and community preparedness.

4.2 Two trends have emerged in relation to natural disasters. The number of deaths from natural disasters has decreased because of improved warning systems, better practice in building construction and enhanced emergency responses. However, the cost of restoration and rehabilitation following a natural disaster has risen because more development is located in hazard-prone areas and the value of people's possessions and the population in these areas have increased. These three factors result in more people and property being vulnerable to natural disasters.

Role of land use planning

4.3 Effective land use planning can limit and, over time, reduce the impacts of natural disasters. The SPP will shape land use planning and development decisions to create settlement patterns that reduce vulnerability to many flood, landslide or bushfire events.

Costs associated with natural disasters

4.4 Natural disasters are estimated to have cost the Australian community $1.13 billion per year (in 1999 dollars) between 1980 and 1999, and to have cost Queensland an average of $239 million each year in direct and indirect tangible costs between 1967 and 1999.[12]

4.5 There is a range of other intangible costs associated with natural disasters that adversely affect the interests of the State, regions and local communities. These costs include loss of life, injury, emotional suffering, loss of memorabilia, reduced quality of life, reduced productivity, weakened economy, loss of employment, associated loss to business and primary producers, increased costs of insurance and environmental degradation. It is widely recognised that the intangible costs of natural disasters, while difficult to estimate, are substantial and are therefore important when considering the benefits of mitigation measures.[13]

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11 Alice Zamecka and Graham Buchanan, *Disaster Risk Management*, Queensland Department of Emergency Services 2000, page 8.

12 Bureau of Transport Economics *Report 103 Economic Costs of Natural Disasters in Australia*, Commonwealth of Australia 2001

13 ibid., pages 87-9.

Climate change

4.6 The *Queensland Greenhouse Policy Framework*[14] acknowledges growing scientific consensus that the enhanced greenhouse effect is changing the world's climate and that Queensland will be vulnerable to the effects of climate change. Predicted changes are likely to include reductions in annual rainfall but increases in rainfall intensity, coastal erosion and sea level, risk of bushfires, and flood risk and damage to transport infrastructure and low-lying human settlements. These changes would have significant impacts on the nature and extent of natural hazards and, where practicable, should be considered when developing hazard mitigation strategies. The State Coastal Plan provides general direction for addressing potential impacts of climate change in the coastal zone.

4.7 The SPP addresses this issue by seeking to ensure that climate change is considered when certain natural hazard assessments are undertaken. However, it does not appear feasible at this stage to consider climate change for bushfire hazard assessments.

4.8 Information sources for climate change issues are provided in Appendix 11: 'Other Information Sources'. This information may assist local governments to form a view about likely climate change impacts on their areas.

Natural disaster mitigation measures

4.9 The SPP is a significant natural disaster mitigation measure. The SPP complements other mitigation measures used by the Commonwealth, State and local governments, such as early warning systems, public education programs, counter disaster plans and physical mitigation measures such as firebreaks and levees. Appendix 1 provides information on a disaster risk management approach that can be implemented at the local government level.

Eligibility for Commonwealth and Queensland Government funding programs

4.10 A further reason to mitigate natural disasters is to meet changes to Commonwealth and State Government guidelines for funding natural disaster relief, capital works and transport infrastructure.

4.11 From July 1998, Commonwealth guidelines concerning the Natural Disaster Relief Arrangements (NDRA) funding were changed so that ongoing financial assistance from the Commonwealth for restoration of public assets is linked to evidence of mitigation for likely or recurring natural disasters or a commitment to develop and implement such a strategy within a reasonable timeframe. Implementing the requirements of the SPP will assist local governments and State Government agencies to demonstrate that this guideline requirement is being met. Details of the NDRA funding program can be obtained at website www.dotars.gov.au/ndr/index.htm

[14] Queensland Greenhouse Policy Framework: A Climate of Change, Queensland Government, September, 2001.

4.12 In 2002, the Queensland Government's Local Governing Bodies Capital Works Subsidy Scheme (funded by the DLGP) was amended to include criteria requiring project proponents to consider the risk of natural hazards and mitigation measures where appropriate.

5. THE POLICY APPROACH

5.1 The SPP introduces the concept of 'natural hazard management areas' as the principal mechanism for triggering the development outcomes and development assessment components of the SPP. Natural hazard management areas for flood, bushfire and landslide are defined in Annex 3 of the SPP.

5.2 The intention of the SPP is that, wherever practicable, natural hazard management areas should be identified through a comprehensive and detailed natural hazard assessment study.[15] Outcome 4 of the SPP requires natural hazard management areas to be identified when planning schemes are made or amended, and these should be integrated with the planning strategies and detailed planning measures required under Outcomes 5 and 6 of the SPP.

5.3 Natural hazard management areas have been defined in a manner that enables the SPP to take effect immediately upon commencement for development assessment purposes.

5.4 For bushfire and landslide this is achieved through the use of 'cascading' definitions of the natural hazard management areas. Where the natural hazard management areas for bushfire and landslide have not been based on the findings of a natural hazard assessment adopted by the local government, the definitions default to other datasets.

5.5 In the case of bushfire this is the Medium and High hazard areas on the Bushfire Risk Analysis maps produced by the Queensland Fire and Rescue Service (note that for bushfire purposes the SPP applies only to those local governments listed in A2.1 of Annex 2 of the SPP – see Map 1 of the SPP Guideline).

5.6 For natural hazard management areas (landslide), the default definition is all land with a slope of 15% or greater (only for those local governments listed in A2.3 of Annex 2 of the SPP – see Map 2 of the SPP Guideline). Although landslides can occur on lesser slopes (slope being only one of a number of factors that determine landslide hazard), the 15% threshold was adopted as the threshold for landslide hazard as slopes steeper than this are generally regarded as having a greater potential for landslide hazard.

[15] Refer to Appendices 2 to 4 of this SPP Guideline for advice on appropriate study approaches.

5.7 A default mechanism for flood hazard management was not adopted for the SPP as reliable statewide flood data was not available. Therefore, the development assessment components of the SPP apply in relation to flood only where a local government has adopted a DFE for managing development, and that DFE has been translated into a natural hazard management area (flood) identified in the planning scheme. A local government wishing to address flood issues urgently could identify a natural hazard management area (flood) and appropriate development assessment criteria in a temporary local planning instrument prior to making or amending the planning scheme.

5.8 In relation to flood hazard management, the SPP sets out the State's position that generally, the appropriate flood event for determining a natural hazard management area (flood) is the 1% Annual Exceedance Probability (AEP) flood. However, the SPP recognises that the adoption of a lower DFE may be appropriate depending on the circumstances of individual localities. The adoption of a lower DFE would require the local government to demonstrate by thorough analysis that the proposed level of flood protection is appropriate to the circumstances of the locality.[16]

6. DEVELOPMENT OUTCOMES AND DEVELOPMENT ASSESSMENT

Introduction

6.1 The following sections provide guidance on how to achieve the SPP Outcomes 1 to 3.

Achieving Outcomes 1 and 2 of the SPP

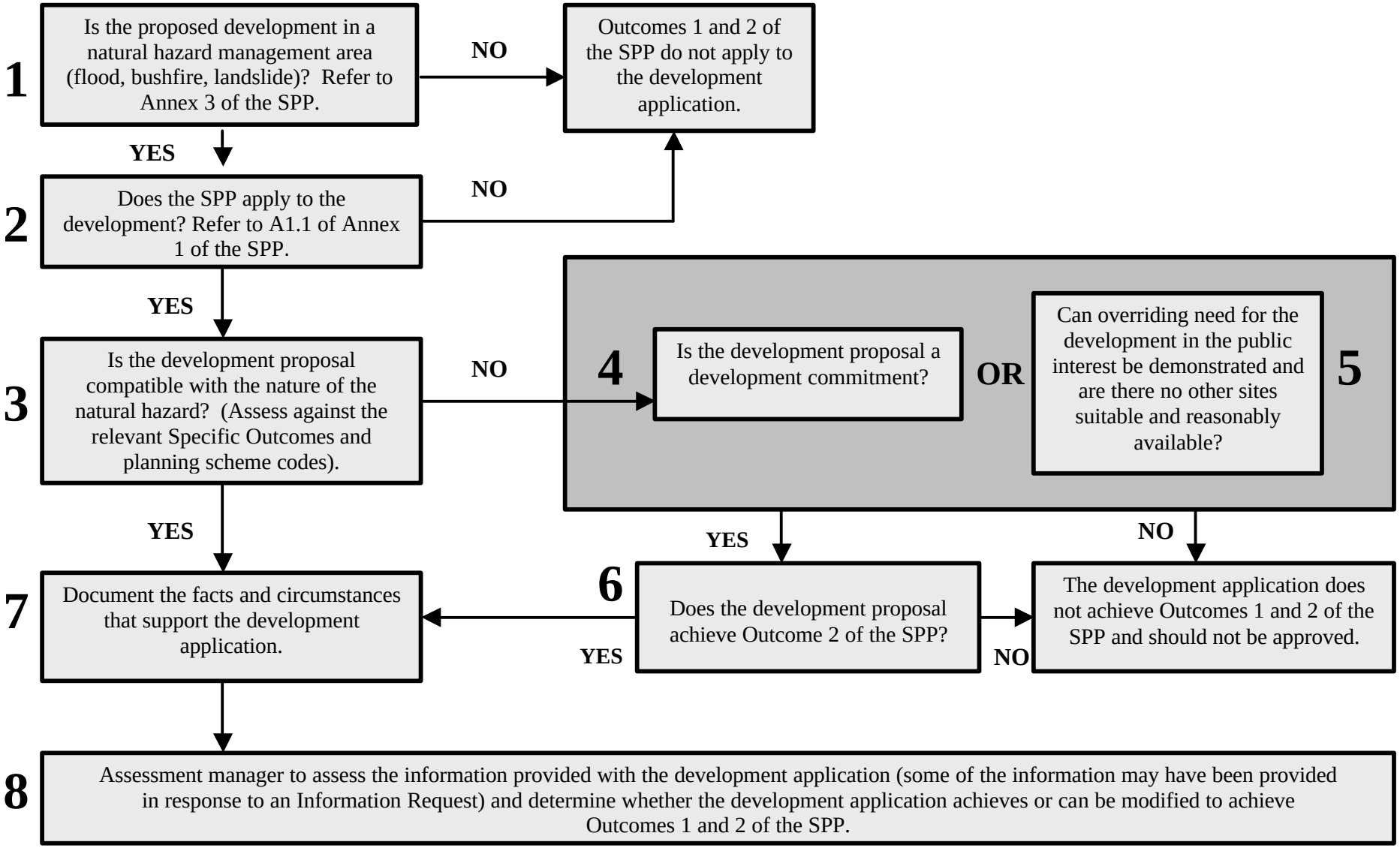
Outcome 1: Within natural hazard management areas, development to which this SPP applies is compatible with the nature of the natural hazard[17], except where:

- **the development proposal is a development commitment[18]; 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.**

6.2 Figure 2 sets out the process for achieving Outcomes 1 and 2. The following subsections provide advice and guidance on the implementation of each of the steps.

[16] Refer to Appendix 2 for advice on the issues to be considered when determining an appropriate DFE.
[17] See Section 9, Glossary.
[18] See Section 9, Glossary.

Figure 2: Achieving Outcomes 1 and 2 of the SPP



Is the proposed development in a natural hazard management area? (Step 1)

6.3 Outcome 1 of the SPP applies to development in natural hazard management areas. It is first necessary to identify whether the development proposal is located within a natural hazard management area and, if so, the severity of hazard that applies, if different natural hazard severities have been identified (e.g. low, moderate, high and extreme).

6.4 Although it is intended that, over time, all natural hazard management areas will be identified on the basis of a comprehensive and detailed study, Annex 3 of the SPP defines natural hazard management areas in a manner that enables the SPP to be implemented from the date of its commencement, except in the case of flood.[19]

6.5 Information on natural hazard management areas should be sought from the local government in the first instance. The other options outlined in Annex 3 of the SPP should be used only where the local government has not identified a natural hazard management area based on a specific technical assessment.

6.6 In relation to natural hazard management areas (flood), it should be noted that the local government will be the only source of information on flood levels. The SPP applies for development assessment purposes in relation to flood only where the local government has identified a natural hazard management area (flood) in the planning scheme.

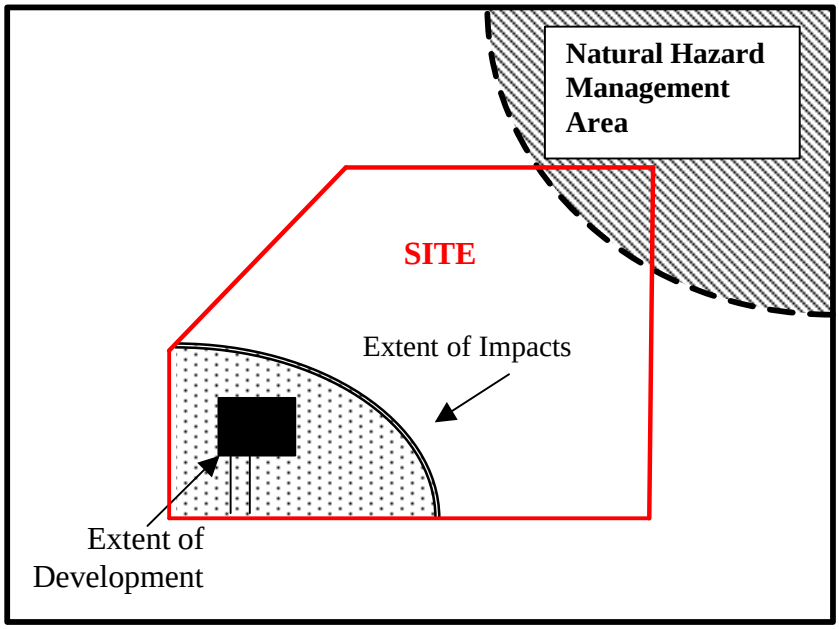
6.7 Information about the severity of the hazard may be available for the development site. If so, this information should be provided to the assessment manager by the proponent.

6.8 The applicant should determine whether any part of the development site is located within a natural hazard management area. Where part of the site is included in a natural hazard management area but the development proposal does not adversely impact on the natural hazard management area, the application should include sufficient information to demonstrate this. In such circumstances, the assessment manager should assess the submitted information and, if it reaches the same conclusion, may determine that further consideration of the SPP is not required (refer to Figure 3). These instances will be assessed on a case-by-case basis and are at the discretion of the assessment manager.

6.9 If the site is not located in a natural hazard management area, or the assessment manager determines that the proposal is not likely to impact on a natural hazard management area, no further consideration of the SPP is required in relation to Outcome 1.

[19] See Section 5 of this SPP Guideline for more information on the approach adopted in the SPP.

Figure 3: Example – Effect of the SPP where part of the site is within a natural hazard management area.



In this example, assessment against Outcomes 1 and 2 of the SPP would not be required.

Does the SPP apply to the development? (Step 2)

6.10 For land located within a natural hazard management area, A1.1 of Annex 1 of the SPP describes the types of development to which the SPP applies as follows:

a) in natural hazard management areas for **flood**, **bushfire** or **landslide** to **material changes of use** and associated **reconfigurations of a lot** that:

- increase the number of people living or working in the natural hazard management area (e.g. residential development, shopping centres, tourist facilities, industrial or commercial uses) except where the premises are occupied only on a short-term or intermittent basis (e.g. by construction/maintenance workers, certain agricultural and forestry workers); **or**
- involve institutional uses where evacuating people may be particularly difficult (e.g. hospitals, education establishments, child care, aged care, nursing homes and high security correctional centres); **or**
- involve the manufacture or storage of hazardous materials in bulk[20]; **or**
- would involve the building or other work described in (b) or (c) below as an intrinsic element of the development proposal; **and**

[20] See Section 9, Glossary for a definition of hazardous materials in bulk.

b) in natural hazard management areas for **flood**, to **building**[21] or other **work** that involves any physical alteration to a watercourse or floodway including vegetation clearing[22], or involves net filling exceeding 50 cubic metres[23]; **and**

c) in natural hazard management areas for **landslide**, to **building**[21] or other **work** that involves:

- earthworks exceeding 50 cubic metres[23] (other than the placement of topsoil); **or**
- vegetation clearing[22]; **or**
- redirecting the existing flow of surface or groundwater in a natural hazard management area (landslide).

6.11 If the development proposal does not include any of the actions or activities identified in A1.1 of Annex 1 of the SPP, Outcomes 1 and 2 do not apply.[24]

Is the development proposal compatible? (Step 3)

6.12 Development proposals within natural hazard management areas should be tailored to the nature of the hazard on the development site. Annex 4 of the SPP sets out the Specific Outcomes that development proposals should achieve to comply with Outcome 1. Appendix 5 of this SPP Guideline includes solutions for each of the Specific Outcomes that can be used to help determine whether or not a development proposal is compatible with the natural hazards.

6.13 The application should demonstrate that the development achieves the relevant Specific Outcomes in Annex 4 of the SPP. Technical studies (e.g. flood study or geotechnical study) may need to be provided to demonstrate compatibility.

6.14 Development that is not compatible with the nature of the natural hazard can still achieve Outcome 1 if it meets either of the exceptions listed in Outcome 1 and achieves Outcome 2. These exceptions relate to development commitments and overriding need in the public interest. Advice on interpreting these exceptions is provided under Step 4 and Step 5 respectively.

Is the development proposal a development commitment? (Step 4)

6.15 The SPP allows development that is incompatible with the nature of a natural hazard to be approved because it is a development commitment.

6.16 Where requested, the application should demonstrate that the development proposal is a development commitment based on an assessment of the development proposal for consistency with the overall outcomes (and/or intent) of the relevant zone (or equivalent), the associated development assessment tables and any applicable codes. The assessment manager should confirm that the development proposal is a development commitment.

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21 Except where the building work is assessible only against the SBR.

22 See Section 9, Glossary.

23 This is the threshold for defining earthworks of State interest to which the SPP applies. Local governments may adopt lower thresholds to reflect the particular flooding or landslide hazard characteristics of different localities.

24 However, Outcome 3 may still apply to development proposals for certain types of community infrastructure. Refer to paragraphs 6.36 to 6.45 of this SPP Guideline.

6.17 A development proposal that is consistent with these planning scheme measures is a development commitment and therefore achieves Outcome 1 of the SPP. However, the development proposal will still be required to achieve Outcome 2.

Can overriding need be demonstrated? (Step 5)

6.18 Development that is incompatible with the nature of a natural hazard can be approved on the grounds of overriding need in the public interest. However, such proposals are also required to achieve Outcome 2. Determining such overriding need will necessarily depend on the circumstances of the particular development proposal. This section of the SPP Guideline sets out the main principles for evaluating an overriding need in the public interest.

6.19 Firstly, the degree of net economic, social and/or environmental benefits to the community should be established and, secondly, if there are net community benefits, the likelihood of suitable alternative sites being generally available should be assessed.

a) Assessing net benefits to the community

6.20 The overall social, economic and environmental benefits of a proposed incompatible development located within a natural hazard management area should be weighed against the consequences of the natural hazard on the proposed development.

6.21 Such development should either serve an essential community need (e.g. a healthcare facility), significantly improve the community's access to services (e.g. a community centre or other facility that reduces travel times for a significant proportion of the community), provide significant long-term economic benefit (e.g. a major new employment opportunity, or an industry with synergies with existing activities in the area), or provide significant environmental benefits (e.g. where other alternative sites would require clearing of remnant vegetation or other areas of significant environmental value such as important habitat areas).

6.22 The SPP specifically states that for the community benefit to be 'overriding', it must outweigh the adverse impacts from the development's exposure to natural hazards. These impacts include:

- the increased risk to life, property and/or the environment;
- the increased demand for emergency services; and
- the potential risk of increased community pressure for hazard remediation works.

6.23 Any increased risk to human lives clearly needs to be given significant weight in determining overriding need.

b) Assessing alternative sites

6.24 A broad assessment of specific alternative sites should be undertaken as follows.

1. Identify the site requirements of the proposed development, including location needs, physical site characteristics, access and servicing.

2. Identify sites or general locations that meet those site requirements and are situated:
   - outside the natural hazard management area; or
   - within the natural hazard management area but with a lower severity of hazard.

3. Evaluate identified sites/locations in terms of their consistency with the planning scheme (or adjoining planning scheme if suitable sites can be identified in an adjoining local government area).

4. Consider in general terms whether land ownership of any preferred alternative site(s) is likely to present a major obstacle to assembling an appropriate parcel of land for the proposed development.

[**NB:** The fact that the applicant owns, or has an option on, the subject site and that it is consequently available for the proposed development does not in itself justify an 'overriding need'.]

Does the development proposal achieve Outcome 2? (Step 6)

Outcome 2: Development that is not compatible with the nature of the natural hazard but is otherwise consistent with Outcome 1:
- **minimises as far as practicable the adverse impacts from natural hazards; and**
- **does not result in unacceptable risk to people or property.**

6.25 Outcome 2 applies to development that is not compatible with the nature of the natural hazard (see Step 3 above), but satisfies either of the exceptions in Outcome 1 (see Steps 4 and 5 above). Development achieves Outcome 2 when it is brought as near as practicable to the level required to achieve the Specific Outcomes for compatibility under Outcome 1 (see Annex 4 of the SPP), and the development would not result in unacceptable risk to people or property.

6.26 There will be some circumstances where a development proposal that minimises the adverse impacts of natural hazards as far as practicable should not be approved because it would still result in an unacceptable risk to people or property.

6.27 The need to apply the 'unacceptable risk' test is most likely to arise in relation to flood and bushfire hazard. This is because a geotechnical assessment can be used to clearly identify development requirements in relation to landslide hazard (which may include an assessment that the site is not suitable for development because the level of landslide risk is unacceptable).

6.28 However, flood and bushfire hazards are difficult to manage within individual sites, and on-site mitigation measures may be inadequate to reduce the level of risk associated with a development proposal to an acceptable level. Also, in the case of flood hazard, the development proposal may adversely impact on the level of flood hazard elsewhere on the floodplain.

6.29 An unacceptable risk may be thought of as one where an informed community would decide not to accept the consequences and likelihood of a particular risk. The key characteristic of unacceptable risk is that it is determined by the community rather than an individual or particular group within the community. The best way to determine a community's risk threshold is through a natural disaster risk assessment study using the process outlined in Appendix 1.

6.30 Where such a structured, community-based assessment of unacceptable risk is not available, it will be the responsibility of the assessment manager to determine whether a particular development proposal would result in an unacceptable level of risk.

6.31 As noted above, unacceptable risk will vary between communities and over time (e.g. a major flood can have immediate effects on perceptions of risk within a community). However, there are certain minimum requirements that development proposals must achieve to meet the test of 'unacceptable risk'. These minimum requirements are set out in Table 1. It should be noted that local governments and other assessment managers may impose more stringent requirements based on the nature of the hazard in the vicinity of the development site, and the characteristics of the development proposal. Appendix 5 provides more information (including associated solutions) on how to achieve these outcomes.

Table 1: Minimum requirements to satisfy the 'unacceptable risk' test

Natural hazard	Minimum requirements
FLOOD	Achievement of Specific Outcomes 1, 2 and 4 in Annex 4 of the SPP.
BUSHFIRE	Achievement of the following elements from Specific Outcome 6 in Annex 4 of the SPP: • providing adequate road access for fire-fighting and other emergency vehicles and safe evacuation; and • providing an adequate and accessible water supply for fire-fighting purposes.
LANDSLIDE	Achievement of Specific Outcome 8 in Annex 4 of the SPP.

6.32 Where suitable measures to achieve Outcome 2 have not been included in the development proposal, the assessment manager should negotiate suitable measures with the development proponent and/or include them as conditions of any development approval. The solutions in Appendix 5 of this SPP Guideline provide guidance as to the types of measures that may be required to achieve Outcome 2.

Document the facts (Step 7)

6.33 Applicants preparing development applications involving land that is contained within a natural hazard management area should consider including the following information as part of the development application:

- plans illustrating the location of the proposed development and the relationship between the proposed development and the natural hazard management area; and
- a report outlining either how the proposed development achieves the relevant Specific Outcomes, including where necessary how it meets the requirements set out in Steps 4, 5 and 6 above.

Role of the assessment manager (Step 8)

6.34 To comply with the requirements of the SPP in relation to Outcomes 1 and 2, the role of the assessment manager is to:

- determine whether the application contains sufficient information, and issue an information request if more information is required;
- assess the application against the SPP and planning scheme; and
- impose conditions to achieve Outcomes 1 and 2 if the application is to be approved.

6.35 The assessment manager should not approve development applications that do not achieve Outcomes 1 and 2 of the SPP.

Achieving Outcome 3 of the SPP

> **Outcome 3: Wherever practicable, community infrastructure to which this SPP applies is located and designed to function effectively during and immediately after natural hazard events commensurate with a specified level of risk.**

6.36 Outcome 3 applies to community infrastructure that provides services vital to the wellbeing of the community anywhere in Queensland[25], including in natural hazard management areas.

[25] Except, in relation to bushfire and landslide, those local government areas not included in Annex 2 of the SPP.

6.37 The types of community infrastructure to which the SPP applies are set out in A1.2 of Annex 1 of the SPP as follows:

- police and emergency services facilities, including emergency shelters;
- hospitals and associated institutions;
- stores for valuable records or items of cultural or historic significance;[26]
- 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*; and
- water cycle management infrastructure.

6.38 Valuable cultural or historical records are irreplaceable and should not be exposed to undue risk from natural hazards. The other types of community infrastructure listed above provide important emergency response or recovery roles, or provide transportation, communication links or service networks that are important to the safety, health and wellbeing of the community.

6.39 Outcome 3 requires that, **wherever practicable**, these types of community infrastructure are located and designed to ensure resilience during and after natural hazard events up to and including the specified level of risk. This requirement applies regardless of which of the following mechanisms is used for the community infrastructure proposal:

- a development application under IDAS;
- allocation of land in a planning scheme; or
- designation of land for community infrastructure under the IPA.

6.40 Appendix 9 to this SPP Guideline contains Specific Outcomes against which a community infrastructure proposal must be assessed to determine compliance with Outcome 3.

6.41 There may be instances where the development proposal should proceed but it is not practicable to achieve the Specific Outcomes in Appendix 9. For example, it may not be possible to achieve the level of immunity from flooding recommended in Appendix 9 because of other relevant considerations. These could include locational requirements such as the need to provide acceptable levels of service (e.g. response times) within service catchments and the need to balance competing demands for services and facilities throughout the State with available resource allocations.

6.42 Therefore, the assessment of community infrastructure proposals will need to be undertaken on the basis of the circumstances associated with individual proposals, and will involve the consideration of the following matters:

- the role and function of the infrastructure, including during a natural hazard event;
- the potential impacts on the community should the infrastructure be operationally impaired by a natural hazard;
- the cost and benefits of mitigation measures (including alternative locations) and the consequences of not requiring mitigation measures;

[26] Including facilities for the storage of public records under the *Public Records Act 2002*.

- taking the foregoing into account, together with the resources and priorities of the responsible public sector entity, the level of protection from, and resilience to, natural hazards considered appropriate for the infrastructure; and
- the requirements about works or the use of land considered necessary to provide the appropriate level of protection from, and resilience to, the adverse impacts of natural hazards. These requirements could include location, siting and design measures.

6.43 As a simple example, it would not be practicable to require a fire or police station to locate outside a natural hazard management area if this increases emergency response times and results in an overall increase in community risk. Similarly, because network infrastructure (such as roads and electricity distribution networks) joins fixed points (e.g. towns) there may be no alternative to traversing areas subject to natural hazards. As a result it will often not be practicable or cost-effective to achieve optimum levels of immunity from natural hazards for network infrastructure.

6.44 The responsibility for determining compliance with Outcome 3 will rest with either the assessment manager or the community infrastructure designator, depending on which of the mechanisms outlined in paragraph 6.39 above is used.

6.45 Certain types of community infrastructure proposals located in natural hazard management areas should achieve Outcomes 1, 2 and 3. Figure 1 above explains the relationships between these outcomes in these circumstances.

7. MAKING AND AMENDING PLANNING SCHEMES

Introduction

7.1 In order to achieve Outcomes 4 to 6 of the SPP, planning schemes should identify particular information and contain appropriate planning strategies and development assessment measures.

Achieving Outcome 4 of the SPP

Outcome 4: Natural hazard management areas are identified in the planning scheme.

7.2 During the process of making or amending planning schemes, local governments are required to assess the potential impacts of development in areas subject to the natural hazards of flood, bushfire and landslide. The intention of the SPP is that, wherever practicable, natural hazard management areas should be identified through a comprehensive and detailed natural hazard assessment study.[27] This assessment includes the determination of natural hazard management areas and may include the assessment of relative levels of severity in relation to particular hazards. The scope of studies will vary between local governments, and sometimes between different locations within the same local government area. The variation in scope should depend on the size and distribution of the population, the degree of risk to people, property, economic activity and the environment posed by

[27] Refer to Appendices 2 to 4 of this SPP Guideline for advice on appropriate study approaches.

development in areas affected by natural hazards, the availability or difficulty of obtaining and analysing information, and the capacity and resources of the local government. The assessment may also need to take into account the potential impacts associated with climate change.

7.3 Local governments are encouraged to undertake natural hazard assessments as part of a comprehensive disaster risk management process that would also provide information to assist in developing appropriate planning scheme outcomes. Appendix 1 of this SPP Guideline provides information on disaster risk management studies including potential sources of financial assistance. Appendices 2 to 4 set out recommended principles and methodologies for identifying natural hazard management areas for the purposes of making or amending planning schemes.

7.4 The scope of studies to be undertaken will be determined by the local government in consultation with relevant State Government departments during the process of making or amending planning schemes. Natural hazard management areas should be clearly identified in the planning scheme through the use of techniques such as overlays, consistent with the approach and terminology suggested for planning schemes in the *IPA Plan Making Guideline 1/02* published by DLGP. The most appropriate presentation will depend on the structure and format of the particular planning scheme.

7.5 Ideally the natural hazard management areas should be mapped as overlays for the whole of the local government area. This should be achievable for bushfire hazard through the use of the Queensland Fire and Rescue Service (QFRS) Bushfire Risk Analysis maps, and for landslide, if necessary, through the use of a default slope threshold with areas above that slope threshold mapped as the natural hazard management area. The natural hazard management area overlay for bushfire should also identify the High and Medium bushfire risk areas as different development requirements apply to each of these areas. When undertaking detailed natural hazard assessments or reviewing the accuracy of the QFRS Bushfire Risk Analysis maps, priority should be given to areas proposed for urban development, including rural residential.

7.6 Identifying the areas affected by a DFE may require a specific flood study for each locality or catchment area. It may not be cost-effective and practicable to conduct these studies for areas that are not subject to significant development pressures, especially in small and/or low-growth local governments. However, at a minimum the natural hazard management area overlays for flood should address all areas identified in the planning scheme as existing or proposed urban development, including rural residential.

Achieving Outcome 5 of the SPP

Outcome 5: The planning scheme contains planning strategies that aim to:

- **ensure that development in natural hazard management areas is compatible with the nature of the natural hazard;**
- **minimise the impacts from natural hazards on existing developed areas; and**
- **prevent development from materially increasing the extent or the severity of natural hazards.**

7.7 Where practicable, the planning scheme's land use strategies should give preference to future land uses that would achieve the development outcomes (Outcomes 1 to 3) in Section 6 of the SPP. Public safety should be the main consideration in seeking to achieve these outcomes, with planning strategies devised to achieve optimum levels of safety within the planning scheme area.

7.8 Uses involving the actions or activities listed in Annex 1 of the SPP need to be considered when developing the land use strategy. When allocating land uses in natural hazard management areas, planning schemes should give preference to those uses that are less susceptible to the risks posed by the particular hazard[28], and include development requirements that lessen the risk of the hazard.

7.9 In general, land use strategies that do not increase the number of people living or working in natural hazard management areas and avoid the establishment or intensification of other uses or works that are likely to increase the adverse impacts of the natural hazard would achieve Outcome 5 of the SPP. In particular, uses such as residential development that are likely to materially increase the risks to life or personal property should be discouraged in areas of high or medium hazard severity, unless the planning scheme includes clear requirement/standards aimed at ensuring that appropriate levels of safety will be achieved.

7.10 Where there are existing development commitments[29] (for example, in areas of existing development), strategies that provide for lower risks from the natural hazard without adversely affecting the development commitment could be considered. Strategies for achieving this could include:

- encouraging alternative uses that are less susceptible to the hazard; and
- mechanisms for encouraging a high proportion of the total development onto those parts of the area that are least affected by the hazard.

7.11 Planning strategies should also seek to ensure development does not occur in a manner that is likely to result in an increase in the extent or severity of a natural hazard. This element of planning strategies applies both within and outside natural hazard management areas and is mainly relevant to flood and bushfire hazard.

7.12 Uses that would not detrimentally impede the flow of floodwaters should be encouraged in floodways and drainage corridors. Suitable uses may include parks, conservation areas, grazing or other agricultural activities, low impact recreational uses such as sports fields, buffer areas around high impact industrial activities or even low density residential uses with appropriate safeguards. The flood storage capacity of floodplains also needs to be protected, and specific development requirements (e.g. limiting the extent of earthworks or requiring compensatory storage capacity) will need to be devised and incorporated in the planning scheme strategies. Localised increases in flood duration or depth may be acceptable where they occur as part of an overall flood management strategy that will result in net benefits to the community.

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[28] Refer to Appendix 2, Table A2.1 for an example of appropriate land uses across a floodplain.

[29] See Section 9, Glossary.

7.13 Uses that would increase the extent or severity of bushfire hazard (such as the establishment or expansion of commercial forests) should be encouraged in areas where they would not place existing and planned communities or facilities at greater risk from bushfires. Key factors to be considered include the likely speed and direction of bushfire movement, the provision of adequate on-site firebreaks, fire-fighting and fuel reduction measures and separation distances from susceptible development and incompatible planning scheme designations.

Achieving Outcome 6 of the SPP

Outcome 6: The planning scheme measures:

(a) include a code(s) designed to achieve development outcomes consistent with Section 6; and

(b) ensure that development to which this SPP applies is assessable or self-assessable against that planning scheme code(s).

The planning scheme, or planning scheme policy(s), specifies the information expected to be submitted with development applications subject to the code(s).

7.14 Detailed planning scheme measures should be prepared generally in accordance with the approach and terminology suggested for planning schemes in the *IPA Plan Making Guideline 1/02* published by DLGP.

7.15 The codes may take the form of specific hazard management codes or be incorporated into broader codes as appropriate. For example, landslide hazard can be addressed as part of a broader code dealing with development on hillsides or steep slopes that may also address environmental and visual amenity issues.

7.16 Appendix 5 provides examples of solutions that achieve the Specific Outcomes in Annex 4 of the SPP concerning compatible development within natural hazard management areas for flood, bushfire and landslide. Appendix 9 provides similar information for the types of community infrastructure to which the SPP applies. These Specific Outcomes and solutions, suitably adapted to reflect local knowledge and conditions, could be used as a basis for the preparation of codes. Also, Annex 5 of the SPP sets out which of these specific outcomes needs to be achieved to avoid 'unacceptable risk' in accordance with outcome 2 of the SPP.

7.17 Planning schemes must also identify appropriate levels of assessment for development within natural hazard management areas. This could involve different levels of assessment for areas of different hazard severity and/or the linking of assessment levels to specific types of development such as those contained in Annex 1 of the SPP. Overlay mapping should be used to differentiate areas of different natural hazard severity that would be subject to different assessment levels and/or assessment criteria. Appendix 5 contains further advice on these matters.

8. ROLES AND RESPONSIBILITIES

Applicant/developer

8.1 The applicant identifies the location of natural hazard management areas on the subject site and the severity of hazard (where applicable), demonstrates that the proposal achieves the relevant development outcomes and incorporates appropriate management techniques into the development proposal.

8.2 The developer implements reasonable and relevant conditions of approval placed on the development approval.

Local government/assessment manager

8.3 Assessment managers have regard to the SPP during development assessment. Assessment managers should impose conditions on development approvals to minimise risk from natural hazards, and should not approve development applications that are unable to achieve development Outcomes 1 to 3 of the SPP.

8.4 Local governments appropriately reflect the SPP in planning schemes by identifying natural hazard management areas and including suitable strategies and detailed measures to achieve the SPP's outcomes.

Queensland Department of Emergency Services (DES)

8.5 The DES reviews draft planning schemes to determine whether the SPP has been appropriately reflected, thereby achieving the State's interest in respect of natural hazard management, and conveys that advice to the DLGP.

8.6 The DES provides advice on interpreting and implementing the SPP and should be consulted by local governments about integrating the SPP into planning schemes.

8.7 The DES, in consultation with NR&M on flood and landslide hazards, provides advice about the appropriate level of hazard assessment to determine natural hazard management areas when preparing planning schemes.

8.8 The DES provides advice on the appropriate agencies and officers to contact in relation to specific natural hazard management issues.

Queensland Department of Local Government and Planning (DLGP)

8.9 The DLGP, in conjunction with other State agencies, reviews planning schemes and amendments to ensure that the SPP has been appropriately reflected into planning schemes.

Queensland Department of Natural Resources and Mines (NR&M)/Environmental Protection Agency (EPA)

8.10 NR&M provides information about landslide and floodplain management issues, and the latest climate change science advances.

8.11 The EPA provides information about related storm tide inundation issues, protection of floodplain biodiversity and planning for climate change.

Minister designating and/or developing community infrastructure

8.12 The designator has regard to the SPP to ensure the outcomes of the SPP are achieved in relation to the specified types of community infrastructure.

Community

8.13 The community has a role in providing input into disaster risk management studies, the preparation of planning schemes and comment in relation to development applications.

9. GLOSSARY

AS/NZS 4360: the Australian/New Zealand Standard for risk management. This standard forms the basis for natural disaster risk assessment and management.

Annual exceedance probability (AEP): the likelihood of occurrence of a flood of a given size or larger in any one year; usually expressed as a percentage. For example, if a peak flood discharge of 500 cubic metres per second has an AEP of 5%, it means that there is a 5% risk (i.e. probability of 0.05 or a likelihood of 1 in 20) of a peak flood discharge of 500 cubic metres per second or larger occurring in any one year. The AEP of a flood event gives no indication of when a flood of that size will occur next.

Bushfire: an uncontrolled fire burning in forest, scrub or grassland vegetation, also referred to as a wildfire.

Climate change: a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Defined flood event (DFE): the flood event adopted by a local government for the management of development in a particular locality. The DFE is generally not the full extent of the flood-prone land.

Development commitment[30]: includes 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.

Disaster risk management: a systematic process that produces a range of measures that contribute to the wellbeing of communities and the environment. The process considers the likely effects of hazardous events and the measures by which they can be minimised.

Emergency rescue area: a predetermined area from which people can be safely rescued in the event of an emergency. An emergency rescue area should comprise a Final Approach and Take Off Area (FATO) with a minimum diameter of 30 metres[31] that is level and free from obstacles likely to interfere with the manoeuvring of a helicopter. The FATO should be located above the DFE or Recommended Flood Level (RFL) that applies to the particular development and should be provided with an adjoining Obstacle Limitation Area (OLA) in accordance with the requirements set out in the *Guidelines for the establishment and use of helicopter landing sites*, CAAP 92-2(1), Air Services Australia, Civil Aviation Safety Authority Australia (CASA). When not required for emergency rescue purposes an emergency rescue area may be used for other purposes such as parking or recreation.

Flood: the temporary inundation of land by expanses of water that overtop the natural or artificial banks of a watercourse i.e. stream, creek, river, estuary, lake or dam.

Floodplain: an area of land adjacent to a creek, river, estuary, lake, dam or artificial channel, which is subject to inundation by the Probable Maximum Flood (PMF).

Floodway[32]: those areas of the floodplain where a significant discharge of water occurs during the DFE. Floodways are often aligned with naturally defined channels and even if partially blocked would cause a significant redistribution of flood flow, or a significant increase in flood levels. What constitutes a floodway may vary from one floodplain or part of a floodplain to another. Floodways will normally be identified as part of a floodplain management study or flood study where their importance in the overall behaviour of flood flows can be properly taken into account. Where a study to determine floodways using local criteria has not been undertaken, a floodway (for the purposes of this SPP) shall be an area where, at the DFE, the floodwater has:

- a velocity–depth product of 0.3 square metres per second or greater; **or**
- a velocity of 1 metre per second or greater.

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30 Note that a designation in a forward planning document such as a strategic plan or development control plan under a transitional planning scheme is not a development commitment for the purposes of the SPP. Also the SPP does not apply to development assessable only against the *Standard Building Regulation.*

31 A minimum FATO diameter of 30 metres is the area required for helicopters with a total length of up to 15 metres.

32 Local governments may adopt an alternative definition of floodway in their planning schemes to reflect more accurately the flood characteristics in a particular locality. Refer to Appendix 2 for additional information on floodways and their identification.

Flood warning time: the time between the release of a flood warning indicating that the locality is likely to be subject to flooding, and the time that the last evacuation route providing egress from the locality to land above the DFE would be made unsafe for evacuation purposes by rising floodwaters.

Hazardous materials in bulk: hazardous materials as defined in the *Dangerous Goods Safety Management Act 2001* (except that radioactive substances and infectious substances[33] are excluded for the purposes of this SPP) in quantities that:

- would be equivalent to or exceed the minimum quantities set out to determine a Large Dangerous Goods Location in the *Dangerous Goods Safety Management Regulation*; or
- would require a licence for a magazine for the storage of an explosive under the *Explosives Regulation 1955*.

IDAS: Integrated Development Assessment System is a framework that establishes a common statutory system under the *Integrated Planning Act 1997* for making, assessing and deciding development applications, regardless of the nature of development, its location in Queensland or the authority administrating the regulatory control.

Landslide: movement of material downslope in a mass as a result of shear failure at the boundaries of the mass.

Mitigation: any measure intended to reduce the severity of a natural hazard.

Natural disaster: a natural hazard event that severely disrupts the fabric of a community and requires the intervention of the various levels of government to return the community to normality.

Natural hazard: a naturally occurring situation or condition with the potential for loss or harm to the community or environment. The natural hazards addressed in the SPP are flood, bushfire and landslide.

Natural hazard management area: an area that has been defined[34] for the management of a natural hazard (flood, bushfire or landslide), but may not reflect the full extent of the area that may be affected by the hazard (e.g. land above the 1% AEP floodline may flood during a larger flood event). Natural hazard management areas for flood, bushfire or landslide are described in Annex 3 of the SPP.

Nature of the natural hazard: the important characteristics of the natural hazard including the type of hazard and its severity.

Probable maximum flood (PMF): the largest flood that could reasonably occur at a particular location, resulting from the probable maximum precipitation. The PMF defines the extent of flood-prone land. Generally, it is not physically or financially possible to provide general protection against this event.

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[33] Radioactive substances are appropriately managed under the *Radiation Safety Act 1999*, and facilities dealing with infectious substances are subject to Australian Standards and the Office of Gene Technology.

[34] A natural hazard management area may be defined using a different term (e.g. bushfire prone area; flood affected area).

Recommended flood level (RFL): the flood event identified in Appendix 9 of this Guideline as providing the recommended level of flood immunity for particular types of community infrastructure.

Risk: is a concept used to describe the likelihood of harmful consequences arising from the interaction of hazards, community and the environment.

Safe refuge: an area at least 300mm above the DFE flood level with sufficient space to accommodate the likely population of the development in safety for a relatively short time until flash flooding subsides or people can be evacuated.

Unacceptable risk: a situation where people or property are exposed to a predictable hazard event that may result in serious injury, loss of life, failure of community infrastructure, or property damage that would make a dwelling unfit for habitation.

Vegetation clearing[35]: removing or cutting down, ringbarking, pushing over, poisoning or in any way destroying a tree, shrub or other plant (other than grass), but does **not** include:

- lopping, pruning or mowing for maintenance purposes;
- work associated with management practices for the conduct of an agricultural or forestry use[36];
- clearing vegetation for essential management including:
  - for establishing or maintaining a firebreak to protect a building, property boundary or paddock;
  - vegetation that is likely to endanger the safety of a person or property on the land because the vegetation is likely to fall;
  - for maintaining an existing fence, stock yard, shed, road or other built infrastructure; or
  - for maintaining a garden or orchard.

[35] Proposals that involve vegetation clearing may also be required to address relevant requirements of the *Vegetation Management Act 1999,* as well as local laws and the planning scheme. Information and advice on these matters should be sought from NR&M and the local government.

[36] Work associated with forestry and management practices for the conduct of an agricultural use (other than the clearing of native vegetation on freehold land) is exempt development that may not be made assessable or self-assessable under the IPA.

APPENDIX 1: DISASTER RISK MANAGEMENT

Local governments and disaster risk management

A1.1 The identification of areas prone to natural hazards in a planning scheme can be used to guide the location and form of future development so that potential risks associated with development in areas prone to natural hazards are avoided or minimised. It is recommended that identification of natural hazard management areas be undertaken as part of a disaster risk management process which considers, plans for and manages the potential effects of natural hazard events prior to their occurrence.

A1.2 A natural disaster risk assessment provides a structured community-based approach to assessing land prone to natural hazards. This can be used to assist local governments making decisions about the future development pattern through the planning scheme making process.

A1.3 The following publications provide detailed guidance in relation to risk management, and in particular explain the opportunities and potential disaster risk management process approaches for local government:

- *Australian/New Zealand Standard for Risk Management* (AS/NZS 4360:1999)
- *Disaster Risk Management*, A. Zamecka and G. Buchanan, Queensland Department of Emergency Services 2000
- *Disaster Risk Management Guide: a How-to Manual for Local Government* Counter Disaster and Rescue Services, Queensland Department of Emergency Services 2000.

A1.4 Figure A1.1 (on the following page) presents an overview of the disaster risk management process. The following paragraphs, taken from the *Disaster Risk Management Guide: a How-to Manual for Local Government* (page 6), summarise the tasks involved in each step.

- *Establish the context*: Identify strategic and organisational issues that may apply to the disaster risk management process. Develop the project management plan and initial risk evaluation criteria.
- *Identify risks*: Identify and describe the nature of the hazards, community and environment. Examine vulnerabilities of the community and environment and identify the risks that the community is facing.
- *Analyse risks*: Examine the risks for the likelihood and consequences and assign the levels of risk.
- *Evaluate risks*: Compare the risks with the risk evaluation criteria (adjust where necessary) and rank the risks in order of priority for treatment.
- *Treat risks*: Select and implement appropriate treatments for dealing with risks.

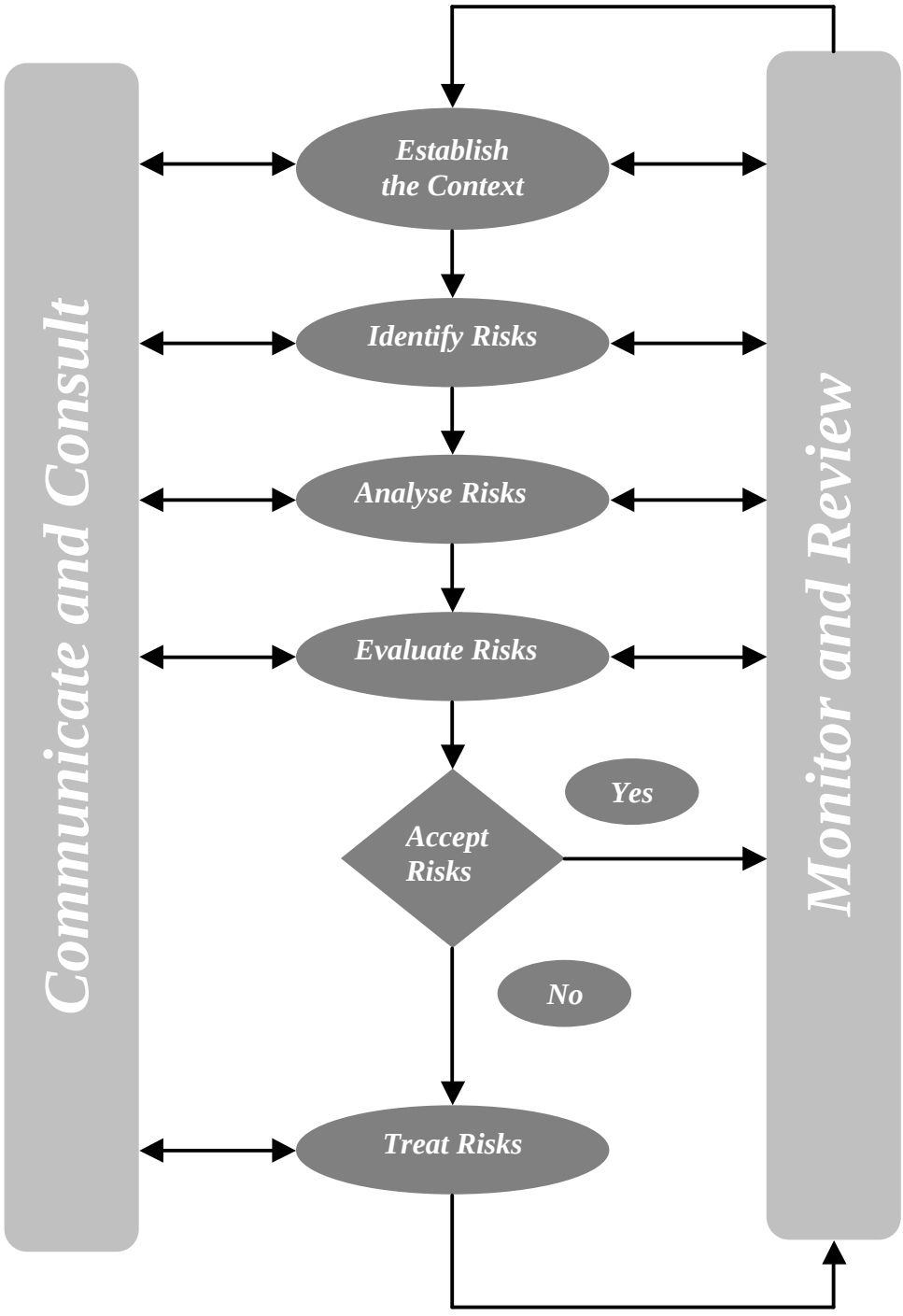
A1.5 The disaster risk management process is underpinned by a continuous requirement for:

- *Communication and consultation*: It is necessary to include all stakeholders in the process. If the process is going to be successful it requires commitment from all parties influenced by it.
- *Monitoring and review*: It is necessary to ensure that the disaster risk management process remains valid by conducting regular reviews. It is necessary to monitor the implementation of selected mitigation treatments and to ensure that disaster risk

management as a cyclic and continuous improvement process is integrated into broader Council planning.

- *Effective documentation*: It is necessary to document all the steps taken to demonstrate that the process is conducted correctly and to satisfy audit.

Figure A1.1. Main elements of the disaster risk management process



Source: *Disaster Risk Management Guide: a How-to Manual for Local Government* Counter Disaster and Rescue Services, Queensland Department of Emergency Services 2000.

Incorporating disaster risk management into local government planning

A1.6 Disaster risk management can be a useful and important part of preparing planning schemes in accordance with the requirements of the *Integrated Planning Act 1997*.

A1.7 Identifying, analysing and evaluating the risks of potential development areas in relation to flood, bushfire and landslide hazards for a local government area provide a key input into planning scheme preparation. Natural hazards can be mapped and included within the planning scheme by using overlay maps or other techniques to identify natural hazard management areas, and the identification and evaluation of risk can be used to inform strategy development.

Financial assistance

A1.8 As at 2003, financial assistance is available to local governments, Aboriginal and Torres Strait Islander Community Councils and River Improvement Trusts to undertake natural hazard mapping as well as risk assessments and technical studies relating to various hazards including flood, bushfire and landslide. The Natural Disaster Risk Management Studies Program (NDRMSP) introduced by the Commonwealth Government in 1999–2000 with the support of State Governments, offers two-thirds funding – one-third each from the Commonwealth and Queensland Governments for natural disaster risk studies including natural hazard studies. The successful applicant is required to provide the final third of the funding. For further information on this program, contact the Disaster Mitigation Unit of Counter Disaster and Rescue Services in the Department of Emergency Services or access website: www.dotars.gov.au/ndr/risk.htm

APPENDIX 2: UNDERTAKING NATURAL HAZARD ASSESSMENT – FLOOD

What is a flood?

A2.1 A flood is the temporary inundation of land by expanses of water that overtop the natural or artificial banks of a watercourse i.e. stream, creek, river, estuary, lake or dam.

A2.2 The behaviour of floodwaters varies across the floodplain and over the duration of a flood event, as well as between different flood events. This is the principal reason for the need to understand the full range of floods, up to and including the Probable Maximum Flood (PMF).[37]

A2.3 Different parts of the floodplain perform different functions during a flood. Floodways provide the major flow paths for floodwaters and are typically aligned with obvious natural channels. Flood storage areas fill and then empty during the passage of the flood peak and are typically low velocity zones. The remainder of the floodplain can be described as flood fringe areas.

What is a Defined Flood Event (DFE)?

A2.4 A floodplain is determined as the extent of land inundated by the PMF. However, it is generally impractical (and probably overly cautious) to adopt the PMF for the purposes of managing floodplain land use and development.

A2.5 Generally a much more likely flood is used for this purpose and is referred to as the 'Defined Flood Event' (DFE).[38] The SPP defines a DFE as 'the flood event adopted by a local government for the management of development in a particular locality'. The natural hazard management area (flood) is based on the DFE. The determination of the DFE should be based on a rational appraisal of the impacts of a range of floods and the social and economic benefits of development.

A2.6 Historically, the 1% Annual Exceedance Probability (AEP) flood – equivalent to 1/100 yr Average Recurrence Interval (ARI) – has been accepted as the preferred DFE, with little assessment of the consequences of larger, less frequent floods or the potential for allowing development based on a lesser flood.

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[37] PMF: The largest flood that could conceivably occur at a particular location, resulting from the probable maximum precipitation. The PMF defines the extent of flood-prone land. Generally, it is not physically or financially possible to provide general protection against this event.

[38] DFE: The flood event selected for the management of flood hazard. DFEs do not define the extent of flood-prone land, which is defined by the PMF.

Natural hazard management area (flood)

A2.7 A natural hazard management area (flood) is described in Annex 3 of the SPP as land inundated by a DFE and identified in a planning scheme. The Queensland Government's position is that, generally, the appropriate flood event for determining a natural hazard management area (flood) is the 1% 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.[39]

A2.8 Outcome 4 of the SPP requires natural hazard management areas for flood to be identified in planning schemes. Natural hazard management areas (flood) trigger the development outcomes and development assessment requirements specified in Outcomes 1 and 2 of the SPP, and are also required to enable the development of the planning strategies and detailed measures required by Outcomes 5 and 6 of the SPP.

A2.9 In identifying natural hazard management areas (flood), a local government will need to select a DFE. Selection of a DFE does not mean more extreme flood events (up to the PMF) will not occur. Residual risk (i.e. the risk of a flood that exceeds the DFE) should be addressed in Local Government Counter Disaster Plans and emergency procedures.

A2.10 NR&M has developed the following advice for identifying natural hazard management areas (flood).

Methodology for identifying natural hazard management area (flood)

A2.11 Natural hazard management areas (flood) ideally should be determined from a comprehensive floodplain management study. The process outlined in *Floodplain Management in Australia: Best Practice Principles and Guidelines* (the Standing Committee on Agriculture and Resource Management (SCARM) Report) is recommended when undertaking a floodplain management study and preparing a floodplain management plan.

A2.12 In its most comprehensive form, a floodplain management study set out in the SCARM Report can be time-consuming and expensive. It may be beyond the capacity or needs of some local governments, particularly those with low growth and a low rate base.

[39] Local Governments are encouraged to adopt a DFE and identify a natural hazard management area (flood) in their planning schemes as soon as possible to enable the outcomes of the SPP to development in flood prone areas. This Appendix gives examples of simple flood study alternatives that may be appropriate for interim use until comprehensive flood studies are completed, or for longer-term use by low-growth local governments with capacity and resource constraints.

A2.13 Therefore, Step 2: Carrying out Flood Studies describes some alternative flood study approaches. These alternatives recognise the varying levels of flood data, resources and need for flood management information that exist across Queensland. Flood studies should be tailored to meet the needs and resources of local governments. Nevertheless, local governments should ensure that they properly assess flood risk.

A2.14 The SCARM Report process comprises the following steps:

Step 1: Establishment of a Floodplain Advisory Committee

A2.15 This Committee's role is to assist local governments to develop and implement a plan for the management of the floodplain. The Committee should comprise a balanced mix of elected, administrative and community representatives.

A2.16 Local government should carefully consider how it consults with the community in the flood study process, the need for and composition of a committee and the terms of reference of any such committee.

Step 2: Carrying out flood studies

A2.17 'The flood study defines the nature and extent of the flood hazard across the floodplain, by providing information on the extent, level and velocity of floodwaters and on the distribution of flood flows'.[40]

A2.18 Current best practice in floodplain management calls for an understanding of the full range of floods possible – up to and including the PMF. This information is unlikely to be available unless generated by a recent and comprehensive flood study.

A2.19 Flood studies are used to determine the flooding characteristics of an area for a range of flood events. They typically have two components:

- ***Hydrologic study*** is used to derive rainfall and resultant stream flows for nominated AEP events from existing rainfall and stream flow information. Throughout Australia, long-term rainfall records for a particular catchment are more likely to be available than long-term stream flow data. Hence, the hydrologic study typically comprises synthesising rainfall for desired AEPs (e.g. 1%, 0.5%, 0.2%) from the available record using accepted methods and routing it through the catchment to arrive at stream flows. The stream flows are then assigned the AEP of the rainfall from which they were generated. The calculations to derive these synthetic stream flows are typically checked or 'calibrated' against any stream flow records that exist and any necessary adjustments made to ensure the match with recorded events is satisfactory.

  Where a sufficiently long stream flow record does exist, a peak flood flow frequency analysis could be applied and used to assign AEPs directly to flood flow rates. A flood frequency analysis is also typically carried out as a check to the rainfall-based approach.

[40] See page 13 in *Floodplain Management in Australia: Best Practice Principles and Guidelines (SCARM Report 73).*

Hydraulic analysis takes the stream flow 'outputs' from the hydrologic analysis and estimates the flood flow behaviour (i.e. flow rates, velocities, depths and extent and duration of inundation) as it passes through the floodplain. It is the hydraulic analysis which produces the flood hazard information of direct relevance to floodplain management planning, including the development of suitable planning scheme measures.

A2.20 In Queensland, the principal sources of data for carrying out a flood study are:

- Commonwealth Bureau of Meteorology (BoM) – rainfall records, historical flood levels (at BoM referenced stream gauges) and possible hydrologic models for flood forecasting studies where BoM operates a flood warning system.
- NR&M – stream flow records at gauged locations, rainfall data including BoM data, hydrologic and hydraulic studies where undertaken by the Department, topographic data (contour information at variable intervals from the State Aerial Photography Program).
- Environment Protection Agency – tide and storm surge data, marine works approvals.
- Infrastructure agencies (including State Government) – existing hydraulic analysis and as constructed details for road and railway formations, bridges and other infrastructure on the floodplain; storage/discharge relationships for major dams.
- Local government – ground levels from sewerage plans, surveys for specific projects, council road works, drainage plans and historical flood levels.
- Local River Trusts.

Flood study alternatives

A2.21 Reductions in the effort and expense of conducting a comprehensive flood study may be available through the alternative flood information sources discussed below. These are a compromise between the cost and time involved in a comprehensive flood study and the suitability of information for planning decisions.

A2.22 The shortcomings to be aware of in using these alternatives are:

- Floodplain and catchment characteristics can have a significant impact on the level of hazard associated with possible floods that are more extreme than those covered by available information. For example, on a western Queensland floodplain the difference in depth between a 1% AEP flood and a 0.5% AEP flood may be only 0.5 metres with little increase in velocities, whereas on a coastal floodplain the difference in depth may be metres with flow velocities also many times greater; and
- The consequences of larger floods remain unknown, which has implications for emergency response planning and the siting of critical installations such as hospitals, police and emergency services.

A2.23 *Historical flood data*: Where historical flood data exists and is of a suitable quality, it may be possible to use this information without any further detailed hydrologic or hydraulic analysis. The minimum requirements in this instance, however, would be for a suitably qualified professional engineer to:

- carry out a flood frequency analysis of the available historical data to indicate the likely AEP of the recorded events;
- consider floodplain and catchment modifications (e.g. changed land use) that may affect run-off or flow regimes;

- plot the extent of inundation as estimated from the data available for the flood event(s) on which development controls are to be based; and
- identify the likely significant flow paths (floodways), which need to be preserved if adverse changes to the flooding regime are to be avoided.

Historical data may include:

- formally recorded gauge height records for a number of floods;
- formally surveyed peak flood levels throughout the area of interest;
- photographs of a historical flood;
- 'high-water' marks recorded on public or private property; and
- interviews with long-term residents.

Every effort should be made to source as much historical data as possible and all avenues should be pursued (e.g. local government records, local newspapers, the community).

Where a historical flood level is chosen as the DFE, some assessment of its AEP is necessary to give an indication of the level of flood risk that is accepted.

A2.24 *Existing flood studies*: A number of river systems in Queensland have been the subject of a flood study. In many cases, these studies were either limited in their scope or performed a number of years ago. Ideally, they should be updated with current data and techniques and/or extended to cover the full range of floods and incorporate catchment development changes as well as future scenarios.

Nevertheless, where existing studies are available they can be valuable sources of information provided their relevance is established. If the study is more than 5 to 10 years old, a suitably qualified professional engineer should review the study outputs, the assumptions and data on which the study was based and the techniques used to model the hydrology and floodplain hydraulics.

Assuming an existing flood study can be established as relevant, it may be acceptable to adopt the study outputs directly, or through some level of interpretation by a suitably qualified professional engineer, as the basis for further studies/assessments of flood risks and mitigation measures.

A2.25 *Topography*: There may be circumstances where the topography suggests floods are not an issue (i.e. large elevated areas such as plateaus with no significant watercourses). Care should be taken in making such a determination, as land subject to flood hazards is not always obvious.

A2.26 *Lack of flood history*: It may be considered unnecessary to evaluate flood risk based on the lack of flooding instances. Caution needs to be exercised in dismissing or downgrading the importance of flood risk considerations on the basis of a lack of flood history. Many instances of previously believed 'flood-free' localities have turned out to be the opposite. Generally it is the case that either no one recorded earlier floods because the area was recently developed and/or the last flood was poorly recorded and long enough ago to have dropped from current memory. Population turnover at a locality can have a similar effect, dulling the community's consciousness of the local flood hazard.

Caution must be exercised when making a judgement as to whether a locality is susceptible to floods. This situation is likely to apply only to fairly small townships where all development has occurred or is occurring in elevated areas. It should also be noted that while mainstream flooding may not be an issue in such circumstances, stormwater drainage might still represent a flood risk.

Definition of flood hazard

A2.27 Determining the level or severity of flood hazard is of considerable significance to the appropriateness or otherwise of various land uses. Careful matching of land use to flood hazard maximises the benefits of using the floodplain and minimises the risks of flooding. As it is a function of flood behaviour, the degree of hazard also varies across the floodplain in response to the following factors:

- flow depth;
- flow velocity;
- rate of flood level rise (including warning times); and
- duration of inundation.

A2.28 The risks that a flood hazard poses are also dependent on a number of 'vulnerability' factors including:

- size and nature of population exposed to the hazard;
- availability of evacuation routes; and
- susceptibility of structures to flood damage.

A2.29 Quantification of the degree of hazard posed by floodwaters has generally relied on analysis of the effects of the flow depth and velocity on individual elements, such as structures, and the ability of people and vehicles to move through the floodwaters to reach safety. This assessment may be then modified on the basis of warning/evacuation times.

A2.30 Appendix J of the SCARM Report defines flood hazard as follows:

- '*Low* – there are no significant evacuation problems. If necessary, children and elderly people could wade to safety with little difficulty; maximum flood depths and velocities along evacuation routes are low: evacuation distances are short. Evacuation is possible by a sedan-type motor vehicle, even a small vehicle. There is ample time for flood forecasting, flood warning, and evacuation routes remain trafficable for at least twice as long as the time required for evacuation.
- *Medium* – fit adults can wade to safety, but children and the elderly may have difficulty; evacuation routes are longer; maximum flood depths and velocities are greater. Evacuation by sedan-type vehicles is possible in the early stages of flooding, after which 4WD vehicles or trucks are required. Evacuation routes remain trafficable for at least 1.5 times as long as the necessary evacuation time.
- *High* – fit adults have difficulty in wading to safety; wading evacuation routes are longer again; maximum flood depths and velocities are greater (up to 1.0 m and 1.5 metres per second respectively). Motor vehicle evacuation is possible only by 4WD vehicles or trucks and only in the early stages of flooding. Boats or helicopters may be required. Evacuation routes remain trafficable only up to the maximum evacuation time.
- *Extreme* – boats or helicopters are required for evacuation; wading is not an option because of the rate of rise and depth and velocity of floodwaters. Maximum flood depths and velocities are over 1.0 m and over 1.5 m/s respectively.'

A2.31 Table A2.1 shows land uses appropriate to various levels of severity of flood hazard (based on matching land use and flood hazard to both maximise the use of the floodplain and minimise the risks and consequences of flooding).

Table A2.1: Appropriate land uses across the floodplain:

<table>
<tr><th colspan="4">Level of severity</th></tr>
<tr><th>Extreme</th><th>High</th><th>Medium</th><th>Low</th></tr>
<tr><td rowspan="2">Rural
Recreation
Open space
Conservation</td><td>Rural
Recreation
Open space
Conservation

Commercial *
Industry *
Clubs *</td><td>Rural
Recreation
Open space
Conservation

Residential *
Commercial *
Industrial *
Clubs *
Schools *

Public institutions
Caravan parks
Local government
Police</td><td rowspan="2">Rural
Recreation
Open space
Conservation

Residential
Commercial
Industrial
Clubs
Schools

Public institutions
Caravan parks
Local government
Police
Telephone exchange
State Emergency Services

Hospitals
Homes for elderly
Museums/libraries</td></tr>
<tr><td colspan="2">* with special controls, such as those presented in Appendix 5.</td></tr>
</table>

Note 1: *Some high impact rural uses such as intensive animal husbandry (e.g. feed lots and poultry farms) involve the provision of structures and storage of materials and chemicals which could present a hazard in times of flood and may only be acceptable subject to special controls.*
Note 2: *Not all forms of recreation or open space are suitable for location in the floodplain. Appropriate land assessment and planning should be undertaken.*
Source: *Adapted from Figure 1, Floodplain Management in Australia: Best Practice Principles and Guidelines, Standing Committee Agriculture and Resource Management (SCARM), Report No. 73.*

Step 3: Carrying out a Floodplain Management Study and preparation of a Floodplain Management Plan

A2.32 'The flood management study identifies and compares options to manage flood hazard'.[41]

A2.33 The purpose of a floodplain management study is to use flood hazard information and information on current and potential future floodplain use to determine:

- the impacts for existing floodplain uses;
- how those impacts can be managed;
- the effects of future floodplain uses on the risks to existing and future development; and
- how best to manage future development.

A2.34 A floodplain management study is the preferred method for determining the DFE(s). Following the sourcing of adequate flood hazard information (as discussed above) the steps in carrying out a floodplain management study are:

- flood damage assessment for each flood event;
- community (people) vulnerability assessment;
- economic impact assessment (if considered significant enough to separate from flood damage assessment);
- assessment of floodplain development scenarios;
- assessment of flood mitigation scenarios;
- adoption of a flood mitigation program;
- determination of DFE(s) based on an acceptable level of risk; and
- development of local floodplain management policy and hydraulic assessment criteria.

A2.35 In many instances, this logical progression may not be appropriate because of overriding local preconditions. For example, there may be a pre-existing DFE, mitigation works may be already predetermined (e.g. a water supply augmentation may dictate that a dam be raised and as part of the raising, a flood mitigation component may be included) or floodplain development may be constrained in some areas by other issues.

A2.36 The principal sources of data for carrying out floodplain management plans in Queensland are:

- NR&M – property data such as ownership and property boundary location (land title information and the Digital Cadastral Database);
- published stage-flood damage curve data from sources such as the Australian National University and reproduced by NR&M in the Regional Flood Mitigation Program Bulletin;
- infrastructure agencies (including State Government) – existing risk studies for major infrastructure; and
- local government.

[41] See page 14 of the *Floodplain Management in Australia: Best Practice Principles and Guidelines (SCARM Report 73).*

A2.37 Having undertaken a comprehensive floodplain management study or suitable alternative approach as outlined below, an appropriate DFE can be determined for each locality in the local government area. The key issues to be considered include:

- potential economic and social impacts of a range of flood events;
- community desires and expectations;
- environmental values of and objectives for the floodplain;
- consistency with adopted DFEs in adjoining localities (whether or not within the same local government area);
- emergency response requirements e.g. warning times, refuges, evacuation routes, recovery measures; and
- management and mitigation measures.

Floodplain management planning alternatives

A2.38 In any given locality, the factors that affect flood risk and the way in which it is managed will differ. Factors such as existing level of risk, opportunity to influence development due to growth, the availability of existing flood studies, historical flood data, other constraints on development such as environmentally sensitive areas, community aspirations and topography will all influence the amount of work required to formulate an appropriate floodplain management plan.

A2.39 The alternatives discussed below are intended for low rate base local governments with a low population growth rate to assist implement the SPP. The shortcomings to be aware of are:

- apart from hydraulic and hazard implications, a variety of other factors affect the most appropriate land use proposal and type of development for a particular area of the floodplain. For example, socio-economic aspects and environmental considerations can be weighed appropriately only in the strategic framework of a floodplain management plan.
- applying these guidelines to isolated developments cannot take into account the cumulative impact of ongoing development. Cumulative impacts can be correctly assessed only as part of the planning process that underlies the formulation of a floodplain management plan.

A2.40 *Limited potential for growth in flood risk*: The SPP requires the consideration of the impacts of flood in the assessment of development and the preparation of planning schemes. Where the potential for new development is small, the impact of the SPP in reducing the locality's exposure to natural hazard risks will be reduced. Nonetheless, development controls that adequately deal with potential flood risks need to be in place. Where there is limited new development, selection of a DFE with which to define a natural hazard management area (flood) could be based on a historical flood level without detailed assessment of the potential flood impacts.

A2.41 *Existing flood impact information*: This approach is similar to the situation described above where existing flood hazard information can be a substitute for conducting a full flood study. If a flood impact (i.e. the consequences of flood events) assessment or flood impact data as a result of a recent flood event is available, it may be possible to reduce the work necessary to develop an appreciation of the consequences of floods for the locality concerned and hence the risk that the community is prepared to accept.

A2.42 *Existing knowledge of community aspirations*: There may be circumstances where a community has clearly indicated the level of flood risk they will accept and this has been communicated to the local government. In this case, process steps aimed at informing and educating the community about the local flood risk and gaining an appreciation of the level of flood risk acceptable to the community may not be required.

Caution must be exercised here because:

- it is unlikely the 'community view' will be totally unanimous and hence a number of people may feel disenfranchised by a simple acceptance of the (believed) current majority view;
- inevitably, the current view will have resulted from the level of flood information available to that community and the experience of that community. This view is likely to change significantly should this information be shown to be erroneous either through a new study or flood event; and
- community acceptance is more often than not predicated on the level of appreciation of flood impacts and the extent to which individuals understand and accept how a flood will actually affect them.

Except in circumstances where the community has good information and has been well educated and/or well experienced in floods and flood impacts, care should be taken in assuming that the community accepts what the community says it accepts.

Step 4: Adoption and implementation of the floodplain management plan

A2.43 'The floodplain management plan comprises a coordinated mix of measures that address existing, future and residual flood problems'.[42] The plan should set out the results of studies, links to flood emergency plans, and should include planning responses. The development of appropriate planning scheme outcomes and measures for flooding is one result of the adoption of the floodplain management plan.

A2.44 The plan should be reviewed at regular intervals or after severe floods to examine changes in flood behaviour, the number of elements at risk and any change in their vulnerability since the last assessment, the roles and responsibilities of agencies and community aspirations.

Climate change

A2.45 The potential impacts of climate change should be addressed as part of the flood study. To date, there have been no conclusive studies that quantify the impact of climate change due to the greenhouse effect on either the frequency or intensity of major (flood) rainfall events across Queensland. It is however, important to consider the potential adverse consequences of climate change on flooding in the local context and to remember that, in addition to possible impacts on rainfall and run-off, conditions such as sea level rise and an increase in the southern excursions of tropical cyclones may have significant implications for coastal floodplains. Climate change information should be sought initially by contacting bodies such as the Commonwealth Scientific and Industrial

[42] See page 16 of the *Floodplain Management in Australia: Best Practice Principles and Guidelines (SCARM Report 73).*

Research Organisation (CSIRO) Climate and Atmosphere, the Bureau of Meteorology, and the Queensland Centre for Climate Applications, in NR&M. However, interpretation should be undertaken by a suitably qualified professional engineer.

A2.46 Sources of information on the effects of climate change on flooding are included in Appendix 11.

APPENDIX 3: UNDERTAKING NATURAL HAZARD ASSESSMENT – BUSHFIRE

What is a bushfire?

A3.1 A bushfire is an uncontrolled fire burning in forest, scrub or grassland vegetation, also referred to as a wildfire.

A3.2 Bushfire may occur on most vegetation and topography types in Queensland where there is a fuel path of sufficient dryness to be flammable.

Natural hazard management area (bushfire)

A3.3 A natural hazard management area (bushfire) is described in Annex 3 of the SPP as follows:

a) 'an area identified by a local government in its planning scheme consistent with the conclusions of a bushfire hazard assessment prepared in accordance with Appendix 3 of the SPP Guideline or other methodology approved by the Queensland Fire and Rescue Service (QFRS); or
b) where such a study has not been undertaken, an area identified by a local government in its planning scheme, reflecting the Medium and High hazard area of the Bushfire Risk Analysis maps produced by QFRS, suitably modified following a visual assessment of the accuracy of the maps; or
c) where an area has not been identified by a local government, the Medium and High hazard areas on the Bushfire Risk Analysis maps produced by QFRS.'

A3.4 Outcome 4 of the SPP requires natural hazard management areas (bushfire) to be identified in planning schemes (except for those local government areas to which the SPP does not apply in relation to bushfires – refer to Annex 2 of the SPP). Natural hazard management areas (bushfire) trigger the development outcomes and development assessment requirements specified in Outcome 1 of the SPP, and are also required to enable the development of the planning strategies and detailed measures required by Outcomes 5 and 6 of the SPP.

A3.5 The following methodology has been developed to assist local governments and developers to identify natural hazard management areas (bushfire). It is an appropriate method for land use planning purposes and is suitable for use by local governments when identifying natural hazard management areas (bushfire) as part of the plan making or amending process and also for site-specific bushfire hazard assessments.

A3.6 However, other methodologies may also be appropriate. Local governments or their consultants should contact the QFRS to discuss alternative methodologies and ensure that they are acceptable.

Climate change impacts

A3.7 Climate change is expected to cause a gradual change in vegetation health and vigour, and some species and vegetation communities will be advantaged over others. Climate change impacts will be reflected over time through changes to vegetation communities and fuel characteristics. These changes are difficult to predict and are likely to occur very gradually over a long timeframe. The changes to bushfire hazard associated with climate change impacts will generally be outweighed by changes caused by human activity in the short term. For these reasons it is not practicable to consider the impacts of climate change in bushfire hazard assessment studies at present.

Methodology for assessing bushfire hazard[43]

A3.8 The methodology involves quantitative and qualitative assessments. The quantitative element requires an assessment of three key characteristics of land that have been found to be the main determinants of the severity of bushfire hazard. These factors are vegetation communities, slope and aspect.

A3.9 The area to be assessed should be disaggregated into sub-units according to vegetation communities, slope and aspect characteristics. Tables A3.1 to A3.3 provide the ranges that should be applied for the analysis of each of the three factors. These ranges will also help to determine the sub-units that should be used to conduct the assessment. The size of the sub-units, and level of accuracy of the resultant bushfire hazard map, may vary with the extent of the area being assessed, the characteristics of the land and vegetation communities, and the accuracy of the base information being used.

A3.10 Each sub-unit is allocated a score for each of the three factors. The total score for each sub-unit determines the severity of bushfire hazard for that sub-unit. A qualitative review of these findings should then be undertaken to verify the results of the quantitative assessment.

A3.11 The qualitative review should consider the known bushfire behaviour.

A3.12 Finally, a safety buffer of land in close proximity to identified bushfire hazard areas needs to be included within the natural hazard management area (bushfire). The safety buffer is required because bushfires can affect unvegetated land in close proximity, particularly due to winds fanning flames, smoke, embers and radiant heat.

Step 1: Assessment of vegetation communities

A3.13 The different types of vegetation communities determine the rate at which dry fuel accumulates. Some vegetation communities protect fuel from drying out in all but extreme bushfire seasons and can then be susceptible to very destructive bushfires. Alternatively, vegetation communities may expose fuels to drying and therefore be frequently available for burning. Frequent bushfires can result in the development of bushfire-tolerant grassy woodlands or grasslands and less destructive bushfire behaviour. The characteristics of different vegetation communities are reflected in Table A3.1. This

[43] Alternative methodologies may also be acceptable but should be referred to the QFRS for assessment and approval prior to implementation.

table also presents the hazard scores for a range of vegetation communities. Vegetation community data is available in digital map form from the Queensland Herbarium, Environmental Protection Agency, at a scale of 1:100,000.

Table A3.1: Hazard scores and associated fire behaviours for various vegetation communities

Vegetation communities [1]	Fire behaviour	Hazard score
Wet sclerophyll forest, tall eucalypts (>30 m), with grass and mixed shrub understorey.	Infrequent fires under severe conditions, flame lengths may exceed 40 m, floating embers attack structures for 1 hour, radiant heat and direct flame are destructive for 30 minutes.	10
Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	Fire intensity depends on fuel accumulation, but can be severe, with flame lengths to 20 m, spot fires frequent across firebreaks, radiant heat and direct flame for 15 minutes.	8
Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	Fire intensity may be severe with flame lengths to 20 m, but less attack from embers.	6
Native grasslands (ungrazed), open woodlands, canefields.	Fast moving fires, available to fire annually to 4 years. Usually no ember attack, radiant heat for >10 m, duration <2 minutes.	5
Intact acacia forests, with light grass to leaf litter, disturbed rainforest.	Fires infrequent, usually burn only under severe conditions, relatively slow fires, usually little ember attack.	4
Orchards, farmlands, kikuyu pastures.	Fires very infrequent, slow moving, may be difficult to extinguish, frequent fire breaks.	2
Grazed grasslands, slashed grass.	Grazing reduces intensity and rate of spread of fire, duration <2 minutes.	2
Desert lands (sparse fuels), mowed grass.	Gaps in fuel, usually slow fire spread.	1
Intact rainforest, mangrove forest, intact riverine rainforest.	Virtually fireproof.	0

Note 1: *Vegetation assessment should be based upon examination of the vegetation on the subject site and surrounding the subject site. Narrow strips of vegetation may be flammable; however, bushfires will not generally reach their full intensity where bushfire fronts are less than 100 metres wide. For this reason the following examples may be viewed as having the next lower hazard score (i.e. paperbark heath would have a score of 6 not 8, cypress pine forest 5 not 6):*

- *areas with a linear shape (e.g. roadside vegetation beside a cleared paddock); and*
- *units of vegetation less than 50 hectares in area and more than one kilometre from the nearest extensive vegetation.*

A3.14 Where the vegetation community is assessed as having a vegetation community hazard score of zero, no other factors need to be taken into account and the relevant sub-units should be given a Low severity of overall bushfire hazard. No further action is required.

Step 2: Assessment of slope [44]

A3.15 Studies have shown that fires burn more quickly and with greater intensity up slopes, generally doubling every 10 degrees of slope. Also, the steeper the slope the more difficult it is to construct ring roads, firebreaks and provide access for emergency crews. Trees situated downhill from structures will have their crowns close to the structures. This presents bushfire hazards particularly for exposed structures such as timber decks. Table A3.2 presents the hazard scores for different categories of slope.

Table A3.2: Hazard scores for slope

Slope	Hazard score
Gorges and mountains (>30%)	5
Steep Hills (>20% to 30%)	4
Rolling Hills (>10% to 20%)	3
Undulating (>5% to 10%)	2
Plain (0% to 5%)	1

*[**Note:** For site-specific assessment of bushfire hazard, if the site is downhill from the hazard, the slope effect may be taken as zero as the fire intensity will be less. However, burning heavy fuels may roll downhill and trees may fall down, so recommended setbacks from the hazard still need to be observed.]*

Step 3: Assessment of aspect

A3.16 Aspect affects bushfire hazard due to the effects that exposure to direct sunlight has on different vegetation communities, including the drying rates of fuels. Aspect also correlates closely with exposure to low humidity winds that increase bushfire intensity. In extremely broken country where there is a variety of aspects, the predominant aspect should be used.

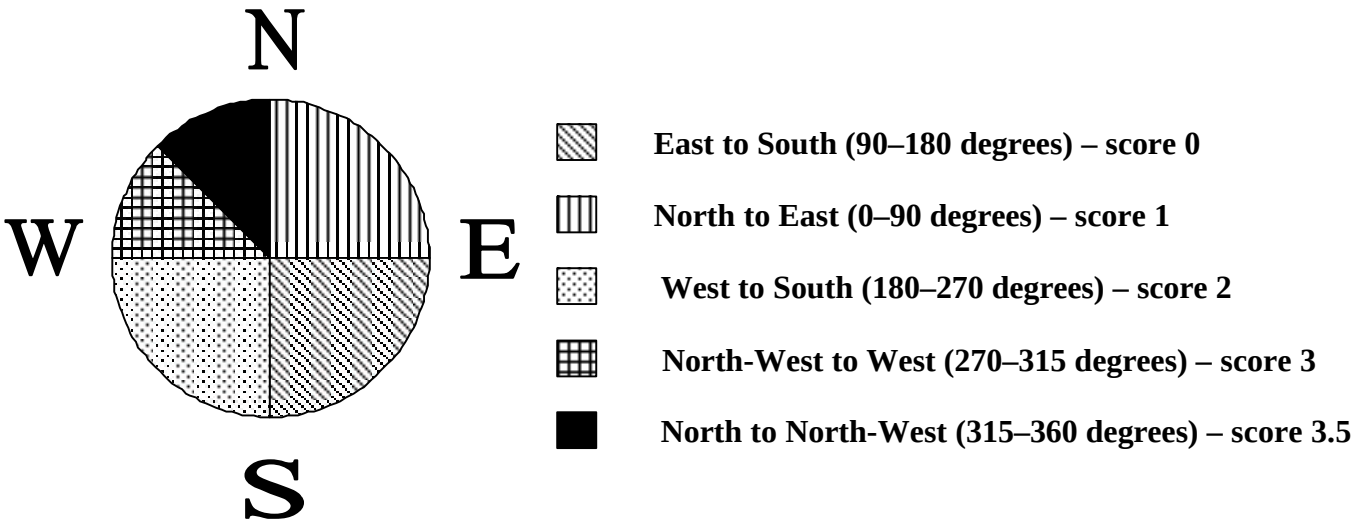
A3.17 As aspect has only a minor influence on flatter land, aspect is not considered to be significant on land with a slope less than 5%. Table A3.2 lists the hazard score for different aspects and Figure A3.1 illustrates the compass degree ranges for each aspect category.

Table A3.2: Hazard score for aspect

Aspect	Hazard score
North to North-West	3.5
North-West to West	3
West to South	2
North to East	1
East to South and all land under 5% slope	0

[44] See Appendix 10 for the methodology for calculating slope.

Figure A3.1: Compass degree ranges for each aspect category



Step 4: Combining scores to identify the severity of bushfire hazard

A3.18 The scores for the individual factors determined for vegetation communities, slope and aspect are added together to give a total for each sub-unit as follows:

Total hazard score = vegetation community hazard score + slope hazard score + aspect hazard score.

A3.19 The total hazard score determines the severity of bushfire hazard for each sub-unit as set out in Table A3.4.

Table A3.4: Hazard score ranges to identify the severity of bushfire hazard

Total hazard score	Severity of bushfire hazard
13 or greater	High[45]
6 to 12.5	Medium
1 to 5.5	Low

[45] Buildings in High severity bushfire hazard areas should be constructed in accordance with the Level 1 requirements of AS 3959:1999 'Construction of Buildings in Bushfire-Prone Areas'.

Step 5: Field verification

A3.20 Preliminary bushfire hazard maps should be prepared based on the results of Step 4 above by aggregating all sub-units with similar levels of bushfire hazard severity into High and Medium severity classifications.[46] Field verification or 'ground truthing' of these preliminary results should then be undertaken. A number of sample areas should be evaluated to test the accuracy of the preliminary bushfire hazard findings.

Step 6: Qualitative assessment

A3.21 Known bushfire behaviour complements the quantitative assessment and should be considered as part of the qualitative review.

A3.22 Known bushfire behaviour is extremely difficult to use as a quantitative planning tool. This is because the absence of bushfire, even for an extended period of time, does not mean that an area will not burn and may lead to massive fuel accumulation with dangerous bushfire behaviour if it does ignite. Known bushfire behaviour may identify sites where combinations of slope and wind have led to severe bushfire behaviour in the past, and where extra precautions to protect assets might be required. The reliability of known bushfire behaviour may be difficult to assess and QFRS should be consulted if problems are indicated.

Step 7: Safety buffers

A3.23 The final step in identifying bushfire hazard areas is to add a safety buffer, as land adjacent to bushfire hazard areas is vulnerable to bushfire attack from these areas.

A3.24 Any land within 100 metres of an area identified as having a High bushfire severity classification should be included in the High bushfire hazard area and any land within 50 metres of an area identified as having a Medium bushfire severity classification should be included in the Medium bushfire hazard area.[47] The safety buffers should be integrated into the preparation of maps identifying bushfire hazard areas. Table A3.5 shows the width of the safety buffers that apply to the various bushfire hazard severity classifications.

Table A3.5: Total hazard score and severity of bushfire hazard with safety buffers

Total hazard score	Severity of bushfire hazard	Width of safety buffer
13 or greater	High	100 metres
6 to 12.5	Medium	50 metres
1 to 5.5	Low	Not applicable

[46] Areas of Low bushfire hazard severity may also be mapped, but the natural hazard management area (bushfire) for the purposes of the SPP comprises only areas identified as being of High or Medium severity.

[47] Safety buffer areas on the boundary between High and Medium bushfire severity areas should be included in the High bushfire severity area.

APPENDIX 4: UNDERTAKING NATURAL HAZARD ASSESSMENT – LANDSLIDE

What is a landslide?

A4.1 A landslide is movement of material downslope in a mass as a result of shear failure at the boundaries of the mass. Landslides can be triggered by natural changes in the environment and human activities.

What causes landslides?

A4.2 Landslides have several causes, including geological, morphological, physical and human. Geological causes include weak materials, weathered materials, jointed materials, adversely oriented structures and contrasts in permeability. Morphological causes include a steep slope, wave erosion or fluvial erosion. Physical causes are rainfall, rapid snowmelt and thawing. Humans can cause landslides by excavating, removing vegetation, irrigating and mining.

A4.3 Landslide triggers include intense rainfall, earthquake shaking, volcanic eruption, storm waves or rapid stream erosion. Intense rainfall is by far the most common trigger of landslides in Australia. During rainfall, rapid infiltration, soil saturation and rising pore-water pressures cause a decrease in the effective strength of slope materials. Loose or weak materials such as colluvium mantling are especially prone to landslides triggered by intense rainfall.

Climate change impacts

A4.4 Climate change is predicted to result in increased rainfall intensity. Any assessment process that considers rainfall intensity should be based on a consideration of likely climate change impacts.

Landslide risk factors

A4.5 Landslide risk cannot be assessed by single factors such as slope angle, soil type or soil thickness. Some steep hillsides can be stable while major landslides have occurred on slopes lower than 15% in eastern Australia. Similarly, soils behave differently in different situations.

A4.6 Although no single set of characteristics can define the complex relationships between the physical environment and land instability, there are two basic principles that should be remembered. First, it is likely that landsliding will occur where it has occurred in the past. Secondly, landslides are likely to occur in similar geological, geomorphological and hydrological conditions as they have in the past.

A4.7 The characteristics of a landslide-prone area may include a combination of some of the following.

a. A history of landslide events in the region.

b. Evidence of instability. If there is any sign of irregularity, the risk of landslide may be high. Evidence includes:

- surface creep (e.g. trees tilted);
- minor surface irregularity (e.g. areas of hummocks and depressions);
- major surface irregularity (e.g. benches of abnormal or irregular flat areas in uniform sloping areas; scars; areas stripped of vegetation during slope movement and cracks; linear features showing lateral displacement of the ground surface; and debris mounds, deposits of soil and rock on or at the base of slopes);
- presence of scarps (i.e. linear features showing the location of vertical displacement of the ground surface);
- evidence of rockfall or instability; and
- evidence of disturbed infrastructure (e.g. tilted powerlines and fences, broken pipes and fractured drains, cracking or tilting of walls, cracking or slumping of embankment slopes, cracking and fall of material from excavated slopes).

c. Recent or historical natural forest vegetation clearing or thinning significantly increases the risk of landslide.

d. Steeper slope angles are usually more at risk.

e. Slope shape – concave shapes are usually more at risk.

f. Site geology – weak materials are usually more at risk.

g. Colluvial thickness may increase the probability of landslides occurring.

h. Concentration of surface water – surface water on crests and upper slopes.

i. Concentration of groundwater.

j. Existing development modifications can significantly alter the risk of slope instability. For example, poor disposal of run-off water or sewage can significantly increase risk of landslide.

Natural hazard management areas (landslide)

A4.8 A natural hazard management area (landslide) is described in Annex 3 of the SPP as:

a) an area identified by a local government in its planning scheme consistent with the conclusions of a landslide hazard assessment prepared in accordance with this Appendix; or
b) where such a study has not been undertaken, an area identified by a local government in its planning scheme and including all land of 15% and greater slope and other land known or suspected by the local government as being geologically unstable, together with other areas that the local government considers may be adversely affected by a landslide event;[48] or
c) where an area has not been identified by a local government, all land with a slope of 15% or greater.

A4.9 Outcome 4 of the SPP requires natural hazard management areas (landslide) to be identified in planning schemes (except for those local government areas to which the SPP does not apply in relation to landslide – refer to Annex 2 of the SPP). Natural hazard management areas (landslide) trigger the development outcomes and development assessment requirements specified in Outcomes 1 and 2 of the SPP and are also required to enable the development of the planning strategies and detailed measures required by Outcomes 5 and 6 of the SPP.

Identifying landslide hazard areas

A4.10 The methodology to be used for a landslide hazard assessment should be tailored to local conditions, and include an assessment of the main indicators of landslide risk (see paragraph A4.7). The assessment should also identify the likely runout distance of debris flows. One approach for doing this is through the use of shadow angles. An example of this approach can be found in the '*Community Risk in Cairns: A Multi-hazard Risk Assessment*' report referenced below. Local governments, their consultants and proponents should consider proposed methodologies and ensure that they are appropriate to their particular circumstances.

A4.11 Examples of landslide hazard assessment techniques may be found in the following documents:

- *A Method of Zoning Landslide Hazard,* McGregor and Taylor, 2001, Australian Geomechanics Journal Vol. 36, No. 3, September 2001, is an example of a quantitative technique for zoning landslide hazard that has been used in Queensland.
- *Community Risk in Cairns: A Multi-hazard Risk Assessment,* Granger, Jones, Leiba and Scott, 1999, Australian Geological Survey Organisation, Better Cities Project.
- *Geotechnical Risk Associated with Hillside Development,* Australian Geomechanics News, No. 10, 1985, Walker, B. et al.
- *Guidelines for Control of Slope Instability within the City of Gold Coast,* Gold Coast City Council, Queensland.
- *Landslide Risk Management Concepts and Guidelines,* Australian Geomechanics Journal Vol. 35, No. 1, March 2000, prepared by the Australian Geomechanics Society, Sub-committee on Landslide Risk Management. This document should be

[48] For example, land below areas prone to landslide.

used as the basis for undertaking landslide and hazard and risk assessments. This document establishes uniform terminology, outlines a framework for landslide risk management, provides guidance on methods which should be used to carry out risk analysis and provides information on acceptable and tolerable risks.

- *Landslide Hazards in Hillside Development: The Geological Approach to Landslide Risk Assessment, Local Authority Assessment of Development Applications on Potentially Hazardous Slopes,* 1982, W. F. Willmott.
- *Landslip Hazard Mapping Report for Maroochy Shire Council,* Golder Associates, 2002, Maroochy Shire Council.
- *Landslip Study for the City of Gold Coast*, SMEC, 1999, Gold Coast City Council.
- *Natural Hazards and the risks they pose to South-East Queensland,* K. Granger and M. Hayne (editors), 2001, Australian Geological Survey Organisation – Geoscience Australia, AGSO Cat. No. 37282.
- *Quantitative Landslide Risk Assessment of Cairns,* M. Leiba, F. Baynes and G. Scott, Australian Geological Survey Organisation, AGSO Record 1999/36.
- *Regional landslide hazard estimation, a GIS/decision tree analysis: Southeast Queensland, Australia,* Proceedings of the Fourteenth Southeast Asian Geotechnical Conference, Hong Kong, 10–14 December 2001.
- *Slope Stability and its Constraints on Closer Settlement on Tamborine Mountain, Southeast Queensland,* Willmott, 1981, Geological Survey of Queensland, Record 1981/14.

APPENDIX 5: DEVISING DETAILED MEASURES IN PLANNING SCHEMES TO ACHIEVE OUTCOME 1

A5.1 The following material is not intended to be incorporated directly into a planning scheme, but should be used to help devise appropriate detailed measures for achieving Outcome 1 of SPP, and integrating those measures with other provisions of the planning scheme. Where the SPP has not been appropriately reflected in a planning scheme, this appendix should be used to assist in interpreting the SPP in development assessment.

A5.2 This appendix refers to scheme measures in terms of overlays and associated assessment criteria, and is consistent with the approach and terminology suggested for planning schemes in the IPA Plan Making Guideline 1/02 published by the Department of Local Government and Planning.

A5.3 The natural hazard management areas for flood, bushfire and landslide relevant to the particular local government should be mapped on overlays (see paragraphs 7.4 to 7.6 in the body of the SPP Guideline for more information on the overlays).

A5.4 Depending on the circumstances in a particular local government area and the organisation of the scheme provisions, there are different ways to incorporate the overlay provisions for flood, bushfire and landslide issues in a planning scheme. For example:

- both the triggers for assessment and the assessment criteria may be dealt with **separately** through overlay assessment tables and associated assessment criteria; **or**
- both the triggers for assessment and the assessment criteria may be **integrated** within one or more zone tables and their associated assessment criteria; **or**
- the **triggers for assessment may be integrated** with the assessment tables for one or more zones, but the **assessment criteria are located separately**.

A5.5 The tables below set out the following information:

- ***Column 1: Development the scheme should make assessable or self-assessable***
  Annex 1 of the SPP describes the types of development that should be made assessable or self-assessable by the planning scheme. Local governments can decide which of these assessment categories should be applied to particular types of development. Whether development is made assessable or self-assessable depends on whether it is possible to identify all relevant assessment criteria in a precise way that does not require any interpretation/discretion. If that is possible, self-assessable is the appropriate assessment category.

- ***Column 2: Specific Outcomes***
  Annex 4 of the SPP sets out specific outcomes for assessing the compatibility of development in natural hazard management areas.

- ***Column 3: Solutions***
  These solutions provide the basis for a local government to devise solutions and acceptable solutions for the planning scheme code(s) in the context of the planning scheme area. A solution can be made an acceptable solution when it can be refined in a way that results in precise criteria requiring no exercise of discretion to determine whether a development proposal complies.

- ***Column 4: Comments***
  This column provides advice about:
  - interpreting the assessment criteria;
  - what information is likely to be required to enable an adequate assessment; and
  - information about, or cross-references to, other relevant matters.

A. NATURAL HAZARD MANAGEMENT AREAS (FLOOD):

Type of development made assessable or self-assessable	Specific outcomes	Solutions	Comments [if applicable]
a) ***material changes of use*** *and associated* ***reconfigurations of a lot*** *that:* • increase the number of people living or working in the natural hazard management area (e.g. residential development, shopping centres, tourist facilities, industrial or commercial uses) except where the premises are occupied on a short-term or intermittent basis (e.g. by construction/maintenance workers, certain agricultural and forestry workers); **or** • involve institutional uses where evacuating people may be particularly difficult (e.g. hospitals, education establishments, child care, aged care, nursing homes and high security correctional centres); **or** • involve the manufacture or storage of hazardous materials in bulk; **or** • would involve the building or other work described in (b) as an intrinsic element of the development proposal; **and** **b)** ***building*** *or other* ***work*** that involves any physical alteration to a watercourse or floodway including vegetation clearing, or involves net filling exceeding 50 cubic metres.	**1.** Development maintains the safety of people on the development site from all floods up to and including the DFE.	**1.1** Development is sited on land that would not be subject to flooding during the DFE. **OR** **1.2** There is no increase in the number of people living or working on the site, except where the premises are occupied on a short-term or intermittent basis (e.g. by construction/maintenance workers, certain agricultural and forestry workers). **OR** **1.3** ***For residential development:*** dwellings are sited so that the floors of all habitable rooms can be located above the DFE flood level. **OR** **1.4** ***For non-residential development and development involving temporary or moveable residential structures (e.g. caravan parks and camping grounds):*** **a)** buildings are located and designed so that floor levels (except areas used for car parking) are at or above the DFE flood level; **or** **b)** there is at least one evacuation route that remains passable for emergency evacuations during all floods up to and including the DFE; **or** **c)** the premises are located in an area where there is sufficient flood warning time to enable safe evacuation; **or** **d)** a safe refuge is available for people within the development site.	**Notes for b) in column 1:** Local governments may adopt lower thresholds than 50 m^3 to reflect the particular flood characteristics of different localities. Vegetation clearing is defined in Section 9, Glossary of this SPP Guideline. **Note for 1.1:** If the development proposal complies with this solution no further assessment is required in relation to flood hazard. **Note for 1.1 and 1.4:** A flood assessment report may be necessary to demonstrate compliance to the satisfaction of the assessment manager (or designator). A flood assessment report should include an assessment of the development proposal against these outcomes and solutions, and may require a specific hydraulic and hydrologic investigation undertaken by a suitably qualified professional engineer. **Notes for 1.3:** The *Standard Building Regulation* and associated *Queensland Development Code* address the floor levels of habitable rooms in relation to flood levels. The definition of habitable rooms is in the Building Code of Australia. Designing dwellings to achieve this requirement may have siting and height implications addressed by separate codes in the planning scheme.

Type of development made assessable or self-assessable	Specific outcomes	Solutions	Comments [if applicable]
			No minimum access standards are being **required** for residential development because the nature and impacts of flooding vary widely throughout the State, as do the expectations and abilities of communities to cope with flood events. Local governments should consider specifying minimum access requirements that are appropriate to the flooding characteristics of particular localities, including the likely duration of inundation and the susceptibility of the wider road network to flooding at the DFE. **Notes for 1.4**: **a)** Local governments may also specify a freeboard level for non-habitable parts of a building, but that level should not exceed that required for habitable rooms. **b)** The evacuation route should either be located above the DFE, or within low hazard areas (see Appendix 2 for the definition of low hazard areas) constructed to a level not more than 300 mm below the DFE. **c)** Flood warning times are applicable only to those areas for which there is a flood warning system in place. Flood warning time is defined in Section 9, Glossary of the SPP Guideline. Local governments may either specify acceptable flood warning times for particular types of use or require the applicant to provide an assessment of the adequacy of the flood warning time available to the particular proposal. Appendix 6 provides additional information on undertaking such an assessment. **d)** Safe refuge is defined in Section 9, Glossary of the SPP Guideline.

Type of development made assessable or self-assessable	Specific outcomes	Solutions	Comments [if applicable]
	2. Development does not result in adverse impacts on people's safety or the capacity to use land within the floodplain.	**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 flood waters of all floods up to and including the DFE; **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.	**Note for 2.1 a):** See Section 9, Glossary for definitions of floodway and vegetation clearing. Local governments should identify floodways in their planning scheme (e.g. on the natural hazard management area (flood) overlay) wherever possible. Where this information is not available the applicant may need to conduct a specific study to identify how the development proposal impacts on any existing floodways. NR&M is a concurrence agency for works in watercourses. **Note for 2.1 b):** Local governments may adopt a lower threshold for net filling as appropriate to the particular flood characteristics of a locality. **Note for 2.2:** A floodplain management plan should be prepared in accordance with the guidance provided in Appendix 2 of this SPP Guideline. Development criteria set out in such a management plan should be incorporated in the planning scheme or planning scheme policy. NR&M can provide further advice on the conduct of floodplain management studies and the preparation of floodplain management plans. **Note for 2.3:** A flood assessment report should be provided to demonstrate compliance to the satisfaction of the assessment manager (or designator). A flood

Type of development made assessable or self-assessable	Specific outcomes	Solutions	Comments [if applicable]
			assessment report should include an assessment of the development proposal against these outcomes and solutions, and may require a specific hydraulic and hydrologic investigation undertaken by a suitably qualified professional engineer.
	3. Development minimises the potential damage from flooding to property on the development site.	**3.1** Dwellings are sited so that the floors of all habitable rooms can be located above the DFE flood level.	**Note for Specific Outcome 3:** No minimum floor levels are being **required** for commercial and industrial development [although placing floor levels above the DFE is an option for achieving specific outcome 1 – see solution 1.4a]. There may be commercial considerations that justify the 'commercial risk' associated with the potential damage to property. Such commercial risk considerations are best addressed through a comprehensive floodplain management plan. Local governments may specify minimum floor levels for non-habitable rooms where this is considered appropriate to the flood characteristics of the locality. However, the freeboard levels should not exceed those for habitable rooms. **Note for 3.1:** The *Standard Building Regulation* and associated *Queensland Development Code* address the floor levels of habitable rooms in relation to flood levels. The definition of habitable rooms is in the Building Code of Australia. Designing dwellings to achieve this requirement may have siting and height implications addressed by separate codes in the planning scheme.

Type of development made assessable or self-assessable	Specific outcomes	Solutions	Comments [if applicable]
	4. Public safety and the environment are not adversely affected by the detrimental impacts of floodwater on hazardous materials manufactured or stored in bulk.	**4.1** The manufacture or storage in bulk of hazardous materials takes place above the DFE flood level. **OR** **4.2** Structures used for the manufacture or storage of hazardous materials in bulk are designed to prevent the intrusion of floodwaters.	**Note for 4:** 'Hazardous materials in bulk' is defined in Section 9, Glossary of this SPP Guideline.
	5. Essential services infrastructure (e.g. on-site electricity, gas, water supply, sewerage and telecommunications) maintains its function during a DFE.	**5.1** Any components of the infrastructure that are likely to fail to function or may result in contamination when inundated by flood water (e.g. electrical switchgear and motors, water supply pipeline air valves) are: **a)** located above the DFE; **or** **b)** designed and constructed to exclude floodwater intrusion/infiltration. **AND** **5.2** Infrastructure is designed and constructed to resist hydrostatic and hydrodynamic forces as a result of inundation by the DFE.	

B. NATURAL HAZARD MANAGEMENT AREAS (BUSHFIRE)

Type of development made assessable or self-assessable	Specific outcomes	Solutions	Comments [if applicable]
material changes of use *and associated* ***reconfigurations of a lot*** *that:* • increase the number of people living or working in the natural hazard management area (e.g. residential development, shopping centres, tourist facilities, industrial or commercial uses) except where the premises are occupied on a short-term or intermittent basis (e.g. by construction/maintenance workers, certain agricultural and forestry workers); **or** • involve institutional uses where evacuating people may be particularly difficult (e.g. hospitals, education establishments, child care, aged care, nursing homes and high security correctional centres); **or** • involve the manufacture or storage of hazardous materials in bulk.	**1.** Development maintains the safety of people and property by: **a)** avoiding areas of High or Medium bushfire hazard; **or** **b)** mitigating the risk through: • lot design and the siting of buildings; **and** • including firebreaks that provide adequate: – setbacks between buildings/structures and hazardous vegetation, **and** – access for fire-fighting/other emergency vehicles; • providing adequate road access for fire-fighting/other emergency vehicles and safe evacuation; **and** • providing an adequate and accessible water supply for fire-fighting purposes.	**1.1** Development is located on land that is not subject to High or Medium bushfire hazard. **OR** ***For all development:*** **1.2** Buildings and structures: **a)** on lots greater than 2,500 m^2: • are sited in locations of lowest hazard within the lot; **and** • achieve setbacks from hazardous vegetation of 1.5 times the predominant mature canopy tree height or 10 metres, whichever is the greater; **and** • 10 metres from any retained vegetation strips or small areas of vegetation; **and** • are sited so that elements of the development least susceptible to fire are sited closest to the bushfire hazard. **b)** on lots less than or equal to 2,500 m^2, maximise setbacks from hazardous vegetation **AND** **1.3** For uses involving new or existing buildings with a gross floor area greater than 50 m^2 each lot has: • a reliable reticulated water supply that has sufficient flow and pressure characteristics for fire fighting purposes at all times (minimum pressure and flow is 10 litres a second at 200 kPa); **or** • an on-site water storage of not less than 5,000 litres (e.g. accessible dam or tank with fire brigade tank fittings, swimming pool). **AND**	**General Note:** If the development site is located within a designated area of nature conservation value under the *Nature Conservation Act 1992* or the planning scheme, the proposed development may be inappropriate because of the need to clear vegetation for firebreaks. However, if the development proposal is a development commitment, the risk from the bushfire hazard should be mitigated in ways that minimise the adverse impacts on the nature conservation values. **Note for 1.1:** If the development proposal complies with this solution no further assessment is required in relation to bushfire hazard. A site-specific bushfire hazard assessment is necessary to demonstrate that although the proposed development site is within an NHMA (Bushfire), the bushfire hazard is low on the subject land. Refer to Appendix 3 for a suitable methodology for bushfire hazard assessments. **Note for 1.2:** Appendix 7 sets out the principles for siting buildings in High and Medium bushfire hazard areas.

Type of development made assessable or self-assessable	Specific outcomes	Solutions	Comments [if applicable]
		For development that will result in multiple buildings or lots: **1.4** Residential lots are designed so that their size and shape allow for: **a)** efficient emergency access to buildings for fire-fighting appliances (e.g. by avoiding long narrow lots with long access drives to buildings); **and** **b)** setbacks and building siting in accordance with 1.2 (a) above. **AND** **1.5** Firebreaks are provided by: **a)** a perimeter road that separates lots from areas of bushfire hazard and that road has: • a minimum cleared width of 20 metres; **and** • a constructed road width and weather standard complying with local government standards. **OR** **b)** where it is not practicable to comply with 1.5a), fire maintenance trails are located as close as possible to the boundaries of the lots and the adjoining bushland hazard, and the fire/maintenance trails: • have a minimum cleared width of 6 metres; **and** • have a formed width and gradient, and erosion control devices to local government standards; **and** • have vehicular access at each end; **and** • provide passing bays and turning areas for fire-fighting appliances; **and** • are either located on public land, or within an access easement that is granted in favour of the local government and QFRS. **AND**	**Note for 1.4:** For reconfiguring a lot applications, building envelopes or similar mechanisms should be used to control the future siting of buildings. **Note for 1.5:** Fire maintenance trails should only be accepted if it is not practicable to provide the firebreak in the form of a perimeter road due to topographic or vegetation constraints, or because access to the proposed lots can be provided from an existing road and it would be unreasonable to require the construction of a new road.

Type of development made assessable or self-assessable	Specific outcomes	Solutions	Comments [if applicable]
		c) sufficient cleared breaks of 6 metres minimum width in retained bushland within the development (e.g. creek corridors and other retained vegetation) to allow burning of sections and access for bushfire response. **AND** **1.6** Roads are designed and constructed in accordance with applicable local government and State government standards and: **a)** have a maximum gradient of 12.5%; **and** **b)** exclude culs-de-sac, except where a perimeter road isolates the development from hazardous vegetation **or** the culs-de-sac are provided with an alternative access linking the cul-de-sac to other through roads. **AND** ***For Development in High Bushfire Hazard Areas (except single dwellings on existing lots)*** **1.7** Development complies with a Bushfire Management Plan for the premises.	**Note for 1.7:** Where the assessment manger has not previously approved a Bushfire Management Plan (either by condition on a previous development approval or by incorporating it in the planning scheme or a planning scheme policy), the development proponent will be expected to prepare such a plan to the satisfaction of the assessment manager. See Appendix 8 for more information on bushfire management plans.
	2. Public safety and the environment are not adversely affected by the detrimental impacts of bushfire on hazardous materials manufactured or stored in bulk.	**2.1** Development complies with a Bushfire Management Plan for the premises.	**Note for 2.1:** 'Hazardous materials in bulk' is defined in Section 9, Glossary of the SPP Guideline. Where the assessment manager has not previously approved a Bushfire Management Plan (see Note 1.7 above), the development proponent will be expected to prepare such a plan to the satisfaction of the assessment manager. See Appendix 8 for more information on bushfire management plans.

C. NATURAL HAZARD MANAGEMENT AREAS (LANDSLIDE):

Type of development made assessable or self-assessable	Specific outcomes	Solutions	Comments [if applicable]
a) ***material changes of use*** *and associated* ***reconfigurations of a lot*** *that:* • increase the number of people living or working in the natural hazard management area (e.g. residential development, shopping centres, tourist facilities, industrial or commercial uses) except where the premises are occupied on a short-term or intermittent basis (e.g. by construction/maintenance workers, certain agricultural and forestry workers); **or** • involve institutional uses where evacuating people may be particularly difficult (e.g. hospitals, education establishments, child care, aged care, nursing homes and high security correctional centres); **or** • involve the manufacture or storage of hazardous materials in bulk; or • would involve the building or other work described in b) as an intrinsic element of the development proposal; and **b)** ***building*** or other ***work*** on potentially unstable slopes that involves: • earthworks exceeding 50 cubic metres (other than the placement of topsoil); **or** • vegetation clearing; **or** • redirecting the existing flow of surface or groundwater.	**1.** Development maintains the safety of people, property and hazardous materials manufactured or stored in bulk from the risk of landslide.	**1.1** The development site is not subject to landslide hazard, either internally or from sloping land above the site. **OR** **1.2** The development does not· **a)** involve any new building work other than a minor extension (<20 m^2 Gross Floor Area) to an existing building; or **b)** involve vegetation clearing; or· **c)** alter ground levels or stormwater conditions. **OR** **1.3** The development includes measures that ensure: **a)** the long term stability of the development site; **and** **b)** the development site will not be adversely affected by landslide activity originating on sloping land above the development site.	**Note for 1.1:** The applicant can demonstrate that the development site is not subject to landslide hazard because the site does not fulfil the criteria for inclusion in the NHMA (e.g. slopes are less than 15% in the case of an NHMA based on that criterion). Alternatively, a site-specific geotechnical analysis prepared by a registered professional engineer may be required to demonstrate that the site is not subject to landslide hazard. **Note for 1.3:** A site-specific geotechnical analysis as specified in Note 1.1 above is required to demonstrate achievement of this solution. The SBR addresses the stability of buildings and structures in relation to landslide. **Notes for (b) in column 1:** Local governments may adopt lower thresholds than 50 m^3 to reflect the particular landslide hazard characteristics of different localities. Vegetation clearing is defined in Section 9, Glossary of this SPP Guideline.

APPENDIX 6: ASSESSING THE ADEQUACY OF FLOOD WARNING TIMES

A6.1 For the purposes of the SPP, flood warning time is defined as the time between the release of a flood warning indicating that the locality is likely to be subject to flooding, and the time that the last evacuation route providing egress from the locality to land above the DFE would be made unsafe for evacuation purposes by rising floodwaters.

A6.2 In Queensland, the Bureau of Meteorology (BoM) will normally be responsible for issuing flood warnings for larger river systems, and may be able to advise the warning time that is likely to be available for a particular locality. This information will only be available for those waterways and areas for which the BoM has a flood warning system in place.

A6.3 The local government may be able to advise on flood warning times in localities not covered by the BoM, and should also be able to advise on the impacts of flooding on evacuation routes. Where information on flood warning times and/or evacuation routes is not available from the local government it will need to be calculated by a suitably qualified and experienced engineer.

When should flood warning times be considered?

A6.4 It is necessary to consider flood warning times when preparing or assessing a development proposal where safe evacuation prior to flood waters making evacuation routes impassable is being relied on as the **only** way of safeguarding occupants of the development from flood.

Calculating whether flood warning times are adequate

A6.5 The safe evacuation time will vary according to the nature and location of the development and ideally, should be calculated for each development proposal. Alternatively, a local government may choose to specify minimum flood warning times for particular types of development and/or particular locations based on a broad assessment of the minimum safe-evacuation times.

A6.6 The key factors to be considered in calculating a safe evacuation time are as follows:

- the time required to mobilise SES resources and communicate flood and evacuation warnings to affected areas (an allowance of 3 hours would be reasonable under normal circumstances);
- preparation time prior to self-evacuation (an allowance of 1 hour would be reasonable under normal circumstances, however, longer times may be required for particular types of development e.g. hospitals, nursing homes);
- travel time will depend on the distance to be travelled to a safe area above the DFE flood level and the characteristics of the evacuation route. Some particular considerations are:
  - travel times will be slower than normal given the conditions and likely stress that people will be under;
  - exit routes should be deemed to have a maximum capacity of 600 vehicles per lane per hour;
  - incoming lanes cannot be reversed for outgoing traffic due to emergency service requirements;

  - need to allow for travel time past the critical point for safety (e.g. a low point in the evacuation route);
- a time allowance must be included at the end of the self-evacuation phase to enable emergency services personnel to ensure that people have evacuated and/or make any special evacuation arrangements that may be required. This time also provides an additional safety margin for evacuation travel (an allowance of 2–3 hours would be appropriate under normal circumstances).

A6.7 Under normal circumstances the aggregation of these times might be expected to result in a safe evacuation time of 8–12 hours. When the available flood warning time exceeds the calculated safe evacuation time, the development proposal can be considered to have an adequate flood warning time.

APPENDIX 7: PRINCIPLES FOR SITING BUILDINGS IN HIGH AND MEDIUM BUSHFIRE HAZARD AREAS

A7.1 Correct siting of the building on the lot is an important design consideration for bushfire resistance.

A7.2 The way a building is sited on land is a basic factor influencing survival. As the pattern of bushfires is very predictable, it is possible to determine the most favourable areas to maximise survival. For example:

- Check data about previous fires in the local district to determine the possible direction bushfire would travel;
- Be aware most bushfires occur during dry conditions, particularly in times of hot temperatures and low humidity, and are often accompanied by strong winds; and
- Remember fires accelerate going uphill and decrease in speed travelling down hill.
- Hanging a building out over the hazard will increase the risk (e.g. a pole house with timber decks will be much more exposed than one set into the slope).
- Siting the structures downhill from the hazard reduces the risk, and this is reflected in the site-specific assessment method. Setbacks are still necessary to avoid falling trees and debris rolling down hill.

Key principles

A7.3 There are two key principles to be considered in siting a building in a High or Medium bushfire risk area:

- avoiding higher risk situations, particularly locations with a combination of slope and certain aspects; and
- maximising the setbacks from hazardous vegetation.

Avoiding higher risk situations

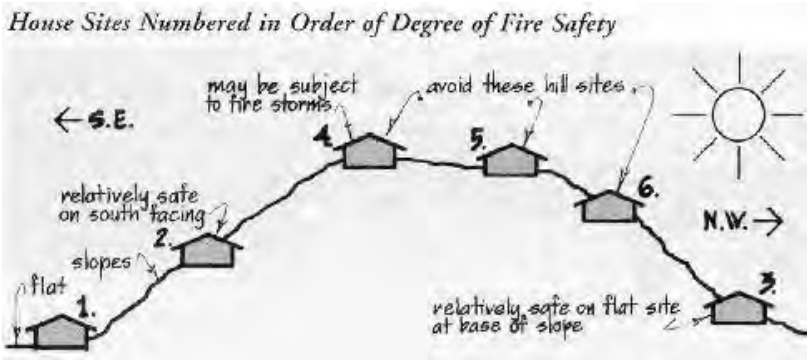
A7.4 On larger lots it may be possible to site buildings in an area depicted on bushfire hazard assessment map(s)[49] as lower bushfire risk (e.g. in an area of Medium bushfire risk in preference to a location of High bushfire risk or where the vegetation is sparser and the fuel loads less).

A7.5 Irrespective of the severity of hazard in any bushfire assessment, combinations of slope and aspect on individual sites should be considered. Figure 1 illustrates the relative bushfire safety of house site locations based on slope and aspect considerations.

A7.6 The order of preference is low flat sites, sites set into Southerly or South East slopes, sites at the bottom of more exposed West and North West slopes. The most dangerous sites are on or at the top of West or North West slopes. Building sites should also avoid the head of gullies with Westerly aspects, because fire winds funnel up such sites.

[49] See Appendix 3.

Figure 1: Order of degree of bushfire safety in locating house sites



(Note: 1 being the safest – 6 being the most hazardous)

Setbacks from hazardous vegetation

A7.7 On lots greater than 2,500 square metres, buildings should be sited so that the following minimum setbacks from hazardous vegetation[50] can be achieved[51]:

- the greater of 10 metres or 1.5 times the predominant mature canopy tree height; and
- 10 metres from any retained vegetation strips or small areas of vegetation.

A7.8 On lots less than 2,500 square metres, the above setbacks may not be achievable where hazardous vegetation adjoins the lot boundaries. In such circumstances, buildings should maximise the setbacks from hazardous vegetation.

[50] Hazardous vegetation comprises vegetation communities with a hazard score of 6 or more in Table A3.1 of Appendix 3.

[51] Consideration should also be given to the vegetation conservation values on the site. It may be possible to achieve the setbacks through clearing of vegetation if this does not adversely affect conservation values.

APPENDIX 8: UNDERTAKING A BUSHFIRE MANAGEMENT PLAN

When is a Bushfire Management Plan required?

A8.1 The SPP requires the preparation of a Bushfire Management Plan (BMP) for development that materially increases the number of people living or working (except for single dwellings on existing lots) in a High severity bushfire hazard area, or that involve hazardous materials that are manufactured or stored in bulk in a High or Medium severity bushfire hazard area. A BMP may also be required for certain types of community infrastructure in either a High or Medium severity bushfire hazard area.

Who should prepare a BMP?

A8.2 A BMP should be prepared by a suitably qualified professional with appropriate technical expertise in the identification and mitigation of bushfire hazard. Suitable professionals may include those in the environmental management, landscape architecture, architecture, town planning and civil engineering fields.

Who should be consulted?

A8.3 At a minimum the local government, responsible Rural and/or Urban Fire Brigade, and managers of adjacent parks or reserves should be consulted. It is also desirable to consult other agencies or individuals, such as previous owners of the site or neighbours, who may have local knowledge of the severity and nature of the bushfire hazard.

What should be included in the BMP?

A8.4 A comprehensive BMP should include the following:

(a) An assessment of the nature and severity of the bushfire hazard affecting the site. The key factors to be considered are vegetation type, slope and aspect as described in Appendix 3 of this SPP Guideline. The assessment should also address other site-specific factors that are important in devising suitable bushfire mitigation strategies. These factors could include matters such as: likely direction of bushfire attack, environmental values that may limit mitigation options, location of evacuation routes and/or safety zones.

(b) An assessment of the specific risk factors associated with the development proposal, including matters such as the nature of activities and materials to be conducted/stored on the site, numbers and types of persons likely to be present, particular warning and/or evacuation requirements.

(c) A plan for mitigating the bushfire risk identified in (a) and (b). The plan should address all of the matters raised in Appendix 5B and recommend specific mitigation actions for the proposed development including:

(1) road and lot layout and land use allocations;
(2) firebreaks and buffers;
(3) building locations or building envelopes;
(4) landscaping treatments;
(5) warning and evacuation procedures and routes;
(6) firefighting requirements including infrastructure;
(7) any other specific measures such as external sprinkler systems and alarms;
(8) purchaser/resident education and awareness programs; and
(9) ongoing maintenance and response awareness programs.

What level of detail is required?

A8.5 The level of detail required will vary with the nature of the development proposal and site, and with the type of development application.

A8.6 If the application must be followed by another application before works can commence (e.g. a Material Change of Use application that must be followed by a Reconfiguration of a Lot application), then matters of detail could be dealt with at the later application stage.

A8.7 The level of detail required to accompany a particular application should be determined in consultation with the assessment manager. However, it is recommended that, at a minimum, items (a), (b) and (c) (1) – (3) outlined above should be addressed in any BMP.

APPENDIX 9: DEVISING DETAILED MEASURES TO ACHIEVE OUTCOME 3

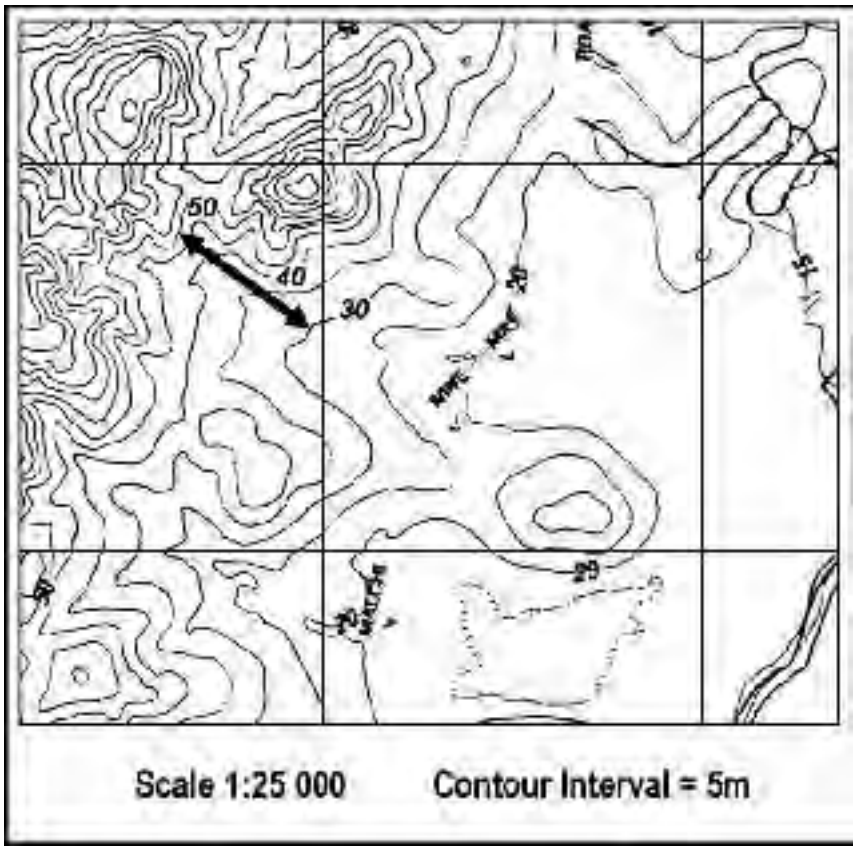
<table>
<tr><th>Specific outcomes</th><th>Solutions</th><th>Comments [if applicable]</th></tr>
<tr><td>1. The community infrastructure is able to function effectively during and immediately after flood events.</td><td>1.1 Community infrastructure development is not located in an area that has been identified by flood hazard mapping as being below the Recommended Flood Level (RFL) specified for that community infrastructure in the following table:
<table>
<tr><th colspan="2">Recommended Flood Levels for Community Infrastructure</th></tr>
<tr><th>Type of Community Infrastructure</th><th>Recommended Flood Levels</th></tr>
<tr><td>Emergency services</td><td>0.2% AEP</td></tr>
<tr><td>Emergency shelters</td><td>0.5% AEP</td></tr>
<tr><td>Police facilities</td><td>0.5% AEP</td></tr>
<tr><td>Hospitals and associated facilities</td><td>0.2% AEP</td></tr>
<tr><td>Stores of valuable records or items of historic or cultural significance (e.g. galleries and libraries).</td><td>0.5% AEP</td></tr>
<tr><td>• State-controlled roads
• Works of an electricity entity not otherwise listed in this table
• Railway lines, stations and associated facilities
• Aeronautical facilities
• Communication network facilities</td><td>No specific recommended flood level but development proponents should ensure that the infrastructure is optimally located and designed to achieve suitable levels of service, having regard to the processes and policies of the administering government agency.</td></tr>
<tr><td>Power stations</td><td>0.2% AEP</td></tr>
<tr><td>Major switch yards</td><td>0.2% AEP</td></tr>
<tr><td>Substations</td><td>0.5% AEP</td></tr>
<tr><td>Sewage treatment plants</td><td>DFE</td></tr>
<tr><td>Water treatment plants</td><td>0.5% AEP</td></tr>
</table></td><td>Note for 1.1: For localities where there is insufficient flood information to identify one or more of the RFLs, a local government may instead nominate required freeboard heights above a known flood level (for example the DFE) that are estimated to provide an approximately equivalent level of flood immunity to that achieved by the RFLs.

Notes for Recommended Flood Levels: For sewage treatment plants, the RFL applies only to electrical and other equipment that, if damaged by floodwater or debris, would prevent the plant from functioning. This equipment should either be protected from damage or designed to withstand inundation. Also some police and emergency services facilities (e.g. water police and search and rescue operations) are dependent on direct water access. The RFLs do not apply to these aspects but other operational areas should be located above the RFL wherever practicable.</td></tr>
<tr><td></td><td>OR
1.2 The community infrastructure is located below the RFL but can function effectively during and immediately after the RFL flood event.
AND
1.3 Essential community infrastructure (emergency services and shelters, police facilities and hospitals, and associated facilities) has an emergency rescue area above the RFL.</td><td>Note for 1.2: The development proposal would need to include a comprehensive report demonstrating that this solution would be achieved to the satisfaction of the assessment manager or designator.

Note for 1.3: Emergency rescue area is defined in Section 9, Glossary of the SPP Guideline.</td></tr>
</table>

Specific outcomes	Solutions	Comments [if applicable]
2. The community infrastructure is able to function effectively during and immediately after bushfire events.	**2.1** The community infrastructure is not located in a natural hazard management area (bushfire). **OR** **2.2** The community infrastructure is located on land that is not subject to High or Medium bushfire hazard. **OR** **2.3** The community infrastructure will not involve any new building work other than a minor extension (<20 m^2 Gross Floor Area) to an existing building. **OR** **2.4** The community infrastructure development is located within a natural hazard management area (bushfire) but is designed to function effectively during and immediately after bushfire events.	**Note for 2.2:** A site-specific bushfire hazard assessment is necessary to demonstrate that although the proposed development site is within an NHMA (Bushfire), the bushfire hazard is low on that site. **Note for 2.4:** The development application should include and comply with a comprehensive Bushfire Management Plan.
3. The community infrastructure is able to function effectively during and immediately after landslide events.	**3.1** Community infrastructure is not located in a natural hazard management area (landslide). **OR** **3.2** The community infrastructure development: **a)** does not result in any new building work other than an addition to an existing building; **b)** does not involve vegetation clearing; and **c)** does not alter ground levels or stormwater conditions. **OR** **3.3** The development includes measures that ensure: **a)** the long term stability of the site; **b)** access to the site will not be impeded by a landslide event; and **c)** the community infrastructure will not be adversely affected by landslides originating on sloping land above the site.	**Note for 3.2:** Vegetation clearing is defined in Section 9, Glossary of this SPP Guideline. **Note for 3.3:** A site-specific geotechnical analysis prepared by a registered professional engineer must be included with the development proposal and demonstrates the achievement of the solution to the satisfaction of the assessment manager or designator.

APPENDIX 10: CALCULATING SLOPE FROM A TOPOGRAPHIC MAP



Length of measured line = 1.7 cm, 1.7 X 25 000/100 = 425 m
Elevation Change = 20 m (read off contours)
Percentage Slope = 20/425 X 100 = 4.7% slope

A10.1 Slope can be described in two different ways, a percent gradient or an angle of the slope. This SPP Guideline uses percent gradient. The methodology for calculating the percent gradient of a slope is as follows:

1. Decide on an area to calculate the slope. Note, it should be an area where the slope direction does not change. Do not cross the top of a hill or the bottom of a valley.
2. When an area of interest is determined, draw a straight line perpendicular to the contours on the slope. For better accuracy, start and end the line on, rather than between, contours on the map.
3. Measure the length of the line drawn and, using the scale of the map, convert that distance to metres.
4. Determine the total elevation change in metres along the line drawn (i.e. subtract the elevation of the lowest contour used from the elevation of the highest contour used). No conversions are necessary on this measurement, because it is a real-world elevation change.
5. To calculate a percent slope, divide the elevation change in metres by the distance of the line drawn (after converting it to metres). Multiply the resulting number by 100 to get a percentage value equal to the percent slope of the hill. If the value you calculate is, for example, 20, this means that for every 100 metres covered in a horizontal direction, 20 metres will be gained (or lost) in elevation.

APPENDIX 11: OTHER INFORMATION SOURCES

A11.1 Information sources are listed below. Local governments, assessment managers and proponents may find these information sources useful in the preparation and assessment of development applications and the making and amending of planning schemes.

A11.2 General

- *Building Code of Australia*
- *Community Risk in Cairns: A Multi-hazard Risk Assessment,* Australian Geological Survey Organisation (AGSO) – Geoscience Australia
- *Community Risk in Mackay: A Multi-hazard Risk Assessment,* Australian Geological Survey Organisation (AGSO) – Geoscience Australia
- *Economic Costs of Natural Disasters in Australia, Report 103,* Bureau of Transport Economics
- *IPA Plan Making Guidelines 1/01,* Department of Local Government and Planning (2001)
- *Natural Hazards and the risk they pose to South East Queensland,* Australian Geological Survey Organisation (AGSO) – Geoscience Australia
- *Planning Safer Communities – Land Use Planning for Natural Hazards,* Emergency Management Australia (2002)
- *Standard Building Regulation 1993*
- *State Counter Disaster Organisation Act 1975* – requiring Local Government Counter Disaster Plans and Disaster Mitigation Plans
- *State Counter Disaster Plan* (2001), Queensland Department of Emergency Services
- *State Policy for Vegetation Management on Freehold Land* (2000), Department of Natural Resources and Mines

A11.3 Disaster Risk Management

- *Australian/New Zealand Standard for Risk Management,* AS/NZS 4360:1999
- *Disaster Risk Management* (2000), Queensland Department of Emergency Services
- *Disaster Risk Management Guide: A How-to Manual for Local Government* (2000), Queensland Department of Emergency Services
- *Natural Disaster Risk Management Guidelines for Reporting,* Queensland Department of Emergency Services

A11.4 Flood

- *Floodplain Management in Australia: Best Practice Principles and Guidelines,* Standing Committee on Agriculture and Resource Management (SCARM), Report 73, CSIRO Publishing
- *Emergency Management Australia Guidelines* (Managing the Floodplain, Emergency Management Planning for Floods affected by Dams)
- *State Coastal Management Plan – Queensland's Coastal Policy* (2001), Queensland Environmental Protection Agency
- *Flood Warning Guide 5,* Emergency Management Australia (2002)

A11.5 Bushfire

- *A Guide to Fire Management in Queensland (Incorporating fire management theory and departmental practice)* (2000), Queensland Department of Natural Resources and Mines
- *Australian Standard 3959: 1999 Building in Bushfire Prone Areas*
- *Australasian Fire Authority Council Guidelines*
- *Building in Bushfire-prone areas: Information and advice,* SAA HB 36-1993, Standards Australia, Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- *Bushfire Management Strategy (April 1998), Gold Coast City Council, Queensland*
- *Bushfire Prone Areas: Siting and Design of Residential Buildings* (1997), Queensland Department of Local Government and Planning, and Queensland Fire and Rescue Service
- *Construction of buildings in bushfire-prone areas,* Australian Standard (AS 3959:1999)
- *Planning for Bushfire Protection: A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners* (2001), New South Wales Planning and NSW Rural Fire Service
- *Protecting your home against bushfire attack (2000),* Department of Local Government and Planning

A11.6 Landslide

- *A Method of Zoning Landslide Hazard,* McGregor and Taylor (2001), Australian Geomechanics Journal Vol. 36, No. 3, September 2001
- *Australian Emergency Manuals Series Part III – Reducing the Community Impact of Landslides* (2001), Emergency Management Australia
- *Australian Landslide Database,* www.ga.gov.au
- *Forest clearing and landslides on the basalt plateaux of South East Queensland* (1984), W. F. Willmott
- *Geotechnical Risk Associated with Hillside Development,* Australian Geomechanics News, No. 10, (1985) Walker, B. *et al.*
- *Guidelines for Control of Slope Instability within the City of Gold Coast*, Gold Coast City Council, Queensland
- *Landslide Hazards in Hillside Development: The Geological Approach to Landslide Risk Assessment, Local Authority Assessment of Development Applications on Potentially Hazardous Slopes* (1982), W. F. Willmott
- *Landslip Hazard Mapping Report for Maroochy Shire Council,* Golder Associates, (2002), Maroochy Shire Council
- *Landslide Risk Management Concepts And Guidelines,* Australian Geomechanics Journal Vol. 35, No. 1, (March 2000) prepared by the Australian Geomechanics Society, Sub-committee on Landslide Risk Management
- *Landslip Study for the City of Gold Coast* (1999), Gold Coast City Council, Queensland
- *Natural Hazards and the risks they pose to South-East Queensland,* Granger and Hayne (editors) (2002), Geoscience Australia
- *Quantitative Landslide Risk Assessment of Cairns,* M. Leiba, F. Baynes and G. Scott, Australian Geological Survey Organisation, AGSO Record 1999/36.

- *Slope Stability and its Constraints on Closer Settlement on Tamborine Mountain, Southeast Queensland*, Willmott, Geological Survey of Queensland, 1981

A11.7 Climate Change

- *Climate Change and Australia's Coastal Communities* (2002), CSIRO
- *Climate change in Queensland under enhanced greenhouse conditions: first annual report, 1997-1998* (1999), Walsh, K. J. E., Allan, R. J., Jones, R. N., Pittock, A. B., Suppiah, R., and Whetton, P. H., Aspendale, Vic.: CSIRO Atmospheric Research
- *Climate change in Queensland under enhanced greenhouse conditions: second annual report, 1998-1999* (2000), Walsh, K. J. E., Hennessy, K. J., Jones, R. N., Pittock, A. B., Rotstayn, L. D., Suppiah, R., and Whetton, P. H., Aspendale, Vic.: CSIRO Atmospheric Research
- *Climate change in Queensland under enhanced greenhouse conditions - third annual report, 1999-2000* (2001), Walsh, K., Hennessy, K., Jones, R., McInnes, K. L., Page, C. M., Pittock, A. B., Suppiah, R. and Whetton, P., CSIRO consultancy report for the Queensland Government, Aspendale, http://www.dar.csiro.au/impacts/consult.html
- *Queensland Greenhouse Policy Framework: A Climate of Change*, Queensland Government (September 2001)
- *State Coastal Management Plan – Queensland's Coastal Policy*, Queensland Government (August 2001)
- www.longpaddock.qld.gov.au
- www.epa.qld.gov.au
- www.treasury.qld.gov.au
- www.transport.qld.gov.au
- www.dar.csiro.au
- www.marine.csiro.au
- www.greenhouse.gov.au
- http://www.pacinst.org/wildlife.html
- http://www.ipcc.ch/pub/SYRtechsum.pdf
- http://www.unep.ch/ipcc/pub/wg2SPMfinal.pdf

Abbreviations

AGSO: Australian Geological Survey Organisation
AEP: Annual Exceedance Probability
BMP: Bushfire Management Plan
BoM: Commonwealth Bureau of Meteorology
CASA: Civil Aviation Safety Authority Australia
COAG: Council of Australian Governments
CSIRO: Commonwealth Scientific and Industrial Research Organisation
DES: Department of Emergency Services
DFE: Defined Flood Event
DLGP: Department of Local Government and Planning
NR&M: Department of Natural Resources and Mines
EPA: Environmental Protection Agency
FATO: Final Approach and Take Off Area
GFA: Gross Floor Area
IDAS: Integrated Development Assessment System
IPA: *Integrated Planning Act 1997*
kPa: kilopascal
LDGL: Large Dangerous Goods Location
MCU: Material Change of Use
NDRA: Natural Disaster Relief Arrangements
NDRMSP: Natural Disaster Risk Management Studies Program
OLA: Obstacle Limitation Area
PMF: Probable Maximum Flood
QFRS: Queensland Fire and Rescue Service
RFL: Recommended Flood Level
SBR: *Standard Building Regulation*
SCARM: Standing Committee on Agriculture and Resource Management
State Coastal Plan: *State Coastal Management Plan – Queensland's Coastal Policy 2001*
SPP: State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide
VMA: *Vegetation Management Act 1999*

NOTES

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Diaster Mitigation Unit
Counter Disaster and Rescue Services
Department of Emergency Services
GPO Box 1425 Brisbane
Queensland 4001
Telephone: (07) 3247 8481
Facsimile: (07) 3247 8480

Copies of the State Planning Policy 1/03 Guideline: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* are available on the Department of Local Government and Planning's website at www.dlgp.qld.gov.au as well as Department of Emergency Services website at www.emergency.qld.gov.au

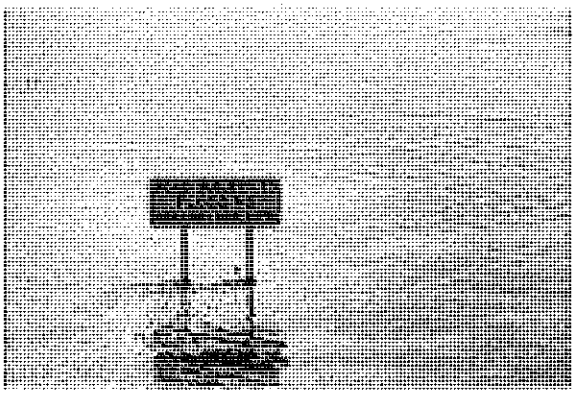
Queensland Reconstruction Authority

Planning for stronger, more resilient floodplains

Part 1 – Interim measures to support floodplain management in existing planning schemes

Australian Government
Geoscience Australia

Queensland Government



In developing this toolkit, the Queensland Reconstruction Authority has consulted more than 10 Local Governments and the Local Government Association of Queensland (LGAQ).

The sheer scope and scale of the weather events which affected Queensland last summer meant that to build and plan stronger, more resilient communities into the future, Councils need more comprehensive data to make informed decisions about how and where we build.

To assist Queensland Councils the Authority has undertaken the single largest floodplain mapping exercise in the State's history. The maps contained in the toolkit - *Planning for Stronger, more Resilient Floodplains* are drawn from evidence of past flooding, including soils, topography and satellite imagery.

They are informed by the 2010/11 summer disasters but do not represent the actual flood line for that period. Why? Because while the whole of Queensland was affected last summer, we know there have been larger floods in some areas in the past. What the maps do show are areas where inundation has previously occurred or is likely to occur. At the conclusion of this mapping exercise, floodplain mapping will be available for the whole of Queensland.

The State's river systems do not stop at local Government boundaries and so for the first time, these floodplain maps have also been developed on a catchment-by-catchment basis. And with them, comes the opportunity for Councils to adopt the floodplain maps and supporting developmental controls into existing planning schemes.

This guideline provides Councils – especially those who have perhaps historically lacked the resourcing capacity to undertake these types of studies - with a ready-made toolkit to help assess future development applications and the opportunity to better align floodplain management and land use planning.

The Queensland Reconstruction Authority wishes to thank in particular the Banana Shire Council and the Fitzroy Basin Association who have made significant contributions to the pilot program and who, along with the LGAQ, have provided input and support for its development.

Banana SHIRE

fba FITZROY BASIN ASSOCIATION

Planning for stronger, more resilient floodplains

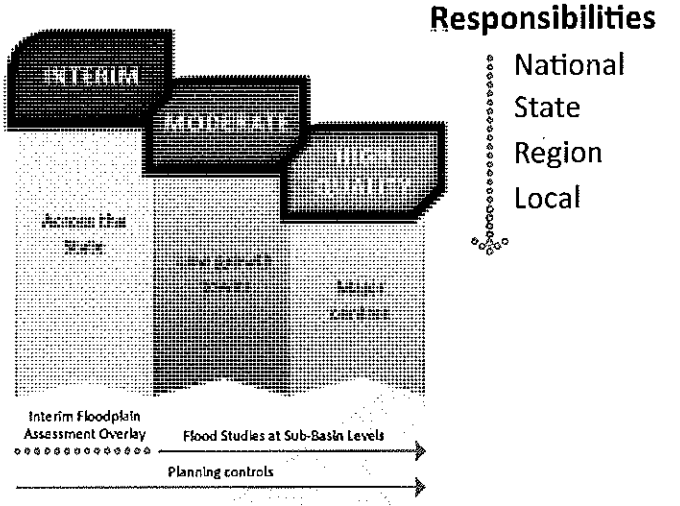
Queensland is a State of meteorological extremes, with floods occurring regularly across many parts of the State. From July to December 2010, this was no better demonstrated as Queensland experienced its wettest spring on record. In total, 13 major river catchments reached their highest recorded peak levels and 210 townships and suburbs were affected by flooding.

Most of our towns and cities are located on floodplains, both inland and coastal. This is an historical fact, principally for reasons associated with water supply, transportation, waste disposal, advantageous points for river crossings, access to productive soils or recreation purposes. Hence, these towns and cities will be subject to flooding from time to time.

Put simply, if we are to use floodplains for these purposes, we need to acknowledge and plan for flooding in a way that improves resilience of our built form and encourages the safety and well being for our communities and individuals.

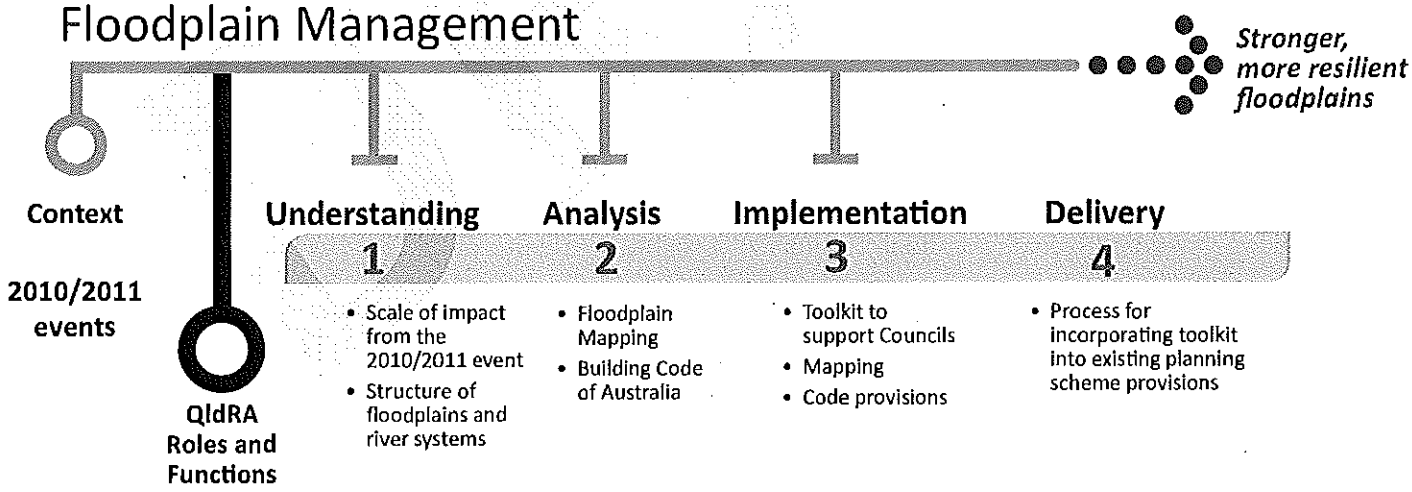
Seeing significant change in Queensland's floodplains will be generational – the full implementation of this improved resilience will be seen over time through specific shifts in local land use planning policy and development assessment decision-making that take account of the vulnerabilities of development in the floodplain. However, through interim changes to the way development is addressed in these risk areas, real steps can be taken now to ensure new development in Queensland's floodplains considers and responds to adverse flood events.

The key to ensuring our State copes with these flood events is improving the resilience of our communities. In response, the Queensland Reconstruction Authority (the Authority) has prepared this two part guideline ***Planning for stronger, more resilient floodplains.***



As demonstrated above, an important aim of ***Planning for stronger, more resilient floodplains*** is to provide a fit for purpose response to help Councils introduce consistent and specific planning controls to manage flood risks in the floodplain assessment area.

Part 1 represents a interim response that can be applied across the entire State. Part 1 includes the development of an *Interim Floodplain Assessment Overlay* incorporating a mapping product and supporting planning scheme provisions. A major driver of this Guideline is the ability to provide low growth Councils with workable products now, in lieu of detailed flood studies which will take significant time and resources to complete across the State. It is recognised that not all Councils will benefit from Part 1 as some Councils are well advanced with flood mapping and planning scheme provisions. However, all Councils can learn from recent events and incorporate the principles of floodplain management in the development and preparation of their new planning schemes.



The Authority acknowledges the following organisations that have provided their support to this important program of work:

- Geoscience Australia
- Banana Shire Council
- Fitzroy Basin Association
- Bureau of Meteorology
- CSIRO

Key information is provided throughout this Guideline. It is marked with this symbol. It has been provided courtesy of the Queensland Floods Science, Engineering and Technology Panel *Understanding Floods – Questions and Answers*. A full copy of this document can be downloaded from www.floodcommission.qld.gov.au

Introduction

During Summer 2010/2011 Queensland experienced unprecedented events that resulted in the entire State being disaster activated. Whilst flooding in Queensland is not rare, between November 2010 and April 2011, 91 per cent of the State was disaster activated as a result of flooding. The scale of the event of summer 2010/2011 has never before been seen.

The management of our floodplains is complex. Balancing the role of the floodplain from protection of agriculture and the environment, to stimulating economic growth and supporting new population growth is a difficult process to manage. Each has its role and arguably each is as important as the other.

To ensure that Queensland learns from the recent natural disasters the Authority has partnered with the Department of Local Government and Planning (DLGP) including Building Codes Queensland (BCQ), the Department of Environment and Resource Management (DERM) and the Department of Community Safety (DCS) to deliver a body of work supporting greater resilience and understanding of our floodplains and to better inform and influence the land use planning process.

An outcome of this partnership is the development of this Guideline, entitled ***Planning for stronger, more resilient floodplains.*** This is a two part Guideline aimed at raising awareness and represents the start of a journey to improve floodplain management throughout Queensland utlising the land use planning process.

To support this process, the Authority has partnered with Banana Shire Council (BSC), a Council that was significantly affected by events in December 2010/ January 2011. Together with the Fitzroy Basin Association (FBA) the BSC will embark on a journey to help improve the management of floodplains through the land use planning process.

Part 1 – ***Interim measures to support floodplain management in existing planning schemes*** delivers a toolkit that includes interim planning scheme measures and supporting mapping to those Councils who currently do not have any floodplain mapping. The mapping has been produced with the support of DERM and the mapping product provided represents an Interim Floodplain Assessment Overlay (Floodplain Maps). The Guideline also identifies a clear implementation path for those Councils that choose to adopt the interim code provisions and mapping.

Part 2 – ***Standard planning scheme provisions and flood study template*** will provide more detailed floodplain assessment guidance to Councils who are looking to prepare their new Planning Schemes under the Sustainable Planning Act 2009 (SPA).

An important aim of this Guideline is to help Councils introduce consistent and specific planning controls to manage flood risks in the floodplain assessment area.

About this Guideline

This Guideline has been developed to support Councils by offering interim fit for purpose measures to ensure that potential flooding impacts can be considered as part of the development assessment process. The Guideline is divided into four key parts:

1 Understanding

- Scale of impact from the 2010/2011 event
- Structure of floodplains and river systems

2 Analysis

- Floodplain planning
- Building Code of Australia

3 Implementation

- Interim Floodplain Assessment Overlay – Mapping
- Interim Floodplain Assessment Overlay – Code provisions

4 Delivery

- Proposed amendment process for existing planning schemes

Part 1 principally focuses on providing Councils with an assessment trigger allowing consideration of a development proposal's potential impact on the floodplain. As an interim solution, this Guideline does not offer a comprehensive solution for managing new or existing development in floodplain areas. It does however, offer those Councils and indeed applicants, additional scheme provisions to ensure that there is due consideration as to what and how a development proposes to respond to a potential flood impact. This toolkit does not replace or override any existing engineering development standards, such as local road design manuals or the *Queensland Urban Drainage Manual*. Critically, it also does not replace or diminish the need for disaster warning and response plans or evacuation procedures. Even after adopting the recommendations in this Guideline, people should not become complacent to the risk of flood.

Objectives

The main objectives of the Guideline are to:

- Promote a greater understanding of the scale and extent of floodplains in Queensland and their management
- Promote a greater correlation between floodplain management and land use planning
- Provide Councils with an information toolkit that they can adopt in a timely manner to provide interim measures to support development assessment
- Support a more resilient built form outcome in flood prone areas through additional interim planning scheme measures.

What will Part 2 contain?

Queensland is in a unique position as the majority of Councils are resolving to prepare new SPA compliant planning schemes. As Part 1 is an interim measure supporting existing planning schemes, Part 2 will build upon Part 1 to work towards a consistent approach of floodplain management in new planning schemes. To support this approach, Part 2 will address the following matters:

- Fit for purpose flood study template to help inform the strategic planning process developed in partnership with CSIRO and Bureau of Meteorology
- Standardised floodplain management provisions
- Advice on transition strategies for land uses, zoning recommendations and other key land use policy matters which effectively translates flood studies and floodplain management plans into land use plans using the Queensland Planning Provisions (QPP).

1 Understanding

Overview of events

During July to December 2010, extremely heavy rainfall was experienced across large parts of eastern Australia, with Queensland experiencing its wettest spring on record. This rain pattern was influenced by the strongest La Niña affect in the Pacific Ocean since the mid 1970s and as a result, Queensland's catchment areas were significantly saturated before major rain events occurred during November 2010 to April 2011.

- On 25 December 2010, the Category 1 Tropical Cyclone Tasha crossed the Queensland coast between Gordonvale and Ravenshoe
- Pre-existing weather conditions and sustained high rainfall between 23–28 December 2010 resulted in flooding in many parts of central and southern Queensland
- On 29 December 2010, Theodore was the first town to be fully evacuated in the history of Queensland. Condamine became the second township. Each was fully evacuated twice.
- On 10 January 2011, the townships of Maryborough, Bundaberg and Gympie were affected by rising floodwaters, leading to the widespread inundation of houses and businesses. Additionally, the Bruce Highway was cut in several locations
- On 10 January 2011, exceptionally heavy rainfall intensified in Toowoomba, culminating in unprecedented flash flooding within Toowoomba's Central Business District
- On 10 January 2011, a further torrent of water hit the Lockyer Valley where the towns of Grantham, Murphy's Creek, Postman's Ridge, Withcott and Helidon were severely affected
- On 11 January 2011, heavy rain continued in the Brisbane River catchment with flooding of Laidley and Forest Hill
- On 12 January 2011, the Bremer River in Ipswich had reached 18 metres while some low-lying Brisbane suburbs had already started to be inundated

Flooding snapshot 2010/2011

210 towns and suburbs were affected by flooding

13 river catchments recorded their highest peak levels

Total evacuation of a township, Theodore and Condamine (twice)

Critical infrastructure was affected

Rockhampton airport was closed

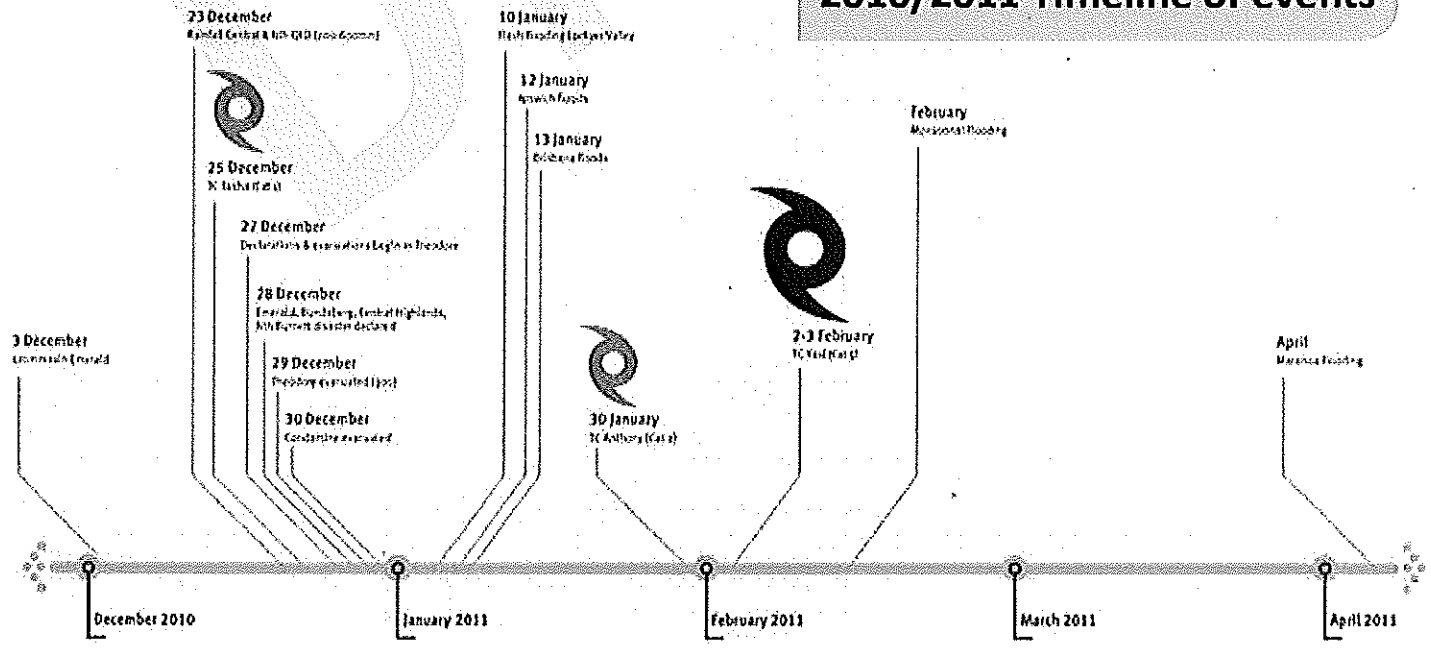
Water purification systems were flooded hampering clean up efforts and access to safe drinking water

50,000 km of road requires rebuild or repair

Damage bill from all disasters is $6.8B

- On 13 January 2011, the Brisbane and Bremer Rivers peaked at 4.46 metres and 19.5 metres respectively. These were lower than 1974 flood levels but the flooding caused significant inundation in both cities
- On 30 January 2011, Category 2 Tropical Cyclone Anthony crossed the coast close to Bowen, battering the coastal strip between Townsville and Mackay, depositing significant rainfall on already saturated areas
- On 3 February 2011, Category 5 Severe Tropical Cyclone Yasi struck. The largest severe cyclone to hit Queensland in recent times, it comprised a damaging core some 400 kilometres across with associated severe weather activity across 1000 kilometres of coastline, including a storm tide of more than five metres, peaking near Cardwell.

2010/2011 Timeline of events



Establishment of the Queensland Reconstruction Authority

The Authority was established through state legislation on 21 February 2011 as a statutory authority for the efficient and effective coordination of the reconstruction effort.

The Authority's mission is to reconnect, rebuild and improve Queensland, its communities and economy. This recognises that reconstruction starts house by house, street by street, community by community, industry by industry and results in a more resilient Queensland.

One of the core functions of the Authority is to respond to the disaster events of summer 2010/2011 and address both short and long term goals. The Authority has recognised a need for a greater understanding of the management of our floodplain specifically as it relates to land use planning outcomes.

Flooding and floodplains

Australia's floodplains are the commercial, social and ecological arteries of the nation. As such they constitute a national asset: an asset subject to damage when floods occur.

Most of our towns and cities are located on floodplains, both inland and coastal. This is an historical fact, principally for reasons associated with water supply, transportation, waste disposal, advantageous points for river crossings, access to productive soils or recreation purposes. Hence, these towns and cities subject to flooding from time to time.

Over time, uses in these areas have also become entrenched and in more recent times lifestyle, mobility and consumer sentiment has meant that these areas continue to be used for a range of commercial, social and ecological purposes. While these uses remain, so too will the potential risks when floods occur.

Put simply, if we are to use floodplains for these purposes, we need to acknowledge and plan for flooding in a way that improves resilience of our built form and encourages the safety and well being for our communities and individuals.

In Australia, flooding can be caused by four different mechanisms: heavy rainfall, storm surge, tsunami and dam failure. Rainfall and storm surge flooding create the most common and significant threats to social and economic well being of flood-prone communities. Tsunami and dam failure can result in catastrophic damage and likely loss of life. The probability of this type of flooding in Australia is low.

Thus, as devastating as recent events have been, they are not unique: 77 floods were recorded in Australia in the last 35 years of the 20th century; eight major floods were recorded in Australia in the 19th century and six in the first decade of the 21st century. Nature will undoubtedly continue to surprise us.

Floodplains are generally the more fertile areas of the continent. A significant proportion of Australia's agricultural output is produced on floodplains including irrigated agriculture. Regular flooding of these areas enhances agriculture by increasing soil moisture.

A floodplain is an essential component of a catchment, and floodplain management is a critical part of overall catchment management.

Cost of flooding

In Australia, floods are the most expensive type of natural disaster with direct costs for the period from 1967 to 2005 estimated at an average of $377 million per year (calculated in 2008 dollars).[1]

Until recently, the most expensive year for floods in Australia was 1974, when floods affecting New South Wales, Victoria and Queensland resulted in a total damage bill in today's figures of $2.9 billion. The Queensland Government estimates costs for the 2011 floods will exceed this figure with the damage to local government infrastructure estimated at $2.5 billion and the total damage to public infrastructure across the State at $6.8 billion. Conversely, and as discussed in section 3 – Implementation, flooding should be the most manageable type of natural disaster.

History of floodplain management

Floodplain management in Australia has evolved through four successive phases:

1. structural works
2. planning
3. flood emergency management
4. all-embracing management

During the structural works phase, predominantly in the 1970s, structural works (typically levees) were used to protect existing properties at risk. Little consideration was given to the use of levees and their potential impact on the environment, risk management planning or even land use planning. However, in 1974 a series of severe floods in New South Wales, Victoria and Queensland caused widespread and significant damage. The outcome was that a better understanding and regulation of levees was required.

In the 1980s and 1990s the importance of flood emergency management was brought into focus predominantly by the New South Wales Bogan River flood in April 1990 which required the forced evacuation of the town of Nyngan.

From the early 1990s the importance of an all-embracing approach to floodplain management was apparent with the States / Territories being far more advanced than previously in an integrated approach to floodplain management.

1 Floodplain Management in Australia, Best Practice Principles and Guidelines, SCARM Report 73, CSIRO Publishing

What factors contribute to floods?

Rainfall is the most important factor in creating a flood, but there are many other contributing factors. When rain falls on a catchment, the amount of rainwater that reaches the waterways depends on the characteristics of the catchment, particularly its size, shape and land use. Some rainfall is 'captured' by soil and vegetation, and the remainder enters waterways as flow. River characteristics such as size and shape, the vegetation in and around the river, and the presence of structures in and adjacent to the waterway all affect the level of water in the waterway.

So what exactly is floodplain management?

The objectives of floodplain management as determined by the Standing Committee on Agriculture and Resource Management (SCARM) are to:

- limit to acceptable levels the effect of flooding on the well-being, health and safety of flood-prone land, individuals and communities
- limit to acceptable levels the damage caused by flooding to private and public property
- ensure that the natural function of the floodplain – to convey and store floodwaters during a flood – is preserved
- encourage the planning and use of floodplains as a valuable and sustainable resource capable of multiple, but compatible, land uses of benefit to the community

Floodplain Management Process

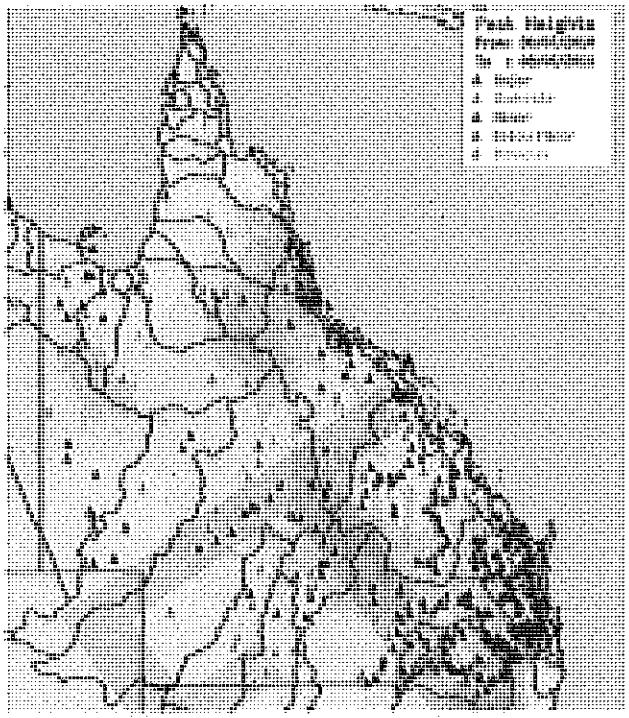
Ultimately the best way to manage our floodplains is through an integrated and approriate mix of measures which are specific for each floodplain area.

The floodplain management process typically encompasses three sequential stages[2]:

- Flood Study – a technical study to determine the nature and extent of flooding
- Floodplain Risk Management Study – an options assessment which evaluates management measures and options for the floodplain in respect to both existing and future development
- Floodplain Management Plan – formal adoption of a plan of management for the floodplain.

The time scale for this process can be in excess of 2 years and includes extensive community consultation. It is well understood that comprehensive community consultation throughout the floodplain management process leads to greater community acceptance of the outcomes. Without appropriate community consultation the estimate of flood risk can often be incorrect. This Guideline should be seen as part of a continuum towards best practice in mapping and managing risk in floodplains.

[2] Mark Babister, WMA Water, Natural Disaster Insurance Review August 2011



Peak heights during the 2010/2011 summer event. Source: *Bureau of Meteorology*

Six major floods occurred in Brisbane between 1885 and 1910, followed by more than 60 years without a major flood

Size of Flood (chance of occurrence in any year) ARI/ (AEP)	Probability of Experiencing the Given Flood in a Period of 70 Years	
	At least once	At least twice
1 in 10 (10%)	99.9%	99.3%
1 in 20 (5%)	97.0%	86.4%
1 in 50 (2%)	75.3%	40.8%
1 in 100 (1%)	50.3%	15.6%
1 in 200 (0.5%)	29.5%	4.9%

Probabilities of experiencing a given size flood once or more in a lifetime. Modified from *Floodplain Development Manual: the management of flood liable land, NSW Government, 2005*

ARI – Average recurrence interval

AEP – Annual Exceedance Probability

How do we estimate the chance of a flood occurring?

Understanding the chance of different sized floods occurring is important for managing flood risk. The chance of a flood event can be described using a variety of terms, but the preferred method is the Annual Exceedance Probability (AEP). A flood with a 1% AEP has a one in a hundred chance of being exceeded in any year. Currently, the 1% AEP event is designated as having an 'acceptable' risk for planning purposes [illegible] in Australia. However, good planning needs to consider more than just the 1% AEP flood.

Understanding the River Systems

Understanding Australia's river systems is integral to developing an appropriate interim land use planning and mapping solution. This exercise has been instrumental to guide and direct how to best map, plan and therefore manage appropriate land use responses.

In Australia there are twelve drainage divisions (Figure 1). Drainage divisions do not stop at state or territory boundaries and they continue until they terminate at the sea, ocean or inland lake.

Queensland hosts part of five (S) of these drainage divisions including:

- Northeast Coast (1)
- Gulf of Carpentaria (9)
- Murray Darling Division (4)
- Bulloo – Bancannia Division (10)
- Lake Eyre Division (11)

Within each drainage division there are several major river basins. Like the national drainage divisions, there are no river basins in Queensland that correlate with Local Government Areas. Therefore, the majority of Local Government Areas will contain several major river basins. There are 246 major river basins nationally, 7S of which are located in Queensland (Figure 2):

- Northeast Coast Division – 46 River Basins
- Gulf of Carpentaria Division – 19 River Basins
- Murray Darling Division – 5 River Basins
- Bulloo – Bancannia Division – 1 River Basin
- Lake Eyre Division – 4 River Basins

Major river basins usually comprise multiple rivers that converge on the river after which the river basin is named. For example, the Fitzroy River Basin includes the prominent rivers of Dawson and Nogoa, which drain into the Fitzroy River. Therefore, each river basin is usually comprised of one or more Sub-Basins. Again, for example, the Fitzroy River Basin is further divided into the following Sub-Basins:

- Isaac River Sub-Basin
- Nogoa River Sub-Basin
- Comet River Sub-Basin
- Dawson River Sub-Basin
- Mackenzie River Sub-Basin
- Fitzroy River Sub-Basin

Just like the major river basins, Sub-Basins do not correlate with Local Government Area (LGA) boundaries. Figure 3 shows the Dawson River Sub-Basin.

By understanding how our major river systems are governed, it can help identify the best way to adopt a standardised approach to land use planning provisions. Given the importance of what happens within a sub-basin, it is recommended that the best management of floodplains is for planning to be undertaken at a sub-basin level. This means that every LGA is likely to have more than one sub-basin within their LGA boundaries and the size of the sections of Sub-Basins they contain will vary. This underlines the need for the preparation of the Floodplain Management Plans to be a collaborative exercise and the traditional means of relying on individual local governments to prepare these plans should be reconsidered.

Local Government boundaries do not correlate with river systems or basin boundaries.

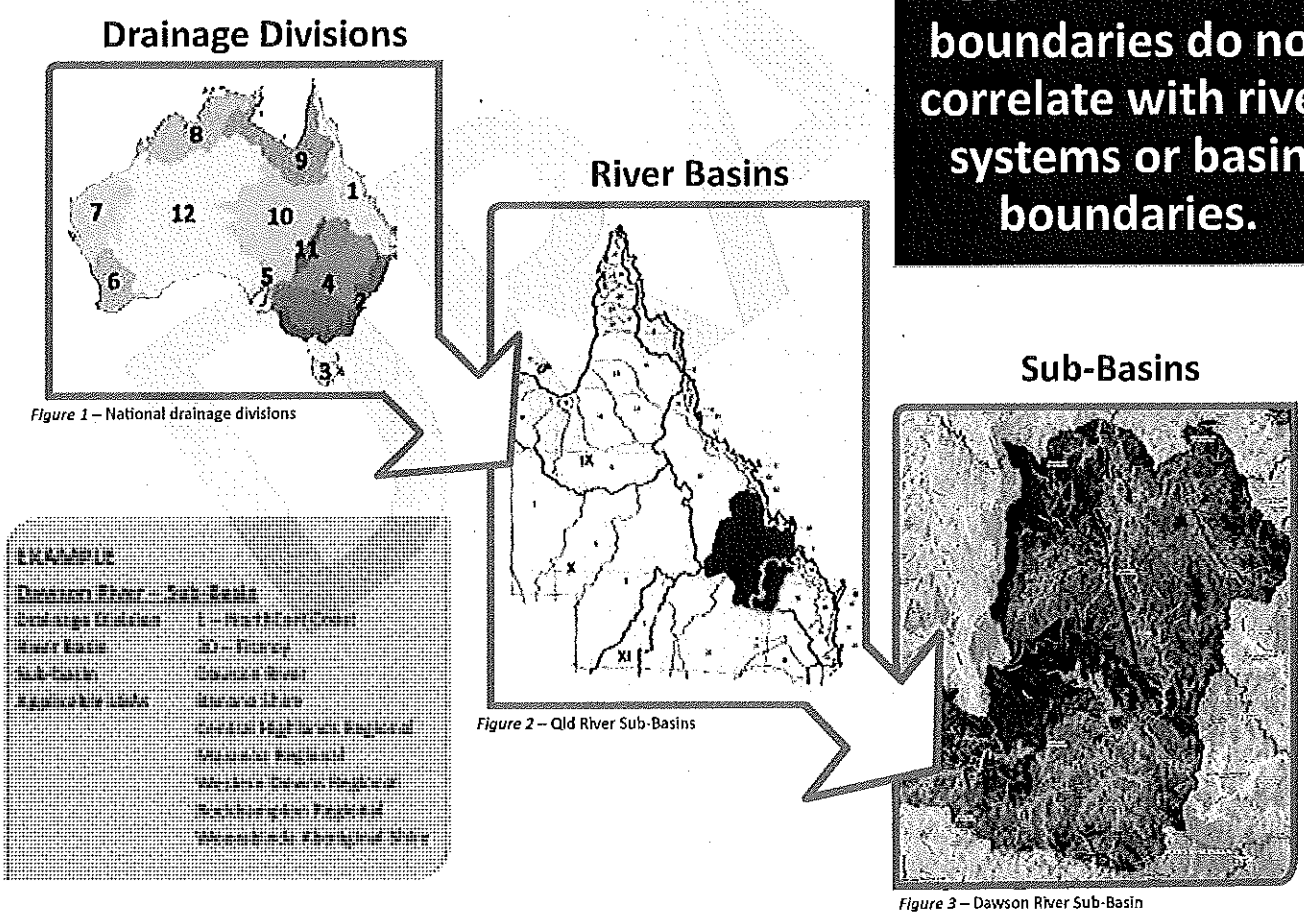


Figure 1 – National drainage divisions

Figure 2 – Qld River Sub-Basins

Figure 3 – Dawson River Sub-Basin

2 Analysis

Australia, and in particular Queensland, is prone to a long list of natural hazards, including flooding, cyclones, severe storms, bushfire, landslide and earthquakes.

The recent flood events seen across the State have highlighted the importance of considered land use planning that responds to the risks presented by natural hazards and particularly flooding.

Understanding how our river systems work here in Queensland acknowledges that an integrated approach to land use planning on floodplains is required to bring together the diverse issues and stakeholders that affect, or are affected by, floodplain management. This approach takes flooding behaviour, flood risk and flood hazard into account, along with all other relevant planning factors.

The end product of this process is a floodplain management plan that facilitates the use of the floodplain for appropriate purposes; limits flood hazard, and damage to socially acceptable levels; enhances the waterway and floodplain environment; and fosters flood warning, response, evacuation, clean-up and recovery in the onset and aftermath of a flood.

Floodplain Monagement in Australia – Best Practice Principles recommends the adoption of an approach to floodplain management at a total catchment (sub-basin) level beyond the LGA boundaries.

This sub-basin perspective is needed in order to manage effectively the result of existing development and the cumulative effects of future development on stormwater and mainstream flooding. This perspective includes both the upstream and downstream implications of proposed land use developments and floodplain management activities.

This approach will require collaboration from many stakeholders to support the ultimate goal of integrated management of our floodplains. This approach should extend beyond the development assessment process.

Traditionally a flood study is a comprehensive technical investigation of flooding behaviour that defines the extent, depth and velocity of floodwaters for floods of various magnitudes.

There are two principle components to a flood study:

Hydrologic analysis or estimation of flood discharges for floods of various magnitudes.

Hydraulic analysis or determination of the extent, depths and velocities of flooding.

This level of detail is not always required to facilitate improved floodplain management. In recognition of the time and cost to prepare detailed flood mapping and studies by Councils, the Authority, with the support of DERM, commenced a mapping exercise in June 2011 to establish interim mapping of floodplains to support Councils' existing planning schemes.

The dataset to inform the interim mapping product to be identified as *Interim Floodplain Assessment Overlay* (Floodplain Maps) was developed using the following overall principles:

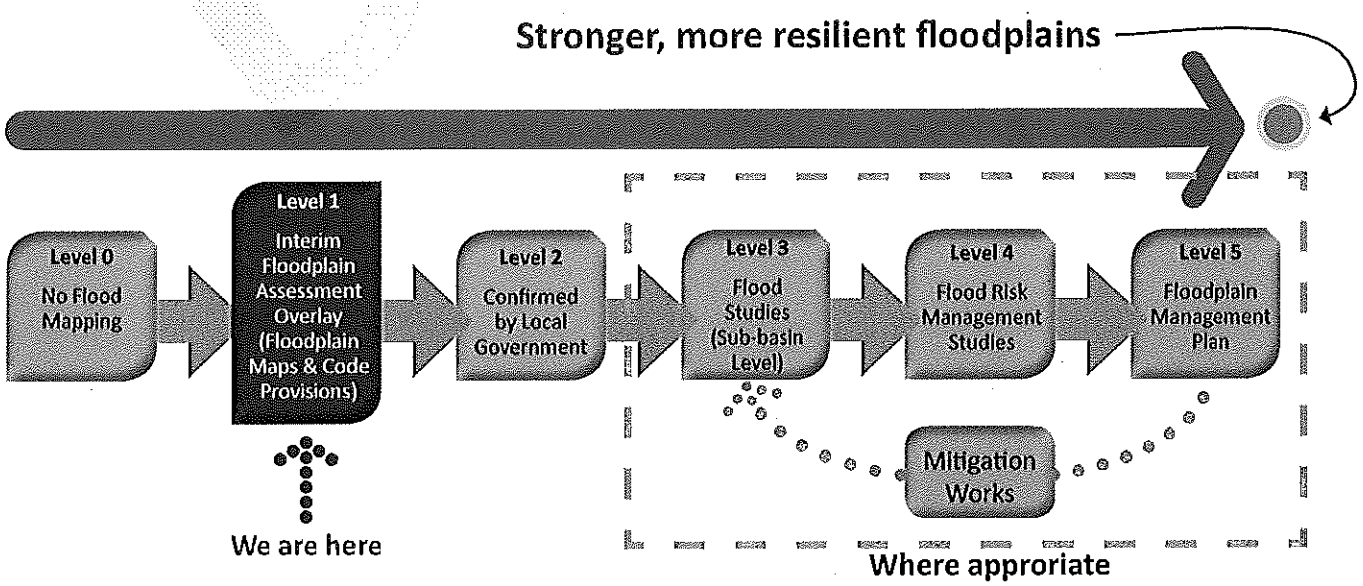
- suitability for a Statewide approach
- a consistent approach
- repeatable if more accurate data is available in the future
- evidential and justifiable

In terms of a maturity model for floodplain mapping, the Floodplain Maps are at level one and provide a framework for communities to decide priorities for more detailed flood studies (*Refer to Figure 4*).

Flood Mapping Maturity Levels

Level 0	No Flood Mapping
Level 1	Sub-Basin 'Interim Floodplain Assessment Overlay Mapping'
Level 2	Confirmed (by local govt) Floodplain Assessment Overlay Mapping. Potential to adopt as equivalent to Probable Maximum Flood defined at Sub-Basin level.
Level 3	Flood Studies completed in priority areas.
Level 4	Flood Risk Management Study
Level 5	Implemented Floodplain Management Plan

Figure 4 – Flood Maturity Mapping Model



The following is an overview and summary of each dataset used in the compilation of the floodplain maps:

Land zone 1

general term: estuarine (tidal flats and beaches)

Quaternary estuarine and marine deposits subject to periodic inundation by saline or brackish marine waters. Includes mangroves, saltpans, off-shore tidal flats and tidal beaches. Soils are predominantly Hydrosols (saline muds, clays and sands) or beach sand.

Land zone 3

general term: alluvium (river and creek flats)

Quaternary alluvial systems, including floodplains, alluvial plains, alluvial fans, terraces, levees, swamps, channels, closed depressions and fine textured palaeo-estuarine deposits. Also includes estuarine plains currently under fresh water influence, inland lakes and associated dune systems (lunettes). Excludes talus slopes, colluvial deposits and pediments. Includes a diverse range of soils, predominantly Vertosols and Sodosols, also with Hydrosols in higher rainfall areas.

SALI Soil Limitation Mapping

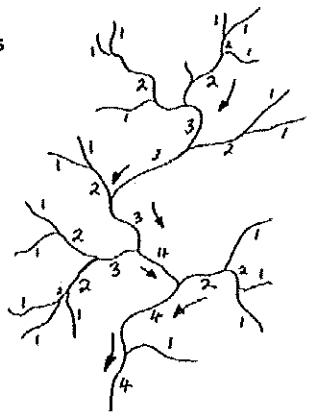
Refers to a soil type which has a limitation of flooding. Soil qualities and limitations are properties that can be assessed on an individual soil material basis and can affect the viability and sustainability of land uses.

Contours

Contour data with 10 metre vertical intervals available over the whole State has been used. In some selected cases to aid the visual interpretation, other available contour information has been used.

Stream Orders

Starting at the headwater, the stream is assigned number one to be made 1st order. As several 1st order streams converge the resultant stream becomes 2nd order. Two 2nd order streams converging form a 3rd order, etc. This is known as the Strahler Method. The number of orders in Queensland's Sub-Basins vary. The Dawson River sub-basin for example is classified to a 9th order. Flooding can occur in the headwater streams (ie. 1st order), but is more likely to be significant in higher order streams. For each sub-basin the appropriate stream orders have been selected to use in developing the Floodplain Mapping.



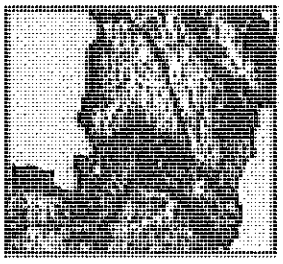
Imagery

Aerial imagery across the State is captured using different modes. The most common is through Landsat 5. Landsat 5 is the fifth satellite of the Landsat program. It was launched on 1 March 1984, with the primary goal of providing a global archive of satellite images. The program is managed by United States Geological Survey (USGS), and data from Landsat 5 is collected and distributed from the USGS's Center for Earth Resources Observation and Science. Australia like many countries has an agreement with the USGS where new satellite imagery is downloaded every 16 days and provided to Geoscience Australia. The imagery has a pixel resolution of 30 metres. In addition to Landsat more detailed aerial photography captured at the time of a flood over a town and cities has been used where available. During the summer 2010/2011 events, approximately 100 towns were captured with high resolution aerial imagery.

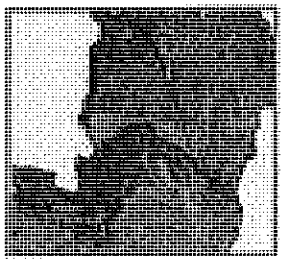
What are Land Zones?

Land zones represent major differences in geology and in the associated landforms, soils, and physical processes that gave rise to distinctive landforms or continue to shape them (Sattler and Williams 1999). Land zones are generally derived by amalgamating a range of geological, land system and/or soil mapping units at 1:100 000 to 1:250 000 scale. *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland. Version 3.1. Updated September 2005. Queensland Herbarium*

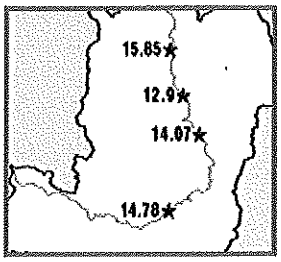
This is the largest mapping exercise currently underway in Australia. The mapping has been undertaken at a sub-basin level. Many Councils may have more than one sub-basin within their Local Government Area.



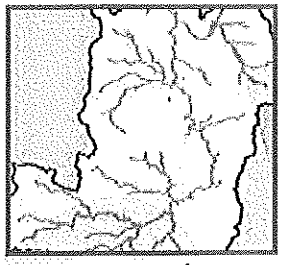
Contours



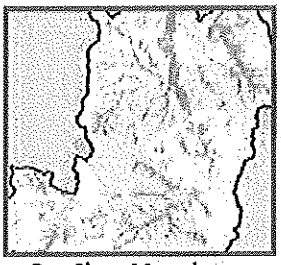
Landsat



Gauging Heights



Stream Orders

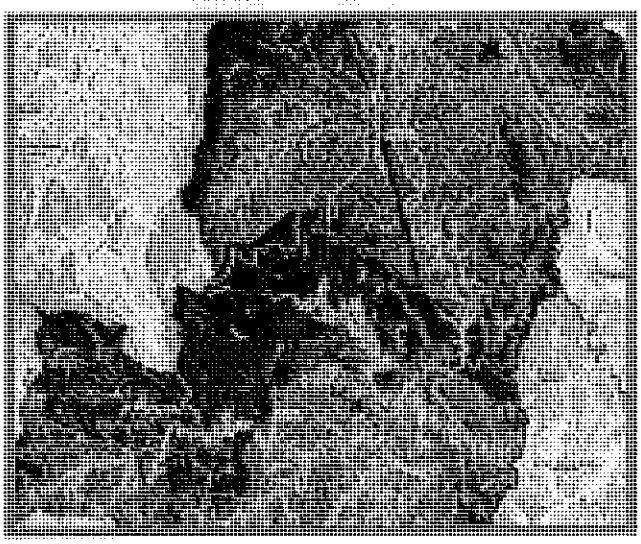


Pre Clear Mapping

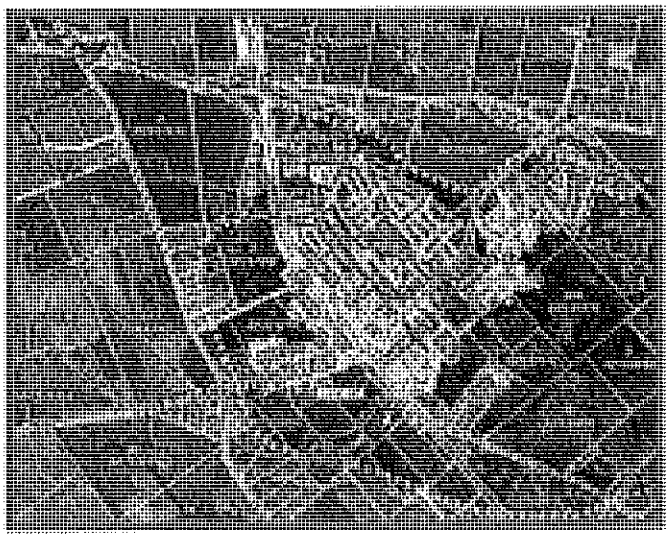
Aerial Tubes – Theodore

The mapping product will be provided to Councils as:

- a Mapbook (a series of A3 Mapsheets covering the whole sub-basin) in both electronic and hard copy format;
- digital data compatible with geographic information systems (GIS) and
- interactive lot and plan search
- all mapping is available at www.qld.gov.au/floodcheck
- Until the mapping is locally verified and checked by Council it will remain as interim.



Example: Interim Floodplain Assessment Overlay for the Dawson River Sub-basin



Example: Interim Floodplain Assessment Overlay for the town of Biloela

3 Implementation

Planning for stronger, more resilient floodplains is a journey towards achieving better floodplain management through the land use planning process. Whilst not all Councils require assistance in achieving this objective, some do and may benefit from the use of this Guideline.

Floods are the most manageable of all natural disasters. Unlike other natural disasters, generally there is an understanding of where floods will occur and estimates of the likelihood of flooding, flood behaviour and the consequences of flooding in some cases. On the other hand the unpredictability of Severe Tropical Cyclone Yasi meant it was not known when it would make landfall until just hours before it crossed the coast. Therefore, through a combination of learning from the Yasi experience and analysing its aftermath, we can plan more efficiently for similar events and, at the same time, create more resilient communities.

New Construction Standards

The Australian Building Codes Board has developed a draft national Standard for Construction of Buildings in Flood Hazard Areas (draft Standard), which is scheduled to be introduced into the Building Code of Australia (BCA) in 2013, following appropriate consultation. The scope of the draft Standard is limited to class 1 (houses and townhouses), class 2 (units and flats), class 3 (hotels, motels and backpackers), class 4 (caretakers dwelling), class 9a (health care) and class 9c (aged care) buildings. It provides specific performance requirements and deemed-to-satisfy (DTS) provisions for the design and construction of new buildings in a flood hazard area, as designated by the relevant authority (ie. Local Government).

DLGP is proposing early adoption of the draft Standard as a new mandatory part of the Queensland Development Code (QDC). Additional non-mandatory provisions, which are currently outside the scope of the draft Standard, are also proposed to be included in the QDC to be adopted by Local Governments on a voluntary basis through a planning scheme, Temporary Local Planning Instrument, or by resolution. It is proposed that the new QDC will apply to new buildings and additions to existing buildings, but not generally to building alterations (for example, internal repairs such as adding bathroom or removing a wall).

However, unless there is appropriate mapping to indicate a building is within a flood prone area, these new provisions may not be triggered.

Temporary State Planning Policy

To assist in this process the Authority partnered with DLGP to implement a new Temporary State Planning Policy (TSPP) – Planning for stronger, more resilient floodplains – which creates the statutory mechanism by which a Local Government may look to adopt the Interim Floodplain Assessment Overlay as part of their existing planning scheme.

The TSPP suspends the effect of paragraphs A3.1 and A3.2 of Annex 3 of State Planning Policy 1/03 Mitigating the Adverse Impacts of Flood, Bushfire and Landslide, which identifies the process by which a Local Government may designate a Natural Hazard Management Area (Flood) (NHMA).

The effect of the TSPP is to allow amendments to an existing planning instrument under the SPA for a Natural Hazard Management Area (Flood) to include:

1) land inundated by a Defined Flood Event (DFE) and identified in a planning instrument; or

2) the Interim Floodplain Assessment Overlay mapping and Model Code provided by the Queensland Reconstruction Authority; or

3) the Interim Floodplain Assessment Overlay mapping and Model Code as amended by the relevant Local Government.

The TSPP therefore gives effect for a Local Government to designate a NHMA (Flood) to be adopted either in the current form provided by the Authority or as amended by the Local Government following a visual assessment through a minor planning scheme amendment process, provided that the amendment does not deviate from the intent of the interim provisions and the purpose as outlined in this Guideline and the TSPP. A Temporary Local Planning Instrument (TLPI) may also be an option for adoption of the mapping and code provisions however, preference is for a minor scheme amendment process be followed.

The TSPP remains in effect for a period of 12 months. It is expected that these amendments will be taken into consideration in the review of the SPP1/03 and an amendment of SPP1/03 will be undertaken prior to the expiry of the TSPP.

Interim Toolkit supporting the TSPP

Part 1 of this Guideline provides a voluntary interim toolkit which includes the Interim Floodplain Assessment Overlay (IFAO). The IFAO includes:-

- Interim Floodplain Assessment Overlay Maps (Floodplain Maps) prepared by the Authority in both digital and hard copy; and
- Interim Floodplain Assessment Overlay Model Code (Model Code).

It is acknowledged that not all local governments require this interim tool. Councils with adequate provisions and mapping will not need this Guideline. The response needs to be fit for purpose recognising the differing needs of each local government. However, even for those Councils who feel that there are adequate provisions within their existing scheme, the floodplain maps may help to:

- inform the strategic planning process for the preparation of their new QPP compliant planning scheme; and
- identify an area for the purpose of triggering the relevant building assessment provisions, if their existing flood mapping does not already perform this function.

For those Councils wishing to adopt the interim provisions, this can be done through incorporating a new section into the existing planning scheme, titled "Interim Floodplain Assessment Overlay" and incorporating as a minor amendment to the planning scheme. Alternatively, a Council may use a TLPI however the minor amendment process is preferred given the limited timeframe associated with TLPIs. Further advice in relation to the interim tool and how it can be implemented is provided in section 4 of this Guideline.

The Floodplain Maps provided (as well as an adopted flood level) can also be used by Councils to trigger the relevant building assessment provisions for construction of buildings in flood hazard areas. This applies to both the current suite of building provisions and those soon to be implemented through the proposed amendments to the QDC.

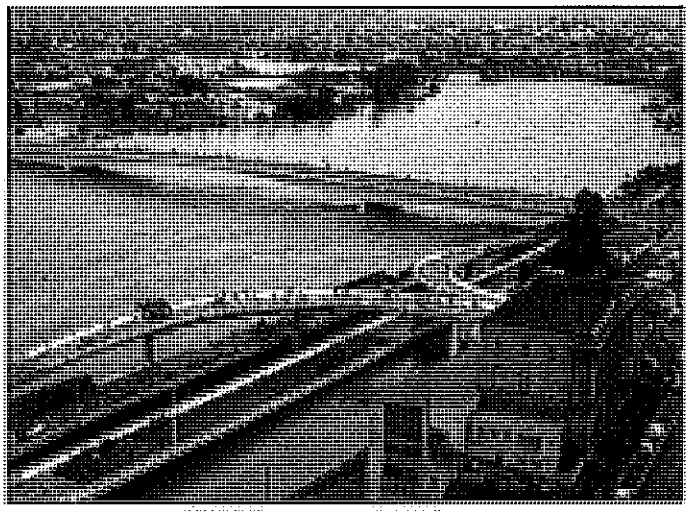
It is also important to note the adoption of the Floodplain Maps is not proposed to alter the level of assessment for development within the overlay area. It simply utilises the existing levels of assessment prescribed in the Table of Development for an area. Therefore, the adopted Floodplain Maps will be used as a trigger for already Assessable Development to be assessed against the Model Code. Any changes to the levels of assessment will require specific consideration by Council and DLGP as part of the amendment process.

Mapping

The Interim Floodplain Assessment Overlay (Floodplain Maps) are being produced across the State. As per section 2 of this Guideline, the Floodplain Maps have been derived by overlaying best available statewide information sources. Individual maps have been designed for display with the cadastre at 1:50,000 scale to allow for properties to be located in respect to the floodplain area.

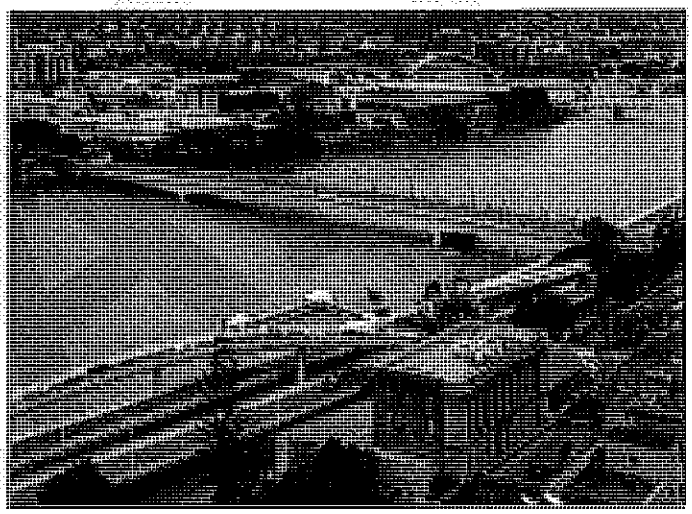
By the end of October 2011, this project will have mapped 40 per cent of the State's area, which when combined with existing flood mapping represents coverage for approximately 90 per cent of the State's population. By mid 2012, Floodplain Maps for relevant areas of the entire State will be available.

Further information on the mapping products, including current coverage and availability can be found at **www.qld.gov.au/floodcheck**

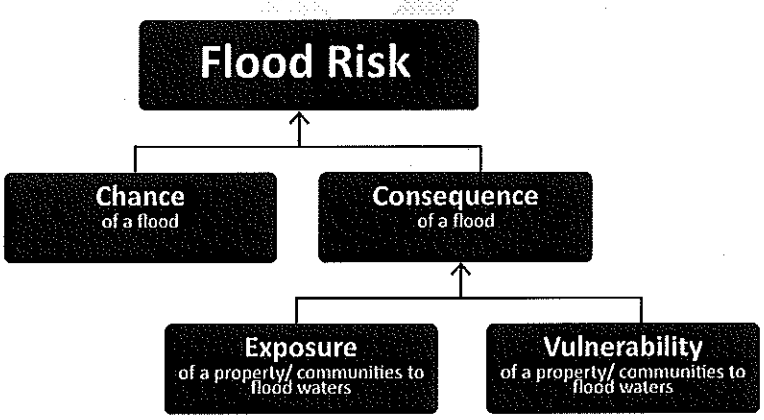


Brisbane River in flood 1974 *Source: Queensland State Archives*

Example: Interim Floodplain Assessment Overlay for the town of St George in Balonne Shire Council



Brisbane River in flood 2011 *Source: Queensland Reconstruction Authority*



Components of Flood Risk

Source:- Queensland Floods Science, Engineering and Technology Panel Understanding Floods – Questions and Answers

How do we manage flood risks?

Flood risk includes both the chance of an event taking place and its potential impact. Land use planning informed by floodplain management plans can reduce risk for new development areas. Flood risk is harder to manage in existing developed areas however modification measures such as dams or levees can change the behaviour of floodwaters. Similarly, property modification measures can protect against harm caused by floods to individual buildings, and response modification measures help communities deal with floods.

Planning scheme provisions – Model Code

To support the Floodplain Maps an Interim Floodplain Assessment Overlay Model Code (Model Code) can be applied in assessing any assessable development on land wholly or partially within the area shown on the Floodplain Maps.

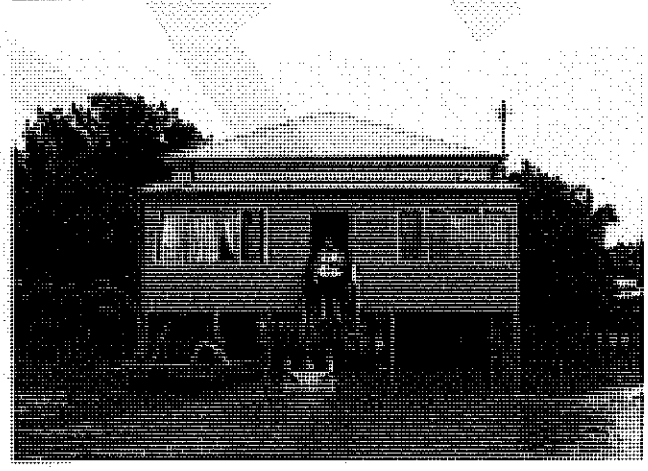
The Model Code is provided in ***Schedule 1***.

Councils may decide on the types of development to which the Model Code applies.

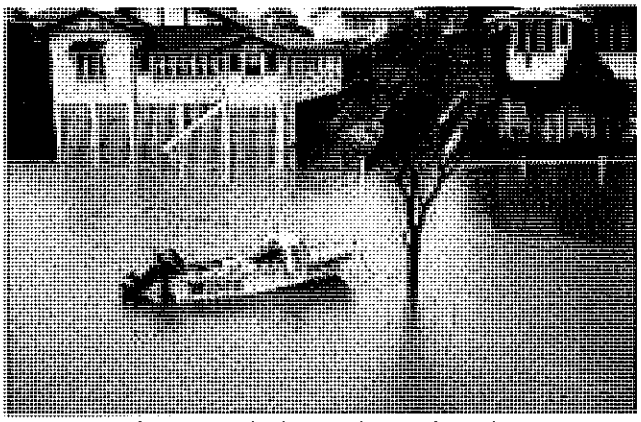
The purpose of the code is to manage built form outcomes in the floodplain so that risks to life and property during future flood events are minimised, and to ensure that future development does not increase the potential for flood damage on site or any other property.

For clarity and consistency, all development-related terms defined elsewhere in other Queensland legislation (such as the *Sustainable Planning Act 2009, Dangerous Goods Safety Management Act 2001*) have the same meaning in this Guideline and its Schedules.

To demonstrate the practical application of the Interim Floodplain Assessment Overlay (including the Floodplain Maps and the Model Code) in a development assessment context, a number of case studies are provided follwing ***Schedule 1*** of this Guideline. This identifies how certain types of assessable development would be assessed against the Model Code.



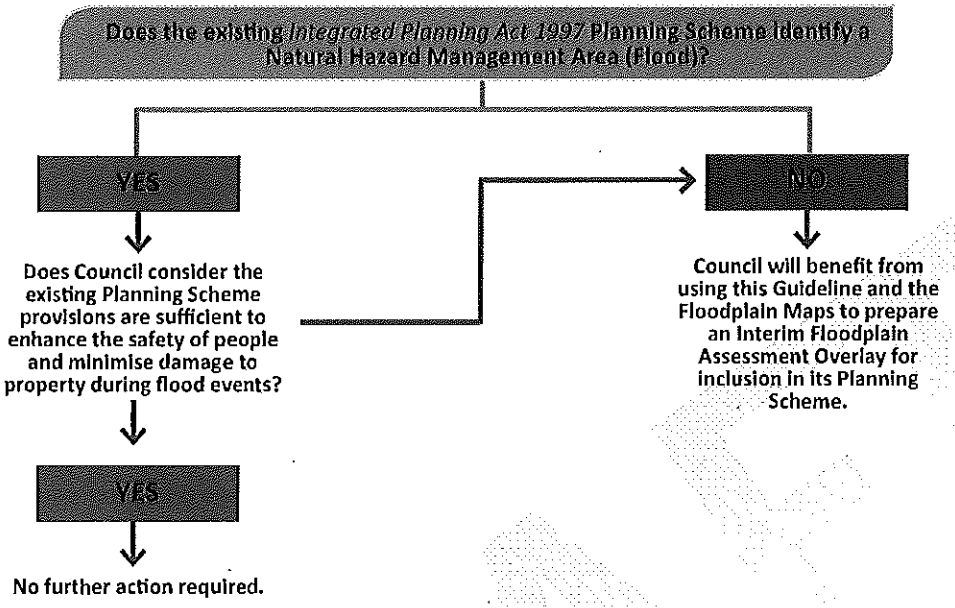
The traditional 'Queenslander' style home was designed to allow the cool breezes to circulate through the house in the hot summer and to let flood waters flow underneath.



Images sourced from:- Queensland Image Library and Getty Images

4 Delivery

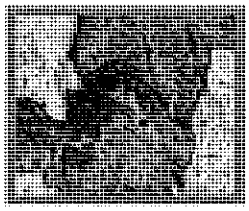
The following flow chart has been prepared to help Councils decide if the interim solution should be considered and adopted within their existing planning scheme.



Understanding the operation of an overlay

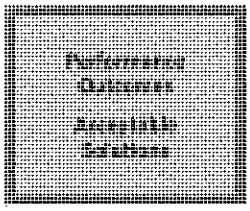
The IFAO includes the Floodplain Maps that for already assessable development will trigger assessment against the additional provisions included in the Model Code. The IFAO can be incorporated into the planning scheme as a new section titled "Interim Floodplain Assessment Overlay". In other words, development identified within the specific mapped area (Floodplain Maps) will trigger an additional set of provisions (Model Code) that will be used to assess development applications within the overlay area.

The IFAO does not necessarily change the level of assessment for development within the mapped overlay area. However, Councils can use the IFAO to change levels of assessment if they choose to do so.



Floodplain Maps

+



Model Code Provisions

= Interim Floodplain Assessment Overlay

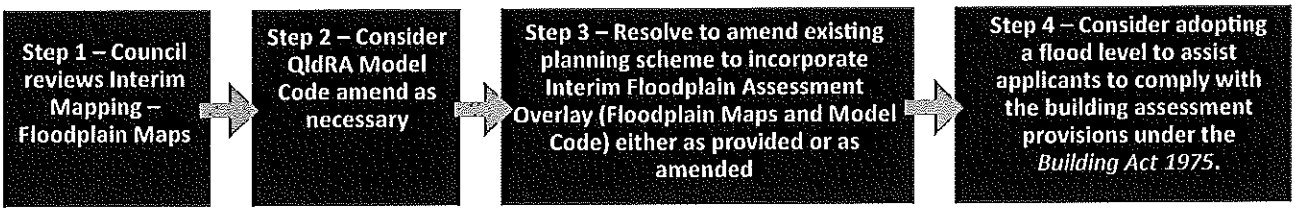
Incorporation into existing Planning Schemes

Existing Planning Schemes in Queensland utilise a number of approaches to trigger additional provisions for certain areas and sensitive development within Local Government areas. The Table below provides a simplified explanation of how the IFAO might be incorporated into different planning schemes across the State.

Existing planning scheme	Incorporation method
Planning Scheme uses overlays which, when assessing development in a particular (mapped) area to which the overlay applies, triggers an additional set of provisions or regulation. *For example some Planning Schemes may include existing overlays such as Acid Sulphate Soils Overlay, Conservation Overlay and Road and Rail Noise Impacts Overlay.*	Include an additional overlay in the 'Overlays' part of the Planning Scheme entitled 'Interim Floodplain Assessment Overlay' which will include reference to the Floodplain Maps and the additional provisions included in the Model Code.
Planning Scheme does not include an 'Overlays' section, rather uses the 'Codes' Part of the planning scheme to identify area codes that are based on mapping and trigger additional provisions for development within that area. *For example some Planning Schemes may include existing area codes such as Biodiversity Code, Heritage Place Code and Aviation Area Code.*	Include an additional code in the "Codes" Part of the Planning Scheme entitled 'Interim Floodplain Assessment Code' which will act as an area code and will include reference to the Floodplain Maps that will trigger the additional provisions included in the new 'Interim Floodplain Assessment Code'.

Process

If Councils decide this Guideline is applicable to their local government area, Councils can follow the steps below to adopt an Interim Floodplain Assessment Overlay within their existing Planning Scheme.



Step 1 Review Interim Floodplain Assessment Overlay – (Floodplain Maps)

The Authority will provide all Local Governments with a copy of the relevant Floodplain Maps for their Local Government Area. The Floodplain Maps have been developed using the best data available statewide to the Authority. More detailed data, information, local knowledge and records may be readily available to Local Governments. Accordingly, while Councils can choose to adopt the Floodplain Maps in their current form, the Authority strongly encourages local governments to consider the Floodplain Maps and ascertain whether they identify all of the areas within the Local Government Area that are potentially subject to flooding.

Councils can amend the Floodplain Maps prior to inclusion in a Planning Scheme.

In particular, it is important to recognise that larger, rarer floods may be experienced which exceed the adopted Floodplain Maps, which might require further consideration by Councils particularly if more detailed local information is available. In reviewing and adopting the IFAO, Councils should have regard to:

- the extent of inundation experienced during the Summer 2010 -2011 flood event
- the extent of inundation experienced during other flood events
- other available data sources such as historic records, flood studies or floodplain modelling.

Step 2 Review Interim Floodplain Assessment Overlay (Model Code)

The Model Code has been prepared by the Authority to provide a standard tool for Assessment Managers to ensure suitable measures are adopted by development in areas potentially at risk of flooding.

The Model Code may be adopted without amendment by Councils as an interim measure for floodplain management. This will be the case particularly for those Councils who currently have no Planning Scheme measures to regulate flooding or floodplain management in their existing Planning Schemes.

Alternatively, Councils may decide to enhance the Model Code with additional or alternative provisions that better reflect their area's local topographical or hydrological circumstances prior to adoption. This is particularly relevant for those Councils that already have an assessment code in their Planning Schemes that deals with flood hazard.

As the Model Code has been oriented to local government areas without flood mapping, Councils with existing Planning Scheme provisions related to flood may in fact have more robust planning provisions than the Model Code for the assessment of flood hazard. It would be prudent for those Councils to consider how the Model Code would integrate into that existing suite of flood hazard provisions. It will be important for those Councils to ensure that the adoption of the Model Code does not in fact reduce the capability of Councils to assess and decide development applications in flood hazard areas.

Step 3 Resolve to amend the Planning Scheme

The IFAO can be incorporated into the planning scheme as a new section titled "Interim Floodplain Assessment Overlay", which includes the Floodplain Maps that trigger assessment of Assessable Development against the Model Code.

To adopt these measures and incorporate them into the planning scheme, Council must resolve to:

1. Adopt the Floodplain Maps either as provided or as amended
2. Adopt the Model Code either as provided or as amended
3. Adopt the Floodplain Maps as a NHMA (Flood)
4. Make an Amendment to the Planning Scheme to include:
    - A new section titled "Interim Floodplain Assessment Overlay" including the Floodplain Maps and the Model Code

The amendment to the Planning Scheme must be undertaken in accordance with the Statutory Guideline 02/09 prepared by the Planning Minister under Section 117 of the SPA (Making and Amending a Local Planning Instrument).

It is acknowledged that a TLPI is an option available for the adoption of the IFAO however, this process is not preferred given timeframes and the need for State Interest Review. It is preferred that Councils follow this Guideline and the intent of the TSPP which supports a Minor Amendment to be considered by the Planning Minister.

Minor Vs Major Amendment

The TSPP allows for Councils to undertake a Planning Scheme amendment that can be considered as a Minor Amendment, in order to adopt the interim provisions as outlined in this Guideline.

It is intended that the amendment to the Planning Scheme will be classified as a "Minor Amendment" where the scope of the amendment does not deviate from the intent of the interim provisions as outlined in this Guideline. Accordingly, following the consultation period of this Guideline, those Councils wishing to adopt the amendments (including changes to the Floodplain Maps and the Model Code) are likely to be able to do so following the Minor Amendment process which can be quickly incorporated into the Planning Scheme.

Where a Council seeks to undertake further amendments to the Planning Scheme, beyond the scope of those outlined in this Guideline, the amendment may be classified as a "Major Amendment". Any change deemed to substantially deviate from the intent will need to undergo the Major Amendment process before being adopted into a Planning Sheme.

Step 4 Adopting a Flood Level

Councils may consider adopting a flood level based on historical highest recorded flood levels (or another level that may be more locally appropriate) across their Local Government area to give greater regulatory coverage to development in flood-prone areas. The adoption of a flood level, and the adoption of the Floodplain Maps which would be amended to reflect the adopted flood level, will trigger the relevant building assessment provisions under the *Building Act 1975* related to flooding – the proposed 'deemed to satisfy' QDC amendments in particular have very detailed flood hazard building requirements that specifically relate to setting habitable floor levels.

Therefore, Councils may adopt a flood level that can be used to assess building applications against the proposed QDC. Council may also wish to set a 'freeboard' level – an additional height above the flood level to provide a factor of safety – if this is to be higher than the minimum 300mm freeboard under the proposed QDC. This will ensure that all structures within the Floodplain Maps will be built to the latest standards.

If a flood level is not or cannot be adopted, it is still important to adopt the Floodplain Maps as this mapping will still trigger the relevant building assessment provisions. In this case, building applications will need to prove, through engineering first principles, that structures are fit for purpose in these flood areas.

The following table may assist in determining how to adopt a level within a Planning Scheme area.

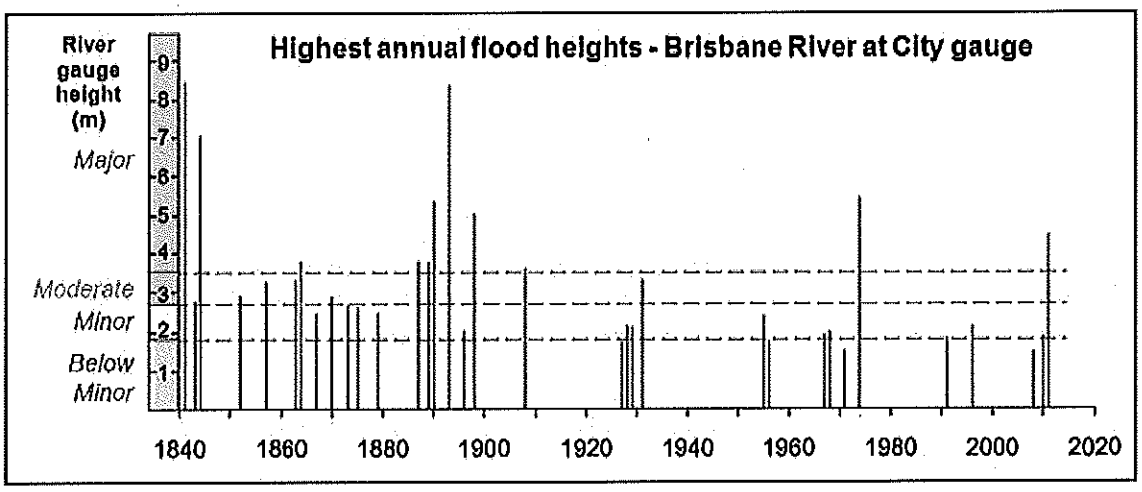
DATA	APPLICATION
Historical Flood Data	Where historical flood data exists, it may be possible to use this information to help inform the adoption of a level. Historical data may include: • formally recorded gauge height records for a number of floods; • formally surveyed peak flood levels throughout the area of interest; • photographs of a historical flood; • 'high-water' marks recorded on public or private property; and • interviews with long-term residents.
Existing Flood Studies	A number of river systems in Queensland have been the subject of a flood study. In many cases, these studies were either limited in their scope or performed a number of years ago. Ideally, they should be updated with current data and techniques and/or extended to cover the full range of floods and incorporate catchment development changes as well as future scenarios.
Topography	There may be circumstances where the topography suggests floods are not an issue (i.e. large elevated areas such as plateaus with no significant watercourses). Care should be taken in making such a determination, as land subject to flood hazards is not always obvious.

Floods can vary in size

Major:

Moderate:

Minor:



Source: Bureau of Meteorology

Schedule 1 – Interim Floodplain Assessment Overlay Model Code

1. **Application**

This Code is an applicable code for assessable development prescribed by a level of assessment table in a zone and/or local plan and involving land wholly or partially within the area identified in the IFAO Floodplain Maps.

This Code is a Queensland Planning Provision (QPP)-compliant Code. For the avoidance of doubt, the following QPP-specific terms in this Code have the following meanings under *Integrated Planning Act 1997* (IPA)-compliant planning schemes:

QPP Compliant Term	Corresponding IPA- compliant Term
Overall Outcome	Overall Outcome
Performance Outcome	Specific Outcome
Acceptable Outcome	Acceptable Solution/Probable Solution
Zone	Area, Precinct, Domain or District or other term commonly understood as a zoning mechanism

Compliance with the Acceptable Outcomes should not be regarded as satisfying all elements of the Performance Outcomes.

The Code must be considered together with other relevant Planning Scheme codes that are applicable to the subject development.

Note: The IFAO Floodplain Maps may also be used to trigger additional design requirements related to flooding for building work assessable under the building assessment provisions, as set out in the Building Act 1975.

2. **Purpose**

The purpose of the Code is to manage development outcomes in the floodplain so that risk to life, property, community and the environment during future flood events is minimised, and to ensure that development does not increase the potential for flood damage on site or to other property.

3. **Overall Outcomes**

The purpose of the Code will be achieved through the following overall outcomes:

a) Development maintains the safety of people on the development site from flood events and minimises the potential damage from flooding to property.

b) Development does not result in adverse impacts on people's safety, the environment or the capacity to use land within the floodplain.

4. **Performance Outcomes and Acceptable Outcomes**

Performance Outcomes	Acceptable Outcomes
PO1. Development siting and layout responds to flooding potential and maintains personal safety at all times.	**For Material Change of Use and Building Work** **AO1.1.** New buildings are: • located outside the overlay area, or; • located on the highest part of the site to minimise entrance of floodwaters; or • elevated; and • provided with clear and direct pedestrian and vehicle evacuation routes off the site. *Note: If part of the site is outside the IFAO Floodplain Mapped area, this is the preferred location for all buildings.* **For Reconfiguring a Lot** **AO1.2.** New lots are: • located outside the overlay area; or • where possible, located on the highest part of the site to minimise entrance of floodwaters. *Note: If part of the site is outside the IFAO Floodplain Mapped area, this is the preferred location for all lots (excluding park or other relevant open space and recreation lots).* *Note: Buildings subsequently developed on the lots created will need to comply with the relevant building assessment provisions under the Building Act 1975.*

Performance Outcomes	Acceptable Outcomes
Cont'd. PO1. Development siting and layout responds to flooding potential and maintains personal safety at all times.	AO1.3. Road and/or pathway layout provides a safe and clear evacuation path: • if a flood level is adopted[1], by locating entry points into the reconfiguration above the flood level and avoiding culs-de-sac or other non-permeable layouts; or • by direct and simple routes to main carriageways. AO1.4. Signage is provided on site (regardless of whether land will be public or private ownership): • indicating the position and path of all safe evacuation routes off the site; and • if the site contains or is within 100m of a floodable waterway, hazard warning signage and depth indicators are also provided at key hazard points, such as at floodway crossings or entrances to low-lying reserves.
PO2. Development is resilient to flood events by ensuring design and construction account for the potential risks of flooding.	***For Material Change of Use and Building Work (Residential Uses)*** AO2.1. Residential dwellings are not constructed as single-storey slab on ground. *Note: The highset 'Queenslander'-style house is a resilient low-density housing solution in floodplain areas. Higher density residential development should ensure only non-habitable rooms (e.g garages, laundries) are located on the ground floor.* ***For Material Change of Use and Building Work (Non-Residential Uses)*** AO2.2. No Acceptable Outcome specified. *Note: The relevant building assessment provisions under the Building Act 1975 apply to all building work within the IFAO Floodplain Mapped area and must take account of the flood potential within the area.* *Note: Resilient building materials for use within the IFAO Floodplain Mapped area should be determined in consultation with Council, in accordance with the relevant building assessment provisions.*
PO3. Development directly, indirectly and cumulatively avoids any significant increase in water flow, velocity or flood level, and does not increase the potential for flood damage either on site or on other properties.	***For Material Change of Use, Building Work, Reconfiguring a Lot and Operational Works*** AO3.1. Works in urban areas[2] associated with the proposed development do not involve: • any physical alteration to a watercourse or floodway including vegetation clearing; or • a net increase in filling. AO3.2. Works in areas other than an urban area[2] either: • do not involve a net increase in filling greater than 50m^3; or • do not result in any reductions of on-site flood storage capacity and contain within the subject site any changes to depth/duration/velocity of flood waters; or • do not change flood characteristics outside the subject site in ways that result in: o loss of flood storage; o loss of/changes to flow paths; o acceleration or retardation of flows; or o any reduction in flood warning times elsewhere on the floodplain.
PO4. Development avoids the release of hazardous materials into floodwaters.	***For Material Change of Use and Building Work*** AO4.1. Materials manufactured or stored on site are not hazardous in nature; or AO4.2 If a flood level is adopted[1], material manufacturing equipment and containers are located above this level, or AO4.3. If a flood level is not adopted, material manufacturing equipment and containers are located on the highest part of the site to enhance flood immunity. *Note: Refer to the Dangerous Goods Safety Management Act 2001 and associated Regulation, the Environmental Protection Act 1994 and the relevant building assessment provisions under the Building Act 1975 for requirements related to the manufacture and storage of hazardous substances.*
PO5. Community infrastructure is able to function effectively during and immediately after flood events.	***For Material Change of Use*** AO5.1. No Acceptable Outcome specified.

[1] Council has adopted a habitable floor level of Xm AHD (Xm AHD flood level + 0.3m freeboard) for the purposes of this Code and the relevant building provisions of the *Building Act 1975*.

[2] As defined in the *Sustainable Planning Regulation 2009*.

Case Study 1

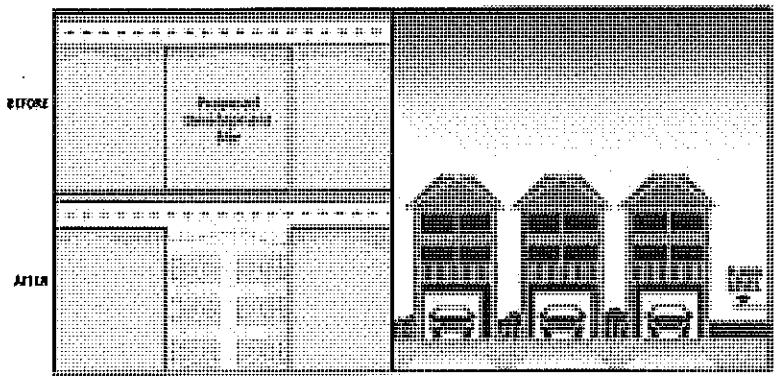
Material Change of Use – Residential (Six Townhouses)

Site Location:

Substantially within IFAO Floodplain Mapped Area

Other Planning Considerations:

Within relevant Zone in Planning Scheme that envisages higher density residential development



Proposed Development:

6 x 3 storey townhouses with ground floor car accommodation

Assessment against IFAO Model Code:

This proposed development complies with the Model Code, as:

- Council sought a flood/hydraulic study identifying a flood level for the site, which the applicant provided
- Buildings are elevated above this level and development has a simple direct evacuation route off site
- Dwellings are not single storey slab on ground – habitable rooms are elevated through ground floor used as car accommodation
- Site is in urban area and no alteration to watercourse or filling is proposed
- No hazardous materials to be stored on site
- Not a Community Infrastructure item

Application is supported by Council

Case Study 2

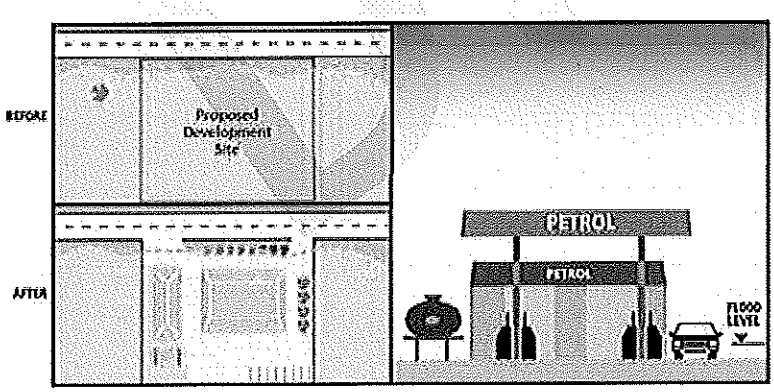
Material Change of Use (Service Station)

Site Location:

Susbtantially within IFAO Floodplain Mapped Area

Other Planning Considerations:

Within relevant Zone in Planning Scheme that envisages service station development



Proposed Development:

Service Station

Assessment againstIFAO Model Code:

This proposed development complies with the Model Code, as:

- Council sought a flood/hydraulic study identifying a flood level for the site, which the applicant provided
- Development located on highest part of site
- Development has simple & direct evacuation route off site
- Site is in urban area and no alteration to watercourse or filling is proposed
- External gas storage (hazardous material) is elevated above flood level and designed in accordance with relevant legislation, while underground tanks are also designed in accordance with relevant legislation
- Service station will have a Business Continuity Plan in place to provide direction on operation during flood events

Application is supported by Council

Case Study 3

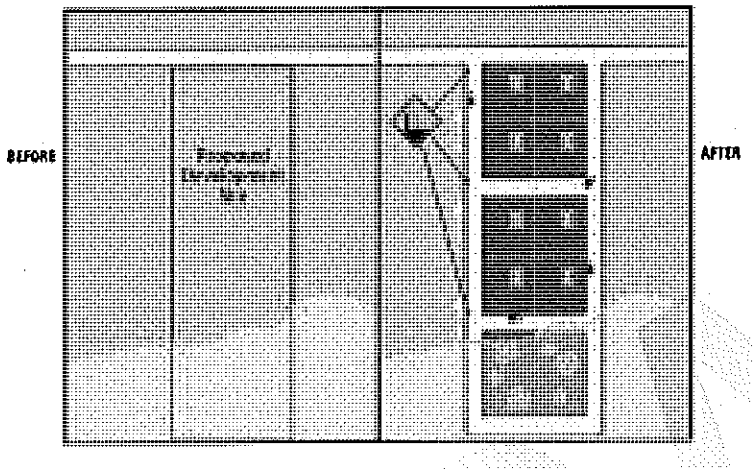
Reconfiguring a Lot – Residential (1 into 8)

Site Location:

Part of site within IFAO Floodplain Mapped Area

Other Planning Considerations:

Within relevant Zone in Planning Scheme that envisages residential subdivision



Proposed Development:

Residential Subdivision 1 into 8 lots

Assessment against IFAO Model Code:

This proposed development complies with the Model Code, as:

- Council requested verification of flood level through flood/ hydraulic study during application stage, which applicant provided
- All proposed new lots located outside of IFAO Floodplain Mapped Area, with a balance park within the overlay area – while not mandatory, this is the most appropriate design outcome to ensure house lots will not be inundated
- Road layout is direct & simple to allow for evacuation during flood
- Appropriate signage is provided indicating evacuation routes
- Site is in urban area and no alteration to watercourse or filling is proposed

Application is supported by Council

Case Study 4

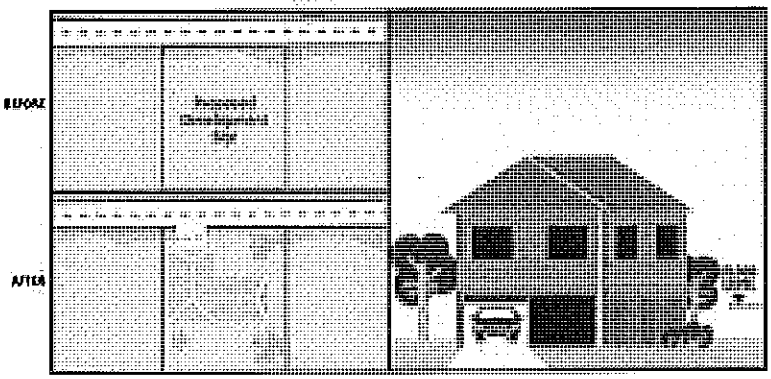
Building Work (New Residential Dwelling)

Site Location:

Substantially within IFAO Floodplain Mapped Area

Other Planning Considerations:

Within relevant Zone in Planning Scheme that envisages low density residential development



Proposed Development:

New residential dwelling that is not assessable development under the Planning Scheme (e.g. exempt or self-assessable)

Assessment:

- Relevant assessment provisions are those under the Queensland Development Code (QDC) (including those for flood hazard triggered by the Floodplain Maps acting as a Natural Hazard Management Area (Flood).
- Interim Floodplain Assessment Overlay Model Code will not apply in this instance.
- Other self-assessable components of the Planning Scheme may still apply as normal (e.g a Residential Zone Code).
- Assessment can be undertaken by private certifier, or Council as required.

Feedback

Planning for stronger, more resilient floodplains has been developed as a toolkit for Councils to support land use planning. The Authority will work closely with Councils during the consultation period to provide advice on both the Guideline and the Floodplain Mapping.

Where mapping has been completed, a hardcopy of the Mapbook and a copy of the digital datasets will be provided to relevant Councils.

The data used in the determination of the "Interim Floodplain Assessment Overlay" is available to Councils via a secure FTP service from the Spatial Information Group within the Department of Environment and Resource Management (DERM). The data consists of a number of whole of state datasets and contour datasets specific to each sub-basin. There are staff members within each Council who currently have access to the DERM FTP service via a secure login and password.

Please contact DERM at productdelivery@derm.qld.gov.au to request access to the datasets via the FTP service.

Feedback on the floodplain mapping can be received by using the feedback button on the interactive mapping website www.qldreconstruction.org.au/maps/interactive-map or via a formal submission during the consultation period.

Councils are invited to contact the Queensland Reconstruction Authority on 07 3008 7200 or alternatively by email to floodplain@qldra.org.au.

Formal submissions during the consultation period can be lodged in the following ways:

Post

Queensland Reconstruction Authority

PO Box 15428

City East Qld 4002

Attention: *Planning for stranger, more resilient floodplains*

Email

floodplain@qldra.org.au

In person

Level 9, 119 Charlotte Street, Brisbane

All submissions are to be received by 11 November 2011.

Rockhampton Source: Queensland Image Library