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seqwater
WATER FOR LIFE

**NORTH PINE DAM
EMERGENCY ACTION
PLAN**

FOR USE BY STAFF OF
SEQWATER
AND
EMERGENCY RESPONSE PERSONNEL

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4	Seqwater	Operations Coordinator	North Coast
5	SunWater	Senior Flood Operations Engineer	Flood Operations Centre, Brisbane
6	DERM	Director Dam Safety	Brisbane
7	Department of Community Safety – State Disaster Coordination Centre	Duty Officer – Disaster Management Service	Brisbane
8	Moreton Bay Regional Council	Local Disaster Response Coordinator	Caboolture
9 – 12	Brisbane City Council	Local Disaster Response Coordinator	Brisbane
13	Queensland Police	District Disaster Coordinator	Moreton
14	Queensland Police	District Disaster Coordinator	Brisbane

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ABBREVIATIONS

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AMTD	Adopted Middle Thread Distance
BoM	Bureau of Meteorology
DCF	Dam Crest Flood
EAP	Emergency Action Plan
FSL	Full Supply Level
FOC	Flood Operations Centre, SunWater
GS	Gauging Station
IERP	Incident and Emergency Response Plan
ML	Megalitre
DERM	Department of Environment and Resource Management
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PMPDF	Probable Maximum Precipitation Design Flood

The Seqwater Incident and Emergency Response structure is a flexible team based structure that parallels the normal management regime. The team based structure is detailed in the diagram below.

The diagram illustrates the Incident Response Team structure, showing the flow of information and support between different levels of the organization.

Executive Management Team (Top Level)

- Incident Manager** (Central Role)
 - Planning Officer**
 - Operations Officer**
 - Logistics Officer**

Incident Response Team (Middle Level)

Operational Support (Bottom Level)

- Water Quality Products
- Land & Water Quality
- Asset Management
 - Commercial
 - Legal
 - Finance
- Media Liaison
- Communications
- Human Resources
- Information Technology

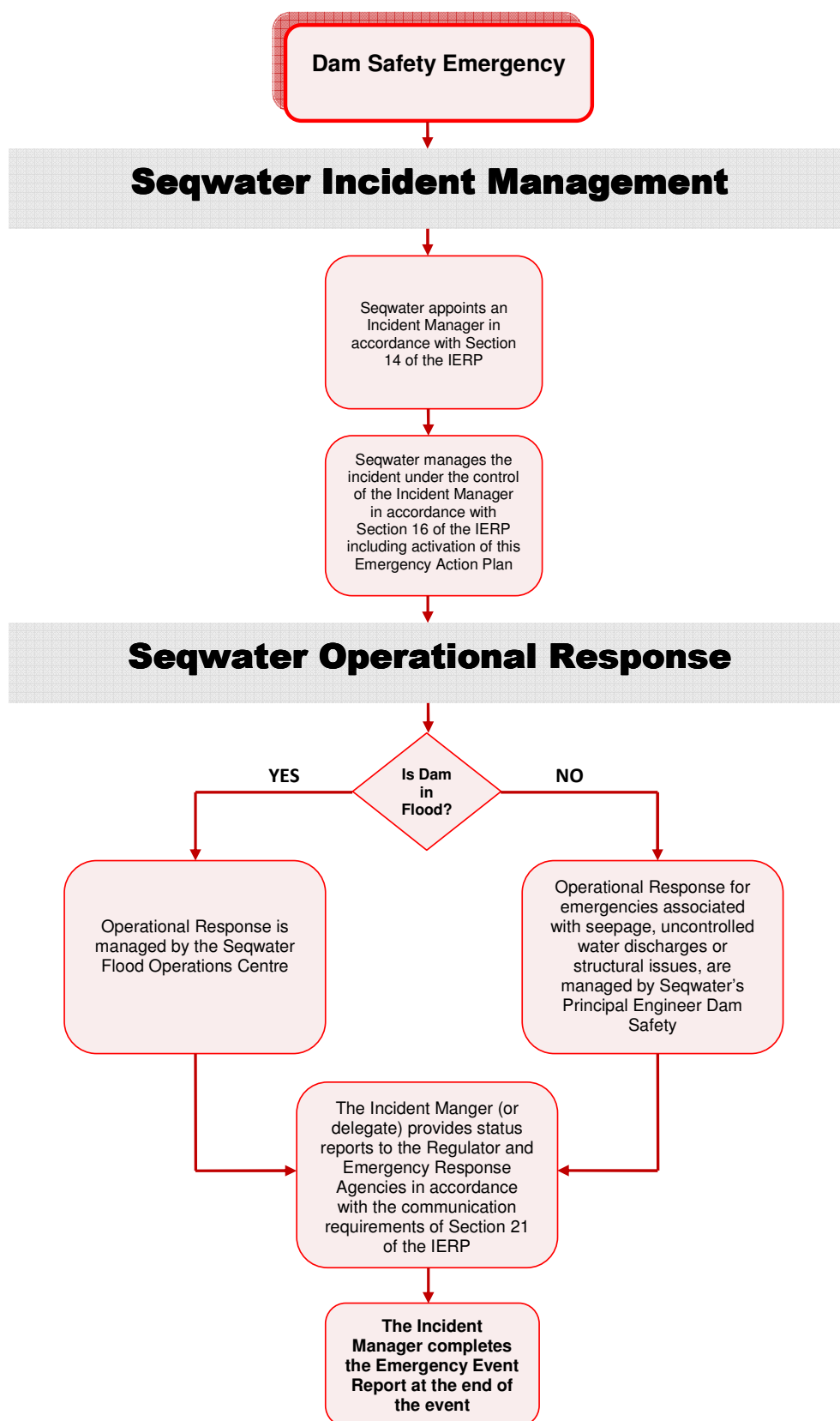
Information Flow:

- Communicate information as required:** Indicated by a large green arrow pointing upwards from the Operational Support level to the Incident Response Team level.
- Requests for Support & Advice:** Indicated by a green arrow pointing downwards from the Incident Response Team level to the Operational Support level.
- Provide Support and Advice:** Indicated by a green arrow pointing upwards from the Operational Support level to the Incident Response Team level.

External Liaison: A dashed line connects the Incident Manager to a box labeled "Liaise with external agencies in terms of response requirements".

This Emergency Action Plan (EAP) sits under the above structure and identifies emergency conditions that could endanger the integrity of the dam and prescribes procedures which should be followed by Seqwater staff in the event of such an emergency. A primary focus of these actions is to provide timely warning to appropriate emergency response and management agencies, to

allow these agencies to implement protection measures for downstream communities. The flowchart below summarises the actions that occur in an emergency situation.



Under the Seqwater Grid Emergency Response Plan, five incident levels have been implemented. These levels have been established to deal with varying degrees of incident severity and range from Level 1 where there are no significant impacts on other water grid participants and the incident can be managed using standard operating procedures and communication protocols, to Level 5 where state or federal government intervention would be expected. Definitions and general principals relating to these levels are detailed in Section 21 of the IERP.

2 AGENCIES AND RESPONSIBILITIES

The following table shows the agencies and personnel who have responsibilities under this Emergency Action Plan.

AGENCIES AND PERSONNEL	RESPONSIBILITIES
Seqwater	<ul style="list-style-type: none"> • Undertake emergency response at the dam. • Determine the area of potential impact from the Dam Safety Emergency. • Provide the relevant Disaster Response Agencies with timely notification of impending and actual emergencies, including details of the emergency and estimates of potential impacts downstream of the dam.
Seqwater Flood Operations Centre	<ul style="list-style-type: none"> • Coordinate dam safety emergency actions for Seqwater during a flood event.
Principal Engineer Dam Safety (Seqwater)	<ul style="list-style-type: none"> • Coordinate dam safety emergency actions for Seqwater outside a flood event, for dam safety emergencies involving actual or potential structural failures.
Land and Water Quality Manager (Seqwater)	<ul style="list-style-type: none"> • Coordinate dam safety emergency actions for Seqwater outside a flood event, for water quality emergencies.
Director Dam Safety (DERM)	<ul style="list-style-type: none"> • Provide regulatory input during a dam safety emergency.
Regional or City Council	<ul style="list-style-type: none"> • Exercise primary responsibility for disaster response and management within its boundaries, in accordance with the Queensland Disaster Management Act 2003. • Deploy all appropriate resources to contribute to response and recovery during the dam safety emergency, until its resources are fully committed. • Mobilise disaster response assistance from other relevant Disaster Response Agencies, as appropriate during the emergency.

A list of agencies and personnel who may need to be contacted in the event of an emergency is included in Appendix A of this document. Once notification is made to a person within an agency on the list, it is the person's responsibility to notify other relevant persons within the agency. Generally attempts to contact an agency should be in the priority order outlined in the list. However discretion should be exercised if the gravity of the situation warrants.

3 DAM TECHNICAL DATA

NORTH PINE DAM	
Population at Risk	Sunny Day Failure: 838 Flood: >100 (not fully assessed)
Failure Impact Rating	2
Hazard Category	Extreme
Dam Owner	Seqwater
Name of Reservoir	Lake Samonvale
Year Complete	1976
Location	North Pine River near Strathpine
Water Course	North Pine River
Purpose	Town water
Type of Construction	Mass concrete gravity and compacted fill embankment dam
Outlet Works	Five radial gates
Catchment Area	348 km ²
FSL	39.60 m AHD
Full Supply Capacity	214,302 ML
Surface Area at FSL	2,075 ha
Main Dam Crest	43.3 m AHD
Main Dam Embankment Length	579 m
Maximum Height of Main Dam Embankment	46 m
Width at Top of Main Dam Embankment	5.0 m
Spillway Crest	32 m AHD
Spillway Length	61 m
Gates	5 X radial
Size of each Crest Gate	12.19 m wide x 8.62 m high
Top of Closed Gate	40.23 m AHD
Winch Room Floor	41.12 m AHD
Radial Gate Electrical Control Gear	41.66 m AHD
Saddle Dam Crest	43.29 m AHD
Saddle Dam Length	518 m including main dam abutments and saddle dams
Maximum Height of Saddle Dam Embankment	To be advised
Peak Water Level as a Result of PMF	1 gate out of service 43.81 m AHD All gates open 43.47m AHD
Spillway Capacity	1 gate out of service: 3,585 m ³ /s All gates open: 4,060 m ³ /s
Maximum Discharge as a Result of PMF	1 gate out of service: 5,800 m ³ /s All gates open: 5,400 m ³ /s
AEP of Spillway Capacity	1 gate out of service: 1 in 550,000 All gates open: 1 in 2,000,000
Regulator valves	2 x 1,370 mm cone dispersion valve

Mean annual pan evaporation	1,533 mm at 040241 Samford
Mean annual rainfall	1,109 mm at 040241 Samford
Hydroelectric Facilities	Nil
Notable events	2009
Maximum Historic Storage Level	40.45 m AHD Early April 1989
Comment	

3.1 Critical Flood Levels

The dam is overtopped for the PMF event. The dam is likely to fail if the dam crest is overtopped.

Dam Critical Stability Levels

Description	Level (m AHD)
Spillway Crest Level	EL 32.00 m
Full Supply level	EL 39.60 m
Top of Closed Gate	EL 40.23 m
Winch Room Floor	EL 41.12 m
Radial Gate Electrical Control Gear	EL 41.66 m
Dam Crest Level	EL 43.28 m

The spillway rating curves were used to route the inflow floods through the reservoir for various flood exceedence probabilities as shown below:

Dam Flood Routing Results

Event (AEP)	Peak Outflow (All Gates Open) (m)	Peak Outflow (One Gate Out of Service) (m)	Peak Water Level (All Gates Open) (m)	Peak Water Level (One Gate Out of Service) (m)
1 in 50	1040	1040	40.28	40.28
1 in 100	1200	1200	40.39	40.39
1 in 1,000	2100	2100	40.85	40.85
1 in 10,000	3000	2800	41.14	41.20
1 in 100,000	3800	3400	41.71	42.29
1 in 1,000,000	4700	4800	42.95	43.54
PMF	5400	5800	43.47	43.81

4 EMERGENCY EVENTS AND ACTIONS

The following events define the triggers for initiation of the Emergency Action Plan. For flood events, formal reports to the Dam Safety Regulator are prepared in accordance with the North Pine Dam Manual of Flood Operations. Formal reports are provided for all trigger events outside flood events.

- Reservoir Level is approaching 39.50m and further rain is forecast (major flood possible)
- Increase in Seepage or New Area of Seepage
- Earthquake, Explosion, Structural Damage to Dam, Abnormal Instrumentation Readings or Major Electrical or Mechanical Failure
- Object Crashes into the Dam or Reservoir

Potential Damage or Indicators of Damage relevant to these triggers are shown in Section 4.5.

4.1 Reservoir Level is approaching 39.50m and Further Rain is Forecast

STORAGE SUPERVISOR	FLOOD OPERATIONS CENTRE
<ul style="list-style-type: none"> Commence filling out Incident Log and continue to fill out Log until incident is closed. Notify Flood Operations Centre of dam status and rainfall. If the Flood Operations Centre cannot be contacted, notify the Principal Engineer, Dam Safety or the Dam Safety and Source Operations Manager. 	<ul style="list-style-type: none"> Commence filling out Incident Log and continue to fill out Log until incident is closed. Obtain and confirm forecast from BOM. Despatch appropriate staff to site if necessary. Advise the Dam Supervisor of dam monitoring actions.
<ul style="list-style-type: none"> Monitor rainfall, lake levels and rates of rise of lake level. Record instrumentation readings as per Dam Standing Operating Procedures. Report damage and unusual observations to the Flood Operations Centre. 	<ul style="list-style-type: none"> Direct the overall operation of the dam in accordance with the Manual of Operational Procedures for Flood Releases from North Pine Dam.
<ul style="list-style-type: none"> Monitor the situation as directed by the Flood Operations Centre. If communication with Flood Operations is lost, continue monitoring and attempt to restore communications. 	<ul style="list-style-type: none"> Inform the persons of the event and the status of the dam in accordance with the Manual of Operational Procedures for Flood Releases from North Pine Dam.
<ul style="list-style-type: none"> Undertake actions as directed by the Flood Operations Centre. If communications with the Flood Operations Centre fail operate the dam in accordance with the North Pine Dam Flood Manual and attempt to restore communications. 	<ul style="list-style-type: none"> Direct visual gate observations at intervals generally not exceeding 30 minutes. At storage levels above EL 40.3 m, direct instrumentations readings and inspections at intervals generally not exceeding 2 hours.
<ul style="list-style-type: none"> If lake level is < 39.60m, advise Flood Operations Centre. 	<ul style="list-style-type: none"> If lake level is < 39.60m and no more rain is forecast, advise Dam Supervisor to close incident.
<ul style="list-style-type: none"> Complete Incident Log and Report. 	<ul style="list-style-type: none"> Complete Incident Log and Report.

4.2 Increase in Seepage or New Area of Seepage

STORAGE SUPERVISOR	PRINCIPAL ENGINEER, DAM SAFETY
<ul style="list-style-type: none"> ▶ Commence filling out Incident Log and continue to fill out Log until incident is closed. ▶ Notify the Principal Engineer, Dam Safety of the situation. ▶ If the Principal Engineer, Dam Safety cannot be contacted, notify the Dam Safety and Source Operations Manager or the Executive General Manager, Operations. ▶ Monitor the situation by measuring the rate of seepage flow and observe the clarity of the seepage flow, keeping notes and photographs for the Incident Log. ▶ Provided it is safe to do so, undertake inspections and instrumentation readings as directed by the Principal Engineer, Dam Safety. 	<ul style="list-style-type: none"> ▶ Commence filling out Incident Log and continue to fill out Log until incident is closed. ▶ Assemble and activate an Incident Management Team to investigate the incident. ▶ Inform the following persons of the event and the status of the dam: <ul style="list-style-type: none"> ○ Local Disaster Response Coordinator ○ CEO ○ Flood Operations Centre ○ Director, Dam Safety (DERM)
<ul style="list-style-type: none"> ▶ Remain in contact with the Principal Engineer, Dam Safety and proceed as directed. 	<ul style="list-style-type: none"> ▶ Undertake site investigations and proceed with actions as appropriate. Such actions may include: <ul style="list-style-type: none"> ○ Directing remedial works ○ Obtaining advice from specialist Dam Safety Consultants ○ Draining down the dam storage level ▶ If a potential dam failure is suspected, immediately inform the following persons: <ul style="list-style-type: none"> ○ Local Disaster Response Coordinator ○ CEO ○ Flood Operations Centre ○ Director, Dam Safety (DERM)
<ul style="list-style-type: none"> ▶ Complete Incident Log and Report. 	<ul style="list-style-type: none"> ▶ Once satisfied that the incident is resolved, stand down the incident team and close the incident. ▶ Complete Incident Log and Report.

4.3 Earthquake, Explosion, Structural Damage To Dam, Abnormal Instrumentation Readings or Major Electrical or Mechanical Failure

STORAGE SUPERVISOR	PRINCIPAL ENGINEER, DAM SAFETY
<ul style="list-style-type: none"> ▶ Commence filling out Incident Log and continue to fill out Log until incident is closed. ▶ Notify the Principal Engineer, Dam Safety of the situation. ▶ If the Principal Engineer, Dam Safety cannot be contacted, notify the Dam Safety and Source Operations Manager or the Executive General Manager, Operations. ▶ Provided it is safe to do so, perform a Dam Safety Inspection including instrumentation and seepage measurements. ▶ Report damage and unusual observations to the Principal Engineer, Dam Safety. 	<ul style="list-style-type: none"> ▶ Commence filling out Incident Log and continue to fill out Log until incident is closed. ▶ Assemble and activate an Incident Management Team to investigate the incident. ▶ Inform the following persons of the event and the status of the dam: <ul style="list-style-type: none"> ○ Local Disaster Response Coordinator ○ CEO ○ Flood Operations Centre ○ Director, Dam Safety (DERM)
<ul style="list-style-type: none"> ▶ Remain in contact with the Principal Engineer, Dam Safety and proceed as directed. 	<ul style="list-style-type: none"> ▶ Undertake site investigations and proceed with actions as appropriate. Such actions may include: <ul style="list-style-type: none"> ○ Directing remedial works ○ Obtaining advice from specialist Dam Safety Consultants ○ Draining down the dam storage level ▶ If a potential dam failure is suspected, immediately inform the following persons: <ul style="list-style-type: none"> ○ Local Disaster Response Coordinator ○ CEO ○ Flood Operations Centre ○ Director, Dam Safety (DERM)
<ul style="list-style-type: none"> ▶ Complete Incident Log and Report. 	<ul style="list-style-type: none"> ▶ Once satisfied that the incident is resolved, stand down the incident team and close the incident. ▶ Complete Incident Log and Report.

4.4 Object Crashes into the Dam or Reservoir

STORAGE SUPERVISOR	PRINCIPAL ENGINEER, DAM SAFETY
<ul style="list-style-type: none"> ▶ Commence filling out Incident Log and continue to fill out Log until incident is closed. ▶ On confirmation of the event, advise the Police or Ambulance if necessary by phoning 000. ▶ Notify the Principal Engineer, Dam Safety of the situation. ▶ If the Principal Engineer, Dam Safety cannot be contacted, notify the Dam Safety and Source Operations Manager or the Executive General Manager, Operations. ▶ Provided it is safe to do so, perform a Dam Safety Inspection, paying particular attention to the area where the object has crashed, including instrumentation and seepage measurements. ▶ Report damage and unusual observations to the Principal Engineer, Dam Safety from fuel or other substances. ▶ Monitor the situation, keeping notes and photographs for the Incident Log and the routine dam safety inspections. 	<ul style="list-style-type: none"> ▶ Commence filling out Incident Log and continue to fill out Log until incident is closed. ▶ Assemble and activate an Incident Management Team to investigate the incident. ▶ Inform the following persons of the event and the status of the dam: <ul style="list-style-type: none"> ○ Local Disaster Response Coordinator ○ CEO ○ Flood Operations Centre ○ Director, Dam Safety (DERM)
<ul style="list-style-type: none"> ▶ Remain in contact with the Principal Engineer, Dam Safety and proceed as directed. 	<ul style="list-style-type: none"> ▶ Undertake site investigations and proceed with actions as appropriate. Such actions may include: <ul style="list-style-type: none"> ○ Directing remedial works ○ Obtaining advice from specialist Dam Safety Consultants ○ Draining down the dam storage level ▶ If a potential dam failure is suspected, immediately inform the following persons: <ul style="list-style-type: none"> ○ Local Disaster Response Coordinator ○ CEO ○ Flood Operations Centre ○ Director, Dam Safety (DERM)
<ul style="list-style-type: none"> ▶ Complete Incident Log and Report. 	<ul style="list-style-type: none"> ▶ Once satisfied that the incident is resolved, stand down the incident team and close the incident. ▶ Complete Incident Log and Report.

4.5 Potential Damage or Indicators of Damage

Problem	General Characteristic	When and What to Check
Overtopping Imminent	Storage full and water level rising.	During periods of excessive rainfall – check reservoir levels.
Rapid increases or cloudy appearance of seepage	Seepage flow through storage embankment is cloudy and increasing (piping failure has started).	After detection of cloudy water look for source in embankment.
Seepage erosion or piping	Progressive internal erosion of the embankment or saddle dam or foundation to form an open conduit or pipe (piping failure).	During routine inspections or after unaccountable increases in seepage flows, look for an emission point.
Foundation Failure	Sliding, rotation, or settlement of part of or entire dam.	During routine inspection or immediately after earthquakes – inspect for evidence of foundation movement or displacement immediately adjacent to the dam.
Slide in downstream slope	Slide in the downstream face.	During routine inspection or following heavy periods of rainfall – look for cracks or scarps near the crest and bulges at the toe.
Flow slide	Collapse and flow of soil around the storage periphery.	During routine inspections, after heavy or long periods of rainfall. Especially in sedimentary or colluvial soils – look for material displacement around the storage rim.
New springs, seeps or boggy areas	Evidence of internal changes in seepage control (could be initial signs of piping failure).	During routine inspection, look for ‘evergreen’ spots, boggy ground or pools of water.
Gullying	No rock protection or vegetation cover on embankment batters or poor drainage.	During and after large rainfalls – inspect embankment and saddle dam batters for damage to rock protection or vegetation cover.
Increase in gallery seepage	Increase in the normal rate of gallery seepage.	After detection – check for differential movement or cracking in concrete components of spillway and retaining walls.
Landslide	Mass movement of soil or rock from slopes and valley walls around the storage.	During routine inspections or following earthquakes – look for material displacement.
Damage to structural concrete	Movement or cracking of structural concrete.	During routine inspections or when mechanical problems such as burst pipe occur – look for any movement or

Problem	General Characteristic	When and What to Check
		cracking of structural concrete.
Failure of appurtenant structures or operating equipment	Loss of ability to supply water or discharge floods safely.	After detecting an operational anomaly – identify and investigation cause.
Loss of storage contents	Excessive loss from the storage and / or occasionally increased seepage or increased groundwater levels near the storage.	During routine monitoring – look for environmental changes such as vegetation damage, salt scalds, etc
Toe erosion	Erosion of embankment toe by spillway discharge or diversion flows.	During and after large rainfalls – inspect embankment toe.
Wave erosion	Beaching or notching of the upstream face of the embankment by waves generated over long periods of strong wind.	During or after periods of strong wind – inspect upstream face of embankment and saddle dam.

APPENDIX A

CONTACT REGISTER

REGISTER – CONTACT LIST FOR EMERGENCIES & FLOOD INFORMATION – NORTH PINE DAM

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Seqwater	Principal Engineer Dam Safety	1	1	John TIBALDI					Seqwater/FCC
	Dam Operations Manager	2	2	Robert DRURY					
	Flood Operations Engineer	3	3	Terry MALONE					
	Operations Coordinator North Coast	4	4	Murray DUNSTAN					
	Executive General Manager, Water Delivery	5	5	Jim PRUSS					
	Chief Executive Officer	3	3	Peter BORROWS					
	Chairman	4	4	Phil HENNESSY					
	Storage Supervisor	1	1	Brett SCHULTZ					
	Standby Officer	2	2	Malcolm LANE					
	Hydrographic Staff	1	1	Carolyn ELLIS-MALLARD					
	Hydrographic Staff	2	2	Stewart NEILSEN					
Department of Environment and Resource Management	Director, Dam Safety	1	1	Peter ALLEN					Seqwater/FCC
	Dam Safety Engineer	2	2	Ron GUPPY					
Flood Operations Centre (operated by Sunwater)	Principal Engineer Dam Safety	1	1	John TIBALDI					Seqwater/FCC
	Flood Operations Engineer	2	2	Terry MALONE					
	Senior Flood Operations Engineer	3	3	Rob AYRE					
	Senior Flood Operations Engineer	4	4	John RUFFINI*					
	Flood Control Room (Operational)	5	5	General Phones					

[illegible]

APPENDIX B

DAM SAFETY EMERGENCY – ASSISTANCE TO SITE

If earth moving machinery or other assistance is required on site during a dam safety emergency at North Pine Dam, the following contact register can be used to obtain assistance.

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile
Moreton Bay Regional Council	Local Disaster Response Coordinator	1	1	Tony MARTINI			
	Local Disaster Response Coordinator	2	2	Ed HAMILL			
	Local Disaster Response Coordinator	3	3	Eleanor DAVIDSON			

APPENDIX C

ROAD CLOSURE / PUBLIC NOTIFICATION ARRANGEMENTS DURING FLOOD EVENTS

Contact Procedure

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile
Moreton Bay Regional Council	On-Call Officer	1	1	Duty Officer			

APPENDIX D

MAPS AND PLANS

Locality Map 1

Alternative Routes Map

Locality Map 2

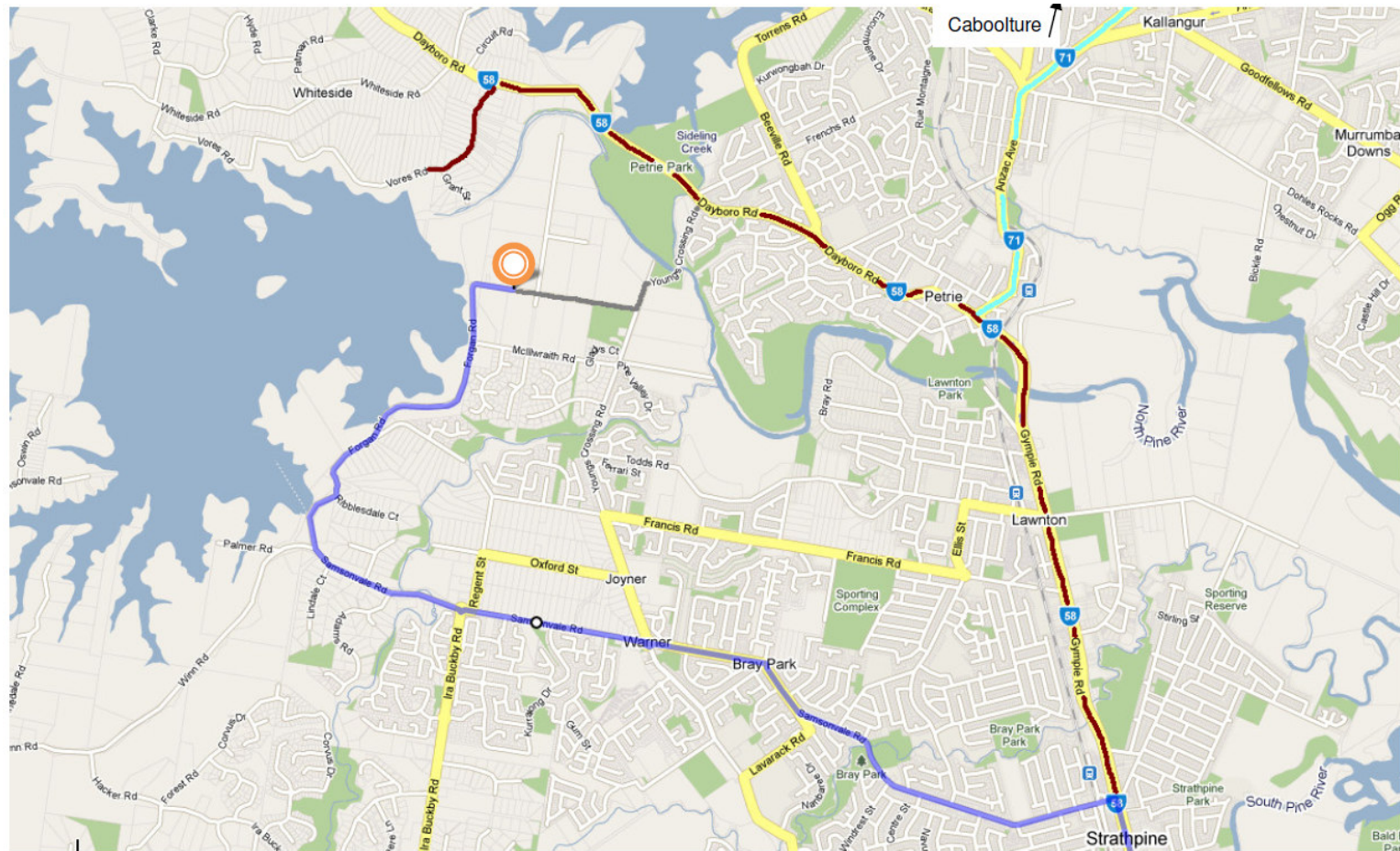
Aerial View of Dam Wall

Outlet Works


General Layout of Dam




(Reference: <http://maps.google.com.au/maps>)




 North Pine Dam WTP (On a small road – left turn from Forgan Rd)

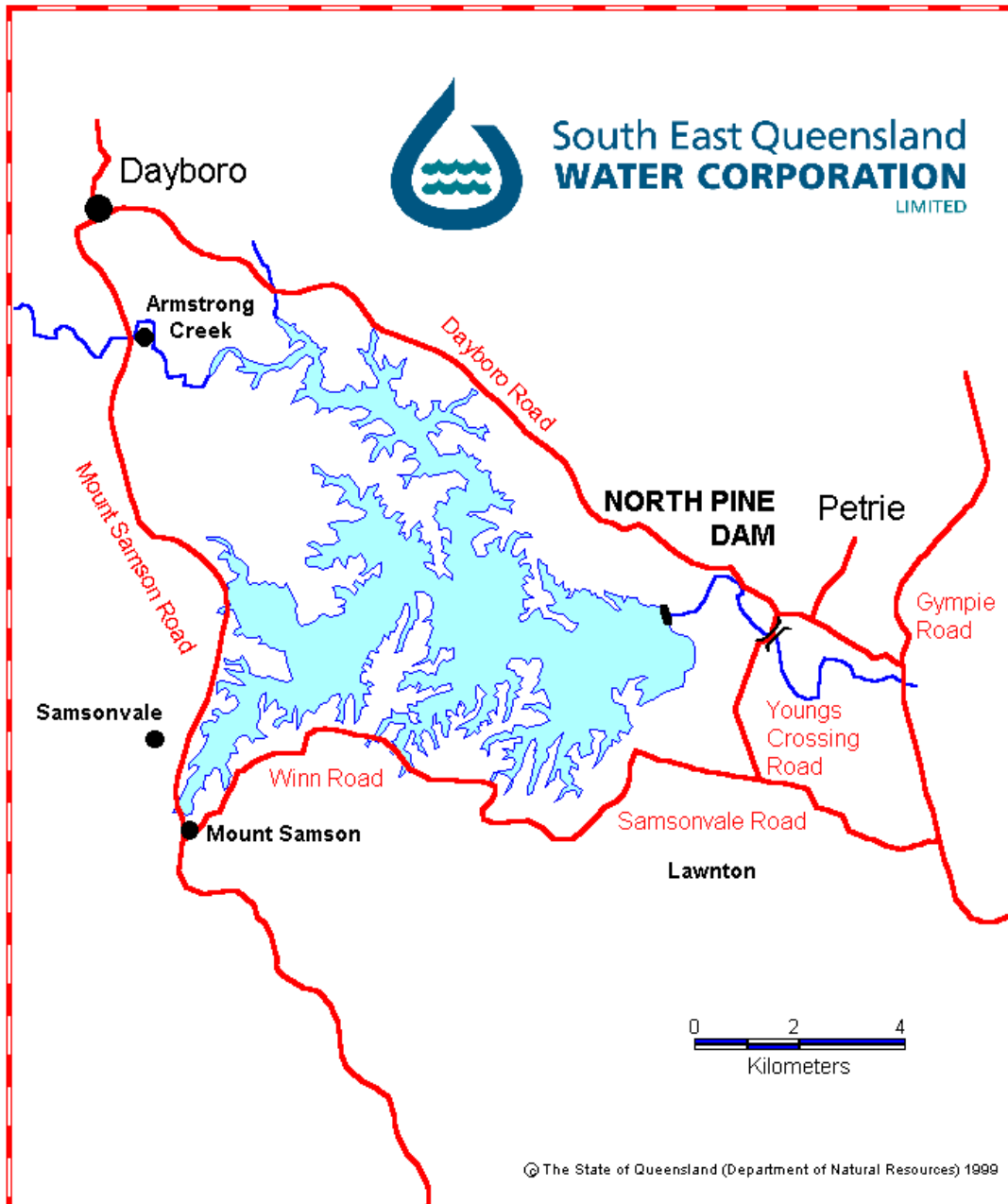
 Preferred Route from Ipswich / Brisbane

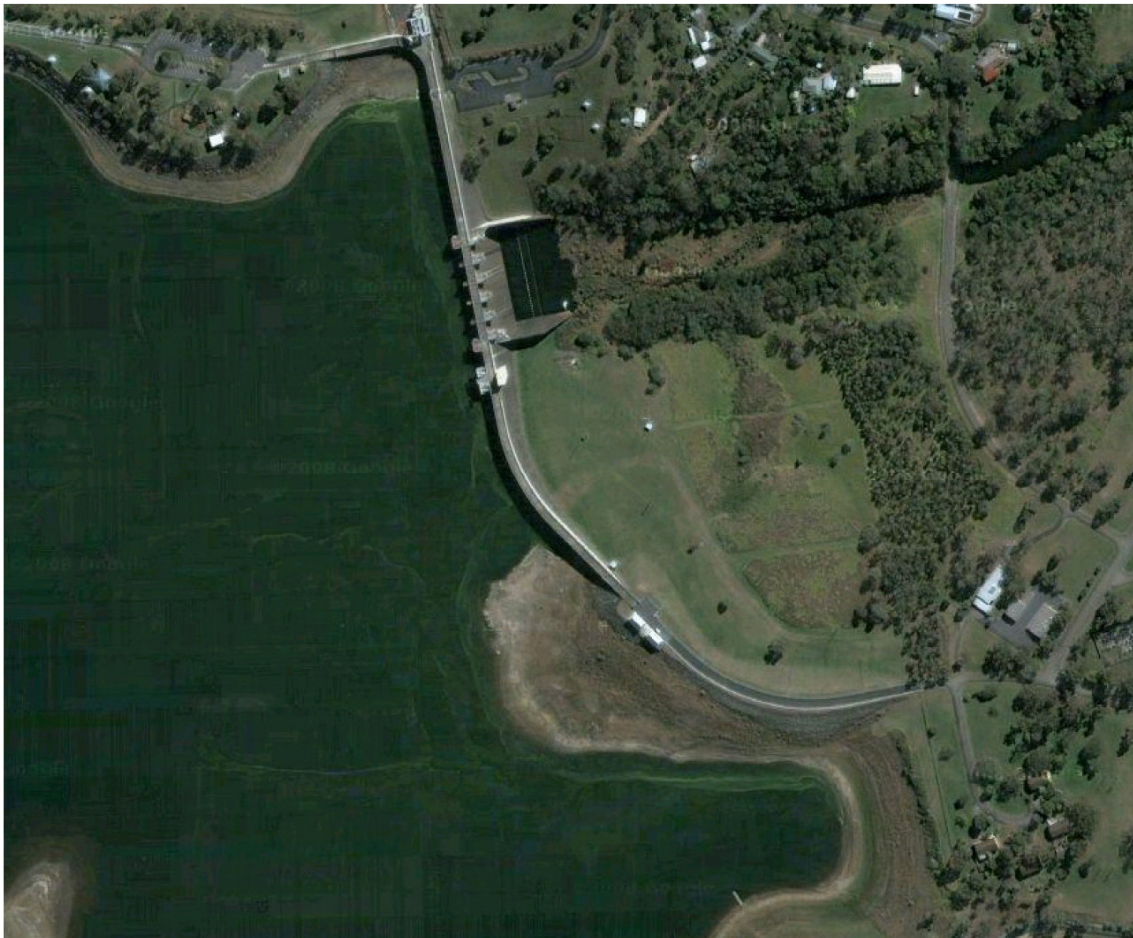
 Alternative Route from Ipswich / Brisbane (key needed OR call WTP Office to be let in)

 Young's Crossing Rd Route (known to have flooding issues)

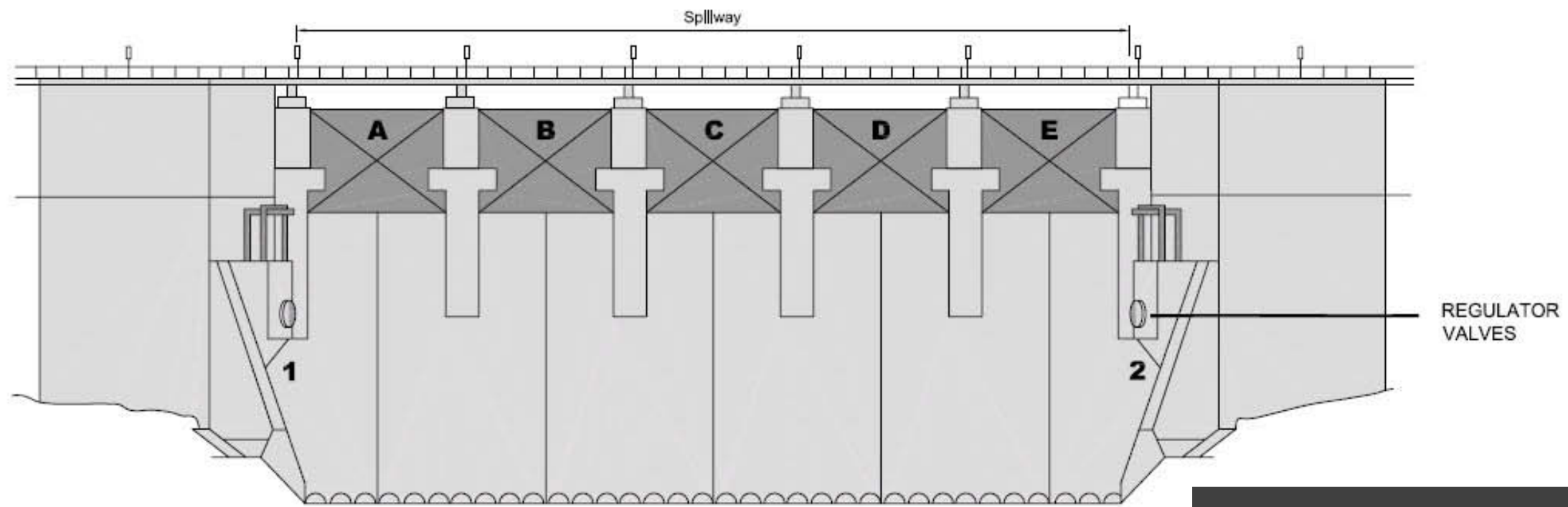
 Route from Caboolture

(Reference: <http://maps.google.com.au/maps>)

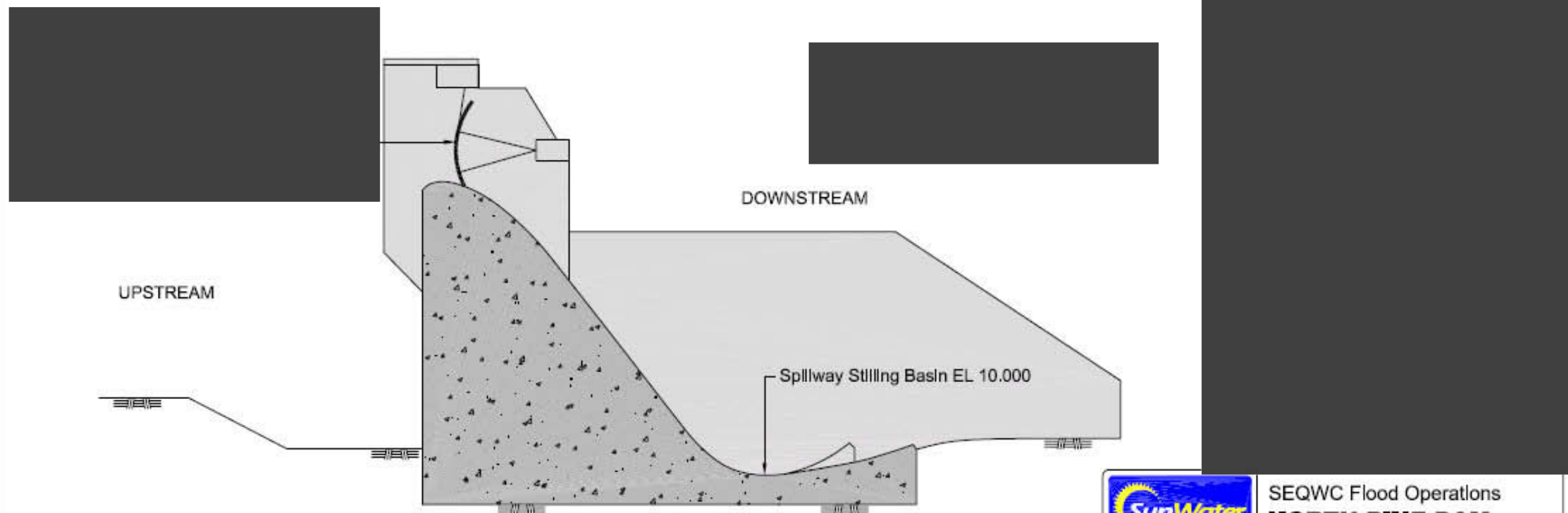




(Reference: <http://maps.google.com.au/maps>)



VIEW LOOKING UPSTREAM



SECTION THROUGH SPILLWAY



SEQWC Flood Operations
NORTH PINE DAM

Q:\FloodE-029\N\216789.dwg
09 May 2001 1:14 PM

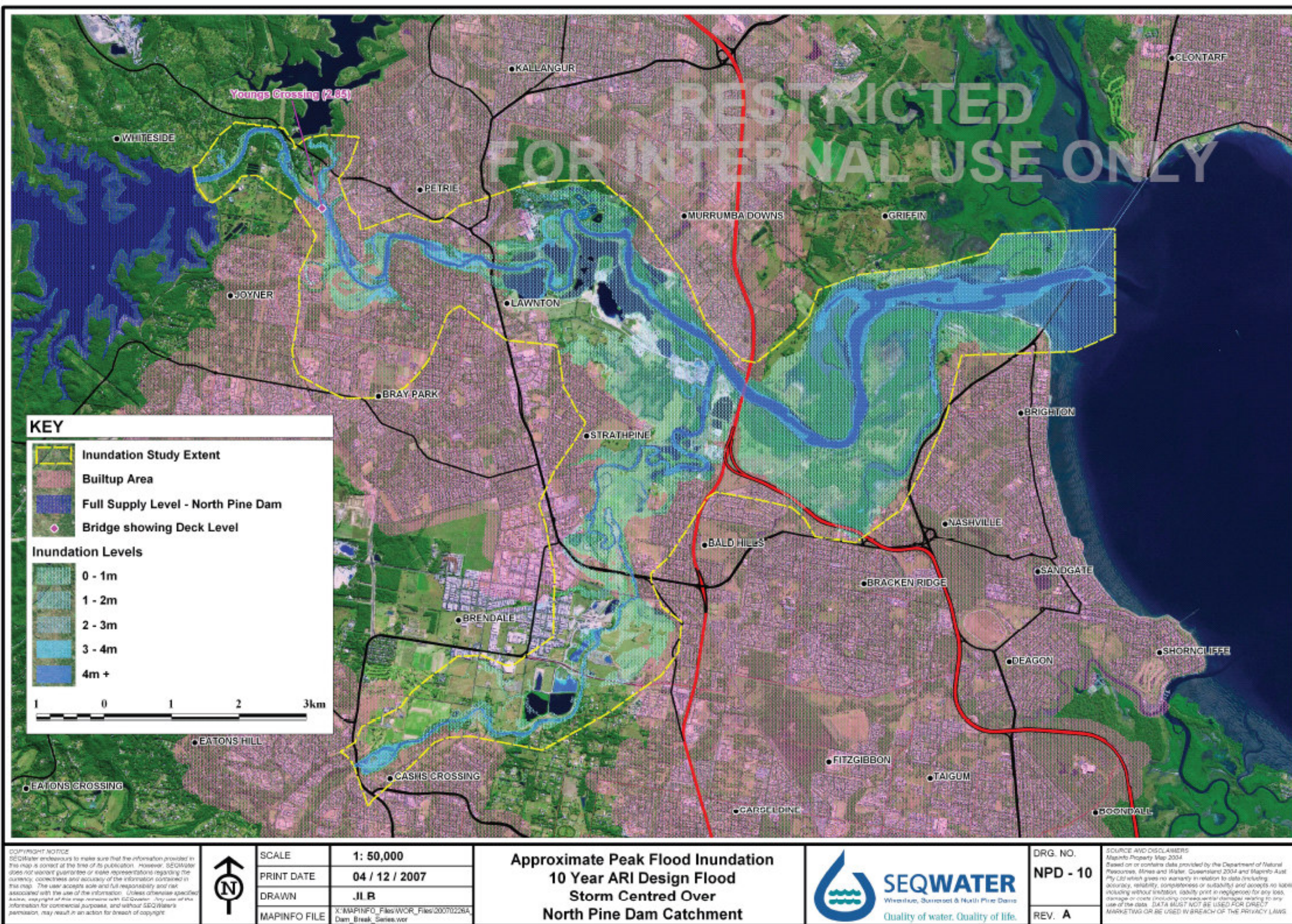


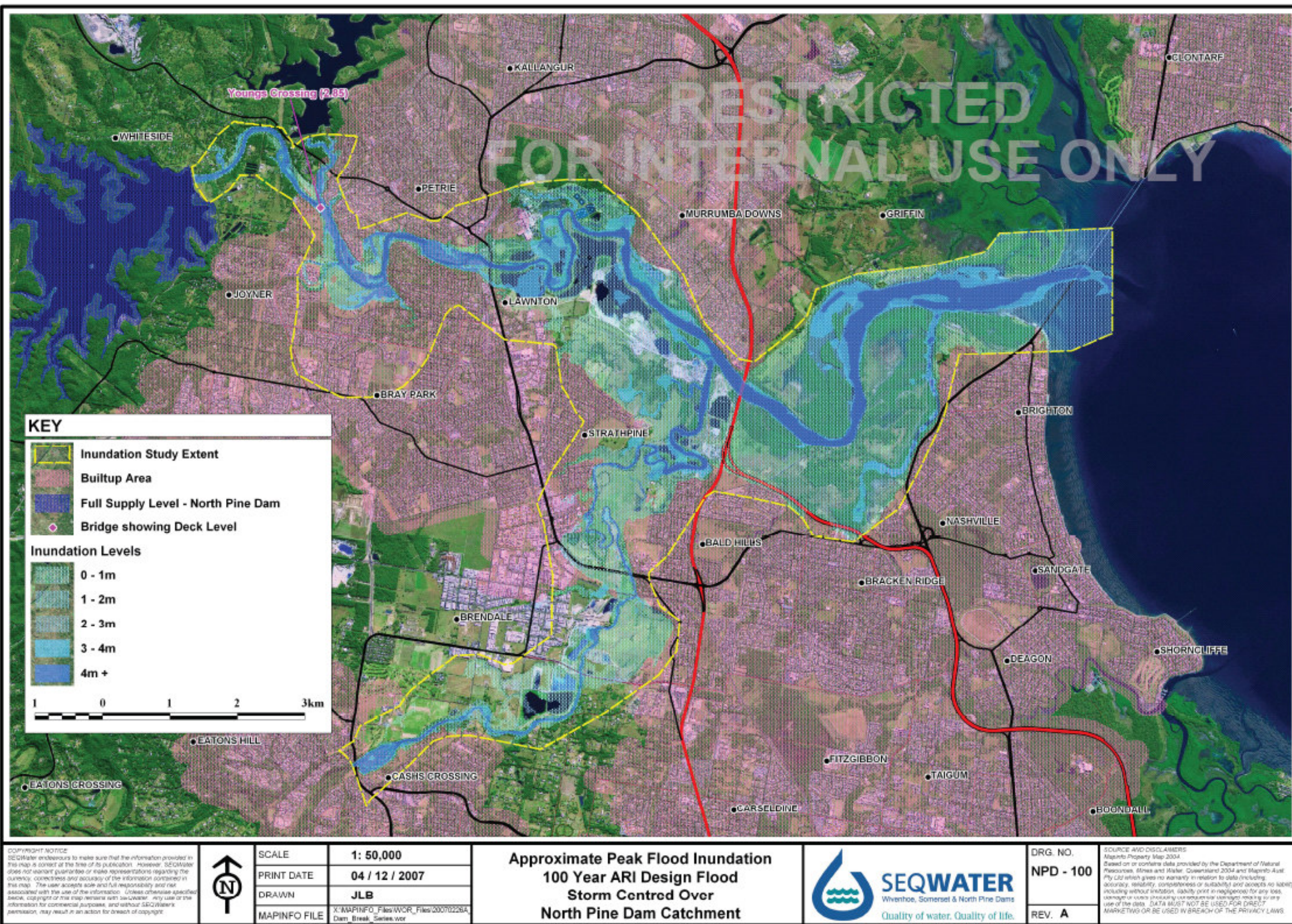
APPENDIX E

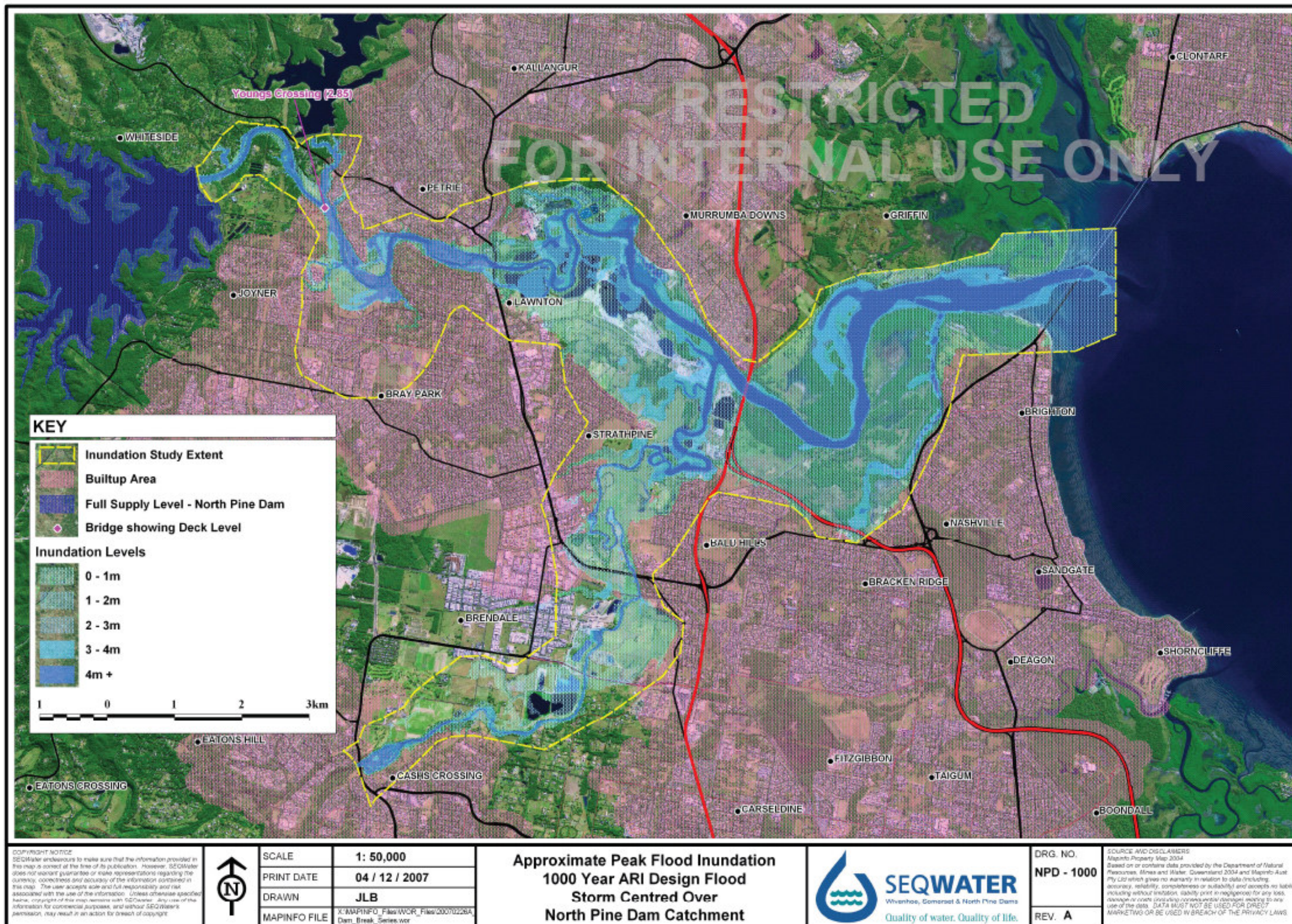
FLOOD INUNDATION MAPS AND DAM BREAK ANALYSIS

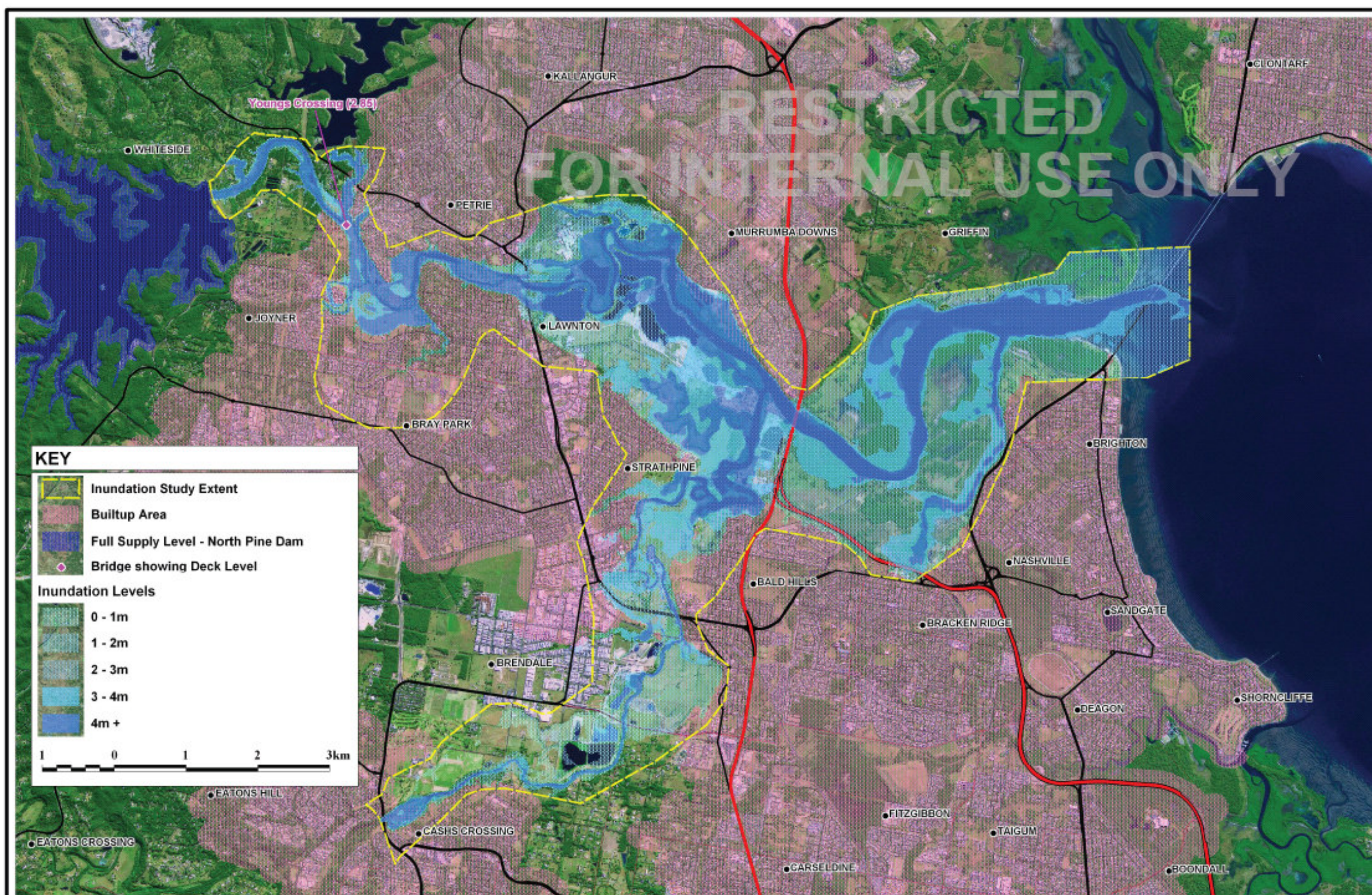
EMERGENCY EVACUATION

Where possible, emergency evacuation should always be carried out to the upper limit of flood levels shown on the inundation maps, due to the uncertainties associated with the flood development time and likely areas of inundation.









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SCALE	1: 50,000
PRINT DATE	04 / 12 / 2007
DRAWN	JLB
MAPINFO FILE	X:\MAPINFO_Files\WCR_Files\2007\0228A_Dam_Break_Series.wor

Approximate Peak Flood Inundation Probable Maximum Flood Storm Centred Over North Pine Dam Catchment



DRG. NO.	NPD - PMF
REV.	A

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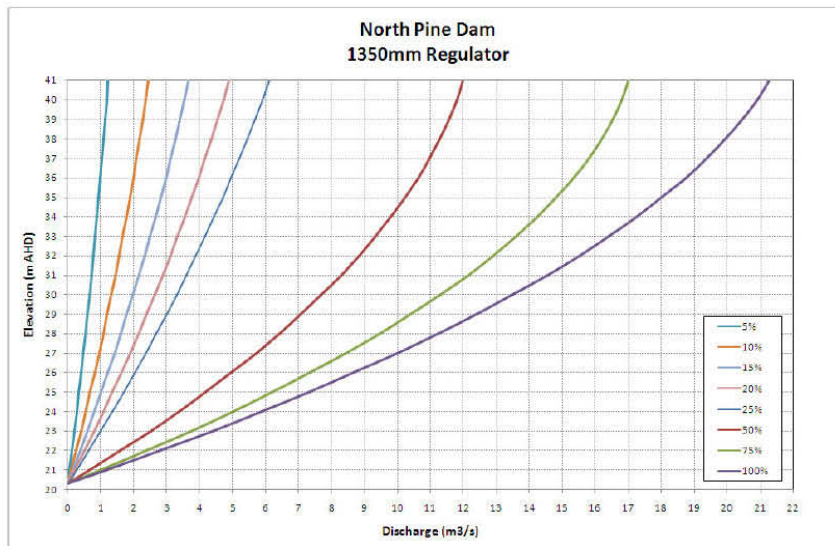
APPENDIX F

DISCHARGE AND STORAGE CURVES

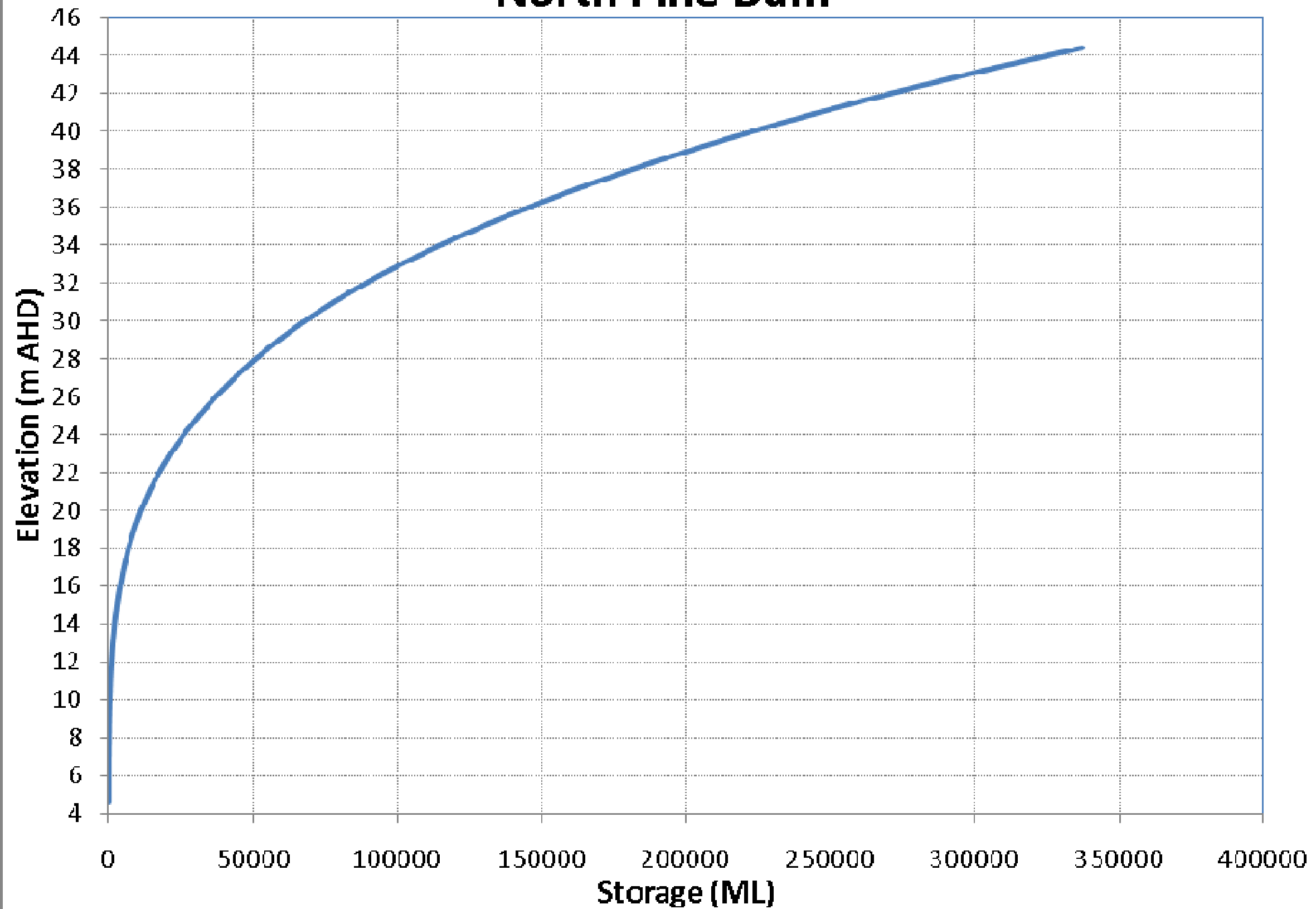


North Pine Dam

1350mm Regulator

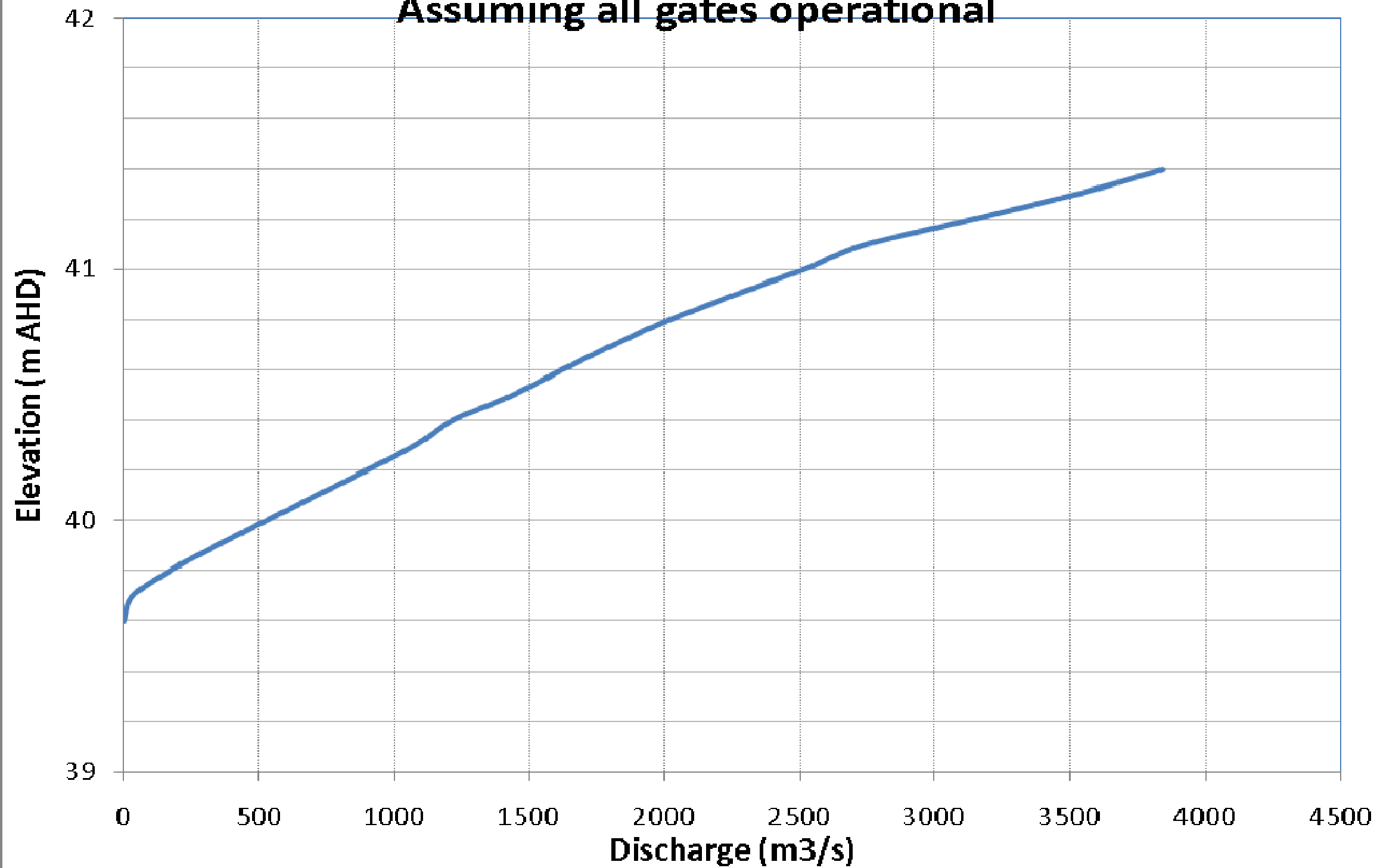


North Pine Dam



North Pine Dam

Assuming all gates operational



APPENDIX G

INSPECTION AND REPORTING FORMS

Incident Management – Incident Log



The purpose of the Incident Log is to record all decisions, actions, direction and other pertinent information. It is important for all personnel involved in managing / responding to the incident to record information in the event that it is required as part of a post incident review or some other investigation.

Incident Name:

Incident Manager:

Date	Time	Item	Recorded by