

**GLEN NIVEN DAM
(ID 276)
Emergency Action Plan
Technical Services
September 2025**



Prepared by:
Technical Services
Department of Natural Resources and Mines, Manufacturing and
Regional and Rural Development
© State of Queensland (DNRMMRRD)
PREPARATION AND AUTHORISATION



Approved by the delegate of the Chief Executive,
Department of Local Government, Water and Volunteers
until 1 September 2026.

Emergency Event - Activation Quick Guide

The Emergency Action Plan (EAP) for Glen Niven Dam covers five emergency conditions. Use the following table to select the relevant section of the EAP that deals with the emergency condition.

Table 1 - Emergency Event Activation Quick Guide

Activation Level	Normal Spillway Discharges	Alert	Lean Forward	Stand Up		Stand Down
Decision Authority	EEC	EEC	EEM & DM	EEM & DM		EEM & DM
Activation triggers for emergency conditions relating to uncontrolled dam release hazards (Flooding)						
Flooding (Section 6.1) (Rising reservoir level, spillway operations)	Reservoir water level above EL 879.46m and below EL 879.90m.	Reservoir water level above EL 879.90m and rising but below EL 880.25m.	Reservoir water level above EL 880.25m and rising but below EL 880.50m.	STAND UP 1 Reservoir water level above EL 880.5m and rising.	STAND UP 2 Reservoir water level above EL 881.60m (0.2m below embankment crest) and rising.	Reservoir water level below EL 879.90m and falling.
Activation triggers for emergency conditions relating to dam failure hazards						
Structural Concerns (Section 6.2) (Seepage progression, cracking or movement of dam structures)	Not applicable	A structural concern has been identified AND No change detected during surveillance inspection	A structural concern has been identified AND Change detected during surveillance inspection OR A possible failure path has been identified	Failure in progress or likely, seepage increasing and/or cloudy		Risk assessment has determined that failure risk has reduced
Water Contamination (Section 6.3) (Biological contamination or toxic spills within the reservoir)	Not applicable	Reports of contamination or potential contamination in the reservoir and/or catchment area and potential hazards to RDSWU, persons and/or property	Reports of contamination or potential contamination in the reservoir and/or catchment area and potential hazards to RDSWU persons and/or property	Confirmation of or high probability of significant contamination in the reservoir or catchment area and potential hazards to RDSWU persons and/or property		Risk assessment that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result
Terrorist Threat/Activity or High Energy Impact (Section 6.4) (Damage resulting from terrorism/ vandalism/ accident)	Not applicable	Not applicable	Possible terrorist activity/suspicious noticed at the dam	Possible terrorist activity/suspicious noticed at the dam or threat received Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit) Failure in progress or likely due to impact or explosion		Risk assessment has determined that failure risk has reduced
Earthquake (Section 6.5) (Damage resulting from an earthquake)	Not applicable	Earthquake reported or felt in the area AND Intensity <u>less than or equal to 5MM</u> AND Change detected during surveillance	Earthquake reported or felt in the area AND Intensity <u>greater than or equal to 5MM</u> AND Change detected during surveillance	STAND UP 1 Earthquake reported or felt in the area AND Change detected during surveillance AND A possible failure path has been identified	STAND UP 2 Failure possible or in progress due to earthquake	Risk assessment has determined that failure risk has reduced

Contents

EAP ELECTRONIC DISTRIBUTION LIST	vi
DOCUMENT REVISION HISTORY	viii
LIST OF ACRONYMS	ix
BUSINESS TERMS AND DEFINITIONS.....	xiii
1.0 Introduction.....	1
1.1 Dam Owner.....	1
1.2 Outline of the Dam	1
1.3 Travel Directions to Glen Niven Dam	2
1.4 EAP Requirements under the <i>Water Supply (Safety and Reliability) Act 2008</i>.....	3
1.5 Objective of the Glen Niven Dam EAP.....	4
1.6 Development of the Glen Niven Dam EAP and Continuous Improvement	5
1.6.1 Training.....	5
1.7 EAP Activation Decision Making Process.....	5
1.8 Dam Hazard Identification	6
1.9 Flood Releases and Agreed Coordinated Response	9
1.10 Communications.....	10
1.10.1 Notifications and Warnings	10
1.10.2 Communication Systems.....	12
1.11 References and Associated Documents	12
1.12 Other Risks and Issues	12
1.13 Technical Data	13
1.14 Critical reservoir water level triggers	15
1.15 Glen Niven Dam - Remote Sensing and Alert System (RSAS).....	16
1.16 RSAS Redundancy Strategy	16
1.17 Bureau of Meteorology.....	16
1.18 Maintenance and Inspections	16
2. Uncontrolled Downstream Releases	17
3. Downstream Release Hazards.....	17
3.1 Persons.....	17
3.2 Property.....	17
3.3 Road Inundation / Road Closure.....	17
4. Communications.....	18
4.1 Notifications and warnings.....	18
4.2 Communication Systems	18
5. EAP Roles and Responsibilities	19
5.1 DNRMMRRD as the Dam Owner.....	19
5.1.1 Emergency Event Coordinator (EEC), Technical Services, DNRMMRRD	19

5.1.2	Dam Inspection Officer (DIO)	19
5.1.3	Dam Inspection Engineer (DE)	19
5.1.4	Emergency Event Manager (EEM)	19
5.1.5	Director Asset Management, DNRMMRRD	20
5.1.6	Executive Director, Technical Services, DNRMMRRD	20
5.1.7	Deputy Director-General, Georesources, DNRMMRRD	21
5.1.8	Director-General, DNRMMRRD	21
5.2	Local Government	21
5.2.1	Chairperson, LDMG	21
5.2.2	Queensland Police Service	21
6.	Emergency Events and Action Tables and Communication Tables	22
6.1	Flood Events	22
6.1.1	Dam Hazard Overview	22
6.1.2	Estimate of Population at Risk (PAR)	22
	Table 4 – Estimated Natural Flooding (Non-Failure) Persons at Risk (PAR)	23
6.1.3	Flood Durations	23
6.1.4	Flood Depths	23
	Table 5 - Flooding Event - DIO Emergency Action Table	24
	Table 6 - Flooding Event - EEC Emergency Action Table	25
	Table 7 - Flooding Event - EEM Emergency Action Table	26
	Table 8 - Flooding Event - DM Emergency Action Table	27
	Table 9 - Flood Event - DIO Communication Table	28
	Table 10 - Flood Event - EEC Communication Table	29
	Table 11 - Flooding Event - EEM Communication Table	32
	Table 12 - Flooding Event - DM Communication Table	33
6.2	Structural/Sunny Day Failure Issues	35
6.2.1	Dam Hazard Overview	35
	Table 13 - Structural Concerns - DIO Emergency Action Table	36
	Table 14 - Structural Concerns - EEC Emergency Action Table	37
	Table 15 - Structural Concerns - DE Emergency Action Table	38
	Table 16 - Structural Concerns - EEM Emergency Action Table	39
	Table 17 - Structural Concerns - DM Emergency Action Table	40
	Table 18 - Structural Concerns - DIO Communication Table	41
	Table 19 - Structural Concerns - EEC Communication Table	42
	Table 20 - Structural Concerns - DE Communication Table	44
	Table 21 - Structural Concerns - EEM Communication Table	45
	Table 22 - Structural Concerns - DM Communication Table	46
6.3	Water Contamination	47

6.3.1	Dam Hazard Overview.....	47
	Table 23 - Water Contamination - DIO Emergency Action Table	48
	Table 24 - Water Contamination - EEC Emergency Action Table	49
	Table 25 - Water Contamination - EEM Emergency Action Table.....	50
	Table 26 - Water Contamination - DM Emergency Action Table.....	51
	Table 27 - Water Contamination - DIO Communication Table	52
	Table 28 - Water Contamination - EEC Communication Table	53
	Table 29 - Water Contamination - EEM Communication Table	54
	Table 30 - Water Contamination - DM Communication Table	55
6.4	Terrorist or High Energy Impact	56
6.4.1	Dam Hazard Overview.....	56
	Table 31 - Terrorist or High Energy Impact - DIO Emergency Action Table	57
	Table 32 - Terrorist or High Energy Impact - EEC Emergency Action Table	58
	Table 33 – Terrorist or High Energy Impact - DE Emergency Action Table	59
	Table 34 - Terrorist or High Energy Impact - EEM Emergency Action Table	60
	Table 35 - Terrorist or High Energy Impact - DM Emergency Action Table	61
	Table 36 - Terrorist or High Energy Impact - DIO Communication Table.....	62
	Table 37 - Terrorist or High Energy Impact - EEC Communication Table.....	63
	Table 38 - Terrorist or High Energy Impact - DE Communication Table	65
	Table 39 - Terrorist or High Energy Impact - EEM Communication Table	66
	Table 40 - Terrorist or High Energy Impact - DM Communication Table	67
6.5	Earthquake	68
6.5.1	Dam Hazard Overview.....	68
	Table 41 - Earthquake - DIO Emergency Action Table	69
	Table 42 - Earthquake - EEC Emergency Action Table	70
	Table 43 – Earthquake – DE Emergency Action Table	71
	Table 44 - Earthquake - EEM Emergency Action Table	72
	Table 45 - Earthquake - DM Emergency Action Table	73
	Table 46 - Earthquake - DIO Communication Table.....	74
	Table 47 - Earthquake - EEC Communication Table.....	75
	Table 48 - Earthquake - DE Communication Table.....	77
	Table 49 - Earthquake - EEM Communication Table	78
	Table 50 - Earthquake - DM Communication Table	79
	Appendix 1 - Notification List and Contact Details	81
	Appendix 2 – Notification Flow Charts.....	88
	Appendix 3 - Glen Niven Dam Locality Plan and Access Route.....	90
	Appendix 4 - Glen Niven Dam Catchment Boundary Map	91
	Appendix 5 – Inspection Safety Protocol.....	92

Appendix 6 – Potential Problem Identification	93
Appendix 7 – Weather Monitoring, RSAS and BOM.....	95
Appendix 8 – Spillway Rating Tables and Flood Duration Curves.....	101
Appendix 9 – Inundation Mapping.....	105
Appendix 10 – Critical Reservoir Water Levels and Trigger Justification	109
Appendix 11 – PAR Evacuation Plans.....	111
Appendix 12 – Riparian and Downstream Water Users (RDSWU) Locality Map	113
Appendix 13 – Burst SMS Sending messages	114
Appendix 14 – Glen Niven Dam Drawings	119
Appendix 15 – Training	120
Appendix 16 – Emergency Event Coordination.....	121
Appendix 17 – Glen Niven Dam Flood Emergency Alert Request.....	122
Appendix 18 – SOP 14 – Normal Spillway Discharge.....	125

EAP ELECTRONIC DISTRIBUTION LIST

Control Copy Number	Position
1	Emergency Event Coordinator, Technical Services, DNRMMRRD
2	Emergency Event Manager, Technical Services, DNRMMRRD
3	Director Asset Management, Technical Services, DNRMMRRD
4	Dam Inspection Officers, SDRC
5	Executive Director, Technical Services, DNRMMRRD
6	Deputy Director-General, Georesources, DNRMMRRD
7	Director-General, DNRMMRRD
8	Southern Downs Local Disaster Management Group, SDRC
9	Warwick District Disaster Management Group, QPS
10	State Emergency Service – Stanthorpe Group

ENDORSEMENT SHEET

This Emergency Action Plan was prepared by Technical Services (TS) officers in liaison with Southern Downs Local Disaster Management Group (LDMG).

Preparation

Name (Print Name): [Redacted]

Position: Senior Engineer, Technical Services

Signed: _____ [Redacted] _____

Date: 16/09/2025

Reviewed

Name (Print Name): [Redacted]

Position: Principal Engineer, Technical Services

Signed: _____ [Redacted] _____

Date: 16/09/2025

Endorsed

Name (Print Name): [Redacted]

Position: A/Director Asset Management, Technical Services

Signed: [Redacted] _____ Digitally signed by [Redacted] Date: 2025.09.17 12:21:23 +10'00'

Date: ___/___/_____

DOCUMENT REVISION HISTORY

Rev	Date	Revision Description
0	December 2015	Draft
1	December 2015	Interim Issue - Emergency Action Plan
1A	December 2016	Interim Emergency Action Plan update - PAR contacts
2	May 2017	Full Issue - Emergency Action Plan
2A	November 2017	Contact list update and document revision
2B	September 2018	Contact list update, MOG and document revision
3	August 2019	Full Issue – Dam upgrade, MOG and update
4	September 2020	Contact list update and document revision
5	September 2021	Contact list update and document revision
6	September 2022	Substantive Update – Earthquake triggers, PAR notifications for flooding events at ALERT, telemetry supplier change, critical water levels summary and trigger justification, contact list update and document revision
7	September 2023	Contact lists and title of roles updated. Corrected grammatical errors and applied minor amendments to wording and formatting for greater consistency and clarification of communication responsibilities.
8	September 2024	Non-substantive changes involve updating contact lists and role titles, correcting grammatical errors, and making minor amendments to wording and formatting to enhance consistency and clarity in communication responsibilities. Update the revision numbers and the date, revise the definitions of relevant terminology, and review and update the Activity Tables. Additionally, emergency contact details, contact lists, and role titles have been revised.
9	September 2025	Non-substantive changes involve inclusion of Event notification flow chart, updating fatigue management requirements and procedure, inclusion of updated SOP-14, updating EA template & contact lists and role titles. Correction of grammatical errors and minor amendments to wording and formatting to enhance consistency and clarity in communication responsibilities. Update to administrative details and emergency contact information, and role titles/personnel names.

LIST OF ACRONYMS

Acronym	Full Title	Description
AEP	Annual Exceedance Probability	Likelihood that a specific rainfall or flood event will be exceeded in any given year
AWS	Australian Warning System	National approach to communicating information and calls to action during emergencies
AHD	Australian Height Datum	Nominated common vertical height Datum for the elevations in this EAP
ANCOLD	Australian National Committee on Large Dams	National organisation providing guidelines on the operation and maintenance of dams
BOM	Bureau of Meteorology	Government department providing weather data and weather warnings
BURST	BURST SMS	SMS broadcast service capable of broadcasting messages to target groups simultaneously via mobile telephones, with reporting. (Appendix 13 – Burst SMS Sending messages)
DDGCEO	Deputy Director-General, Georesources DNRMMRRD	Deputy Director-General, Georesources for DNRMMRRD
DDMG	District Disaster Management Group	Assist and enable local government to fulfil their functions under the Disaster Management Act 2003
DDS	Director Dam Safety	Director Dam Safety for DLGWV
DE	Dam Inspection Engineer	Engineer appointed to undertake inspections
DG	Director-General, DNRMMRRD	Director-General of DNRMMRRD
DIO	Dam Inspection Officer	Person appointed to undertake inspections
DLDC	Deputy Local Disaster Coordinator	Person nominated under s.35 of the Queensland Disaster Management Act 2003 as the coordinator of responses in an emergency event
DM	Director Asset Management	Director for DNRMMRRD responsible for management of water infrastructure
DNRMMRRD	Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development	Department representing Queensland Government who own Glen Niven Dam
DEMU	DNRMMRRD Emergency and Disaster Management Unit	Emergency Management Section of the Department

Acronym	Full Title	Description
DNRMMRRDRM	DNRMMRRD Media	DNRMMRRD work group responsible for internal departmental media etc.
Downstream release	Downstream release	Any downstream release for this dam limited to uncontrolled releases from spillway or embankment failures only.
DLGWV	Department of Local Government, Water and Volunteers	Dam Safety Regulation is included within this Department
EA	Emergency Alert (Polygon Alert)	A SMS and landline broadcast system managed by the State. The system is capable of broadcasting pre-prepared messages to everyone within an area defined by a polygon. The LDC are responsible for distribution of EA messaging.
EAP	Emergency Action Plan	The Emergency Action Plan for Glen Niven Dam
Earthquake Intensity	Modified Mercalli (MM) 5 or Magnitude Scale 5	Felt outdoors. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing. Pictures move. Pendulum clocks stop.
EDTS	Executive Director, Technical Services	Executive Director of the Technical Services unit of DNRMMRRD
EEC	Emergency Event Coordinator	Person responsible for activating the EAP and coordinates emergency actions
EEM	Emergency Event Manager,	Person responsible for management of the dam emergency event
EER	Emergency Event Report	Document prepared by the EEM and sent to the DDS
EL	Elevation	Reduced vertical height elevations (m) with reference to a common datum AHD
ERT	Emergency Response Team	Internal TS team which carries out EAP communications and actions
EWN	Early Warning Network	A SMS, Landline and Email broadcast service managed by TRC. The system is capable of broadcasting messages to target groups simultaneously via mobile telephones, landline telephones and email, with reporting. This is an opt-in system.
FIA	Failure Impact Assessment	Independent assessment to determine the number of people, population at risk (PAR) who would be impacted by failure of a dam.
FSL	Full Supply Level	Reservoir Water Level reached for reservoir to start spilling

Acronym	Full Title	Description
GDA	Geocentric Datum Australia	Datum for position (Latitudes and Longitudes.)
GSDM	Generalised Short-Duration Method	The Generalised Short-Duration Method is appropriate for durations up to 6 hours, suitable for small catchments such as those of reservoirs and tailings dams anywhere in Australia.
LDC	Local Disaster Coordinator	Person nominated under s.35 of the Queensland Disaster Management Act 2003 as the coordinator of responses in an emergency event
LDCC	Local Disaster Coordination Centre	Centre established in an emergency to manage the response to a disaster
LDMG	Local Disaster Management Group	Management group established to manage the response to an emergency event at the local level.
Message Code	Message Code	Description of message provided in Activity Table
M/MM	Magnitude or Modified Mercalli Scale	Description of 5 M/MM:- Felt outdoors. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing. Pictures move. Pendulum clocks stop.
m	Metres	Unit of distance
ML	Megalitres	Unit of water measurement (1000 litres)
PAR	Population at Risk	Population exposed to danger as a result of the event leading to the emergency situation
PMF	Probable Maximum Flood	Maximum inflow from the estimated largest possible flood event.
PMP	Probable Maximum Precipitation	Rainfall from the estimated largest possible event.
PMPDF	Probable Maximum Precipitation Dam Failure	Dam Overtopping Failure as a result of the estimated largest possible event.
QFD	Queensland Fire Department	Queensland Fire Department which includes Fire and Rescue, Rural Fire Service, State Emergency Service and Emergency Management.
Polygon	SMS Alert Area Polygon	SMS alert message broadcast area, administered by the LDMG
QPS	Queensland Police Service	Queensland Police Service
RDSWU	Riparian and Down Stream Water Users	Persons or property impacted as a result of the event other than PAR.

Acronym	Full Title	Description
RPEQ	Registered Professional Engineer Queensland	Engineer with qualifications and experience registered to undertake engineering work in Queensland
RSAS	Remote Sensing and Alert System	Electronic real time monitoring system that can be accessed remotely and provides alarms
RWL	Reservoir Water Level	Water level in the Glen Niven Dam Reservoir
SDCC	State Disaster Coordination Centre	Coordinates the communications and actions during an event if required
SDRC	Southern Downs Regional Council	Glen Niven Dam located in council area and contracted provider of Dam Inspection Officers (DIO)
SES	State Emergency Service	State Emergency Service
SitRep	Situation Report	Situation reports are issued to relevant entities during activation of the EAP to keep them informed of the current status of the dam
SMS	Short Message Service	Service provided on mobile phones for sending messages
SOP	Standard Operating Procedure	Documented procedure for undertaking a defined activity
SPO	Senior Project Officer	DNRMMRRD officer responsible for operations at the dam
Sunny Day	Sunny Day Embankment Failure	Embankment failure and uncontrolled downstream release during a period of nil inflow to the reservoir
TS	Technical Services	Technical Services is the team within DNRMMRRD responsible for the management of the dam.
WQ	Water Quality	Water Quality

BUSINESS TERMS AND DEFINITIONS

The meanings of the terms used in this section are set out in accordance with relevant legislation, the Emergency Action Plan guideline and dam industry terminology.

Term	Definition
Dam hazard	Means a reasonably foreseeable situation or condition that may: cause or contribute to the failure of the dam, if the failure may cause harm to persons or property, OR require an automatic or controlled release of water from the dam, if the release of the water may cause harm to persons or property.
Dam hazard event	Means an event arising from a dam hazard if: persons or property may be harmed because of the event, AND a coordinated response, involving 2 or more of the following relevant entities, is unlikely to be required; each local group and district group for the EAP, each local government whose area may be affected, the chief executive, another entity the owner of the dam considers appropriate, AND the event is not an emergency event.
Dam emergency event	Means an event arising from a dam hazard if: persons or property may be harmed because of the event, AND any of the following; a coordinated response, involving 2 or more of the following relevant entities, is required to respond to the event; the event may arise because of a disaster situation declared under the Disaster Management Act 2003; an entity performing functions under the State disaster management plan may, under that plan, require the owner of the dam to give the entity information about the event.
Disaster management plan	Of a district group or local government, means the groups' or local government's disaster management plan under the Disaster Management Act 2003.
District group (District Disaster Management Group)	For an emergency action plan (EAP), means a district group established under the Disaster Management Act 2003, section 22 whose disaster district under that Act could, under the plan, be affected by a dam hazard.
Notice response	A dam owner's written response to a notice following an assessment of an EAP by a local government or district group.
Referable dam	A dam, or a proposed dam after its construction, will be a referable dam if: a failure impact assessment of the dam, or the proposed dam, is carried out under the Water Supply (Safety and Reliability) 2008, AND the assessment states the dam has, or the proposed dam after its construction will have, a category 1 or category 2 failure impact rating, AND the chief executive has, under section 349 of the Act, accepted the assessment. Also, a dam is a referable dam if: under section 342B of the Act, the owner of a dam is given a referable dam notice and, before the effective day for the notice, does not give the chief executive a failure impact assessment for the dam, AND

	<p>the chief executive has not, under section 349 of the Act, accepted a failure impact assessment of the dam.</p>
Relevant entity	<p>Means each of the following under the EAP for the dam:</p> <ul style="list-style-type: none"> the persons who may be affected, or whose property may be affected, if a dam hazard event or emergency event were to happen for the dam, e.g. the owners of parcels of farm land adjacent to the dam or residents of a township each local group and district group for the EAP each local government whose local government area may be affected if a dam hazard event or emergency event were to happen the chief executive another entity the owner of the dam considers appropriate, e.g. the Queensland Police Service.
Activation Levels	<p>The four levels of EAP activation are:</p> <p>Alert: A heightened level of vigilance due to the possibility of an event occurring. No further action may be required; however, the situation should be monitored by someone capable of assessing the potential of the threat. Moving to an Alert level indicates the dam owner is getting ready to activate the Lean Forward level of the EAP if the situation deteriorates.</p> <p>Lean Forward: An operational state characterised by a heightened level of situational awareness of an impending disaster event and a state of operational readiness. Disaster coordination centres are on standby and prepared but not activated.</p> <p>Stand Up: The operational state where resources are mobilised, personnel are activated, and operational activities commenced. Disaster coordination centres are activated. The dam owner needs to provide an Emergency Event Report (EER) in accordance with the provision of the Act.</p> <p>Stand Down: Transition from responding to an event back to normal core business and/or continuance of recovery operations. There is no longer a requirement to respond to the event and the threat is no longer present.</p> <p>The movement through these levels of activation is not necessarily sequential. It should be applied with flexibility and adaptability and be tailored to the location and event. Triggering one of these levels of activation may not necessarily mean a similar activation of LDMGs or DDMGs.</p>
BOM flood level classifications	<p>The three levels of flooding are:</p> <ul style="list-style-type: none"> Minor flooding: This causes inconvenience such as closing of minor roads and the submergence of low-level bridges and makes the removal of pumps located adjacent to the river necessary. Moderate flooding: This causes the inundation of low-lying areas requiring the removal of stock and/or the evacuation of some houses. Main traffic bridges may be closed by flood waters. Major flooding: This causes inundation of large areas, isolating towns and cities. Major disruptions occur to road and rail links. Evacuation of many houses and business premises may be required. In rural areas widespread flooding of farmland is likely.
Chemical spill/toxic condition	<p>The contamination of water in the storage of the dam that could create a dam hazard.</p>

Dam Crest Failure	Dam crest failure is when failure occurs during a flood event with the water level at the crest of the non-overflow section of the dam embankment
Dam Failure	Dam failure is the physical collapse of all or part of a dam or the uncontrolled release of any of its contents. 'Sunny day' dam failure is where the failure occurs at the full supply level and there is no concurrent rain associated flooding.
Flood release	A flood release from a dam occurs when catchment inflows raise the storage level above the Full Supply Level (FSL) resulting in a discharge from the spillway of the dam.
Piping	Internal scour caused by the water flow and seepage that occurs through earth dams, dam foundations, or dam abutments. The internal scour can lead to the formation of a pipe, which can lead to a failure of the dam.
Probable maximum flood	Probable maximum flood is the flood resulting from probable maximum precipitation coupled with the worst catchment conditions that can be realistically expected.
Probable maximum precipitation	Probable maximum precipitation is the theoretical greatest depth of precipitation physically possible based on generalised methods.
Probable maximum precipitation design flood	Probable maximum precipitation design flood is the flood resulting from probable maximum precipitation coupled with standard catchment conditions that can be expected.
Terrorist activity	A deliberate attempt to damage or fail a dam.

1.0 Introduction

This Emergency Action Plan (EAP) has been prepared to guide the Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development (DNRMMRRD) and relevant entities for events or releases from Glen Niven Dam that compromise the safety of persons and/or property downstream of the dam. Glen Niven dam is located in the upper reaches of Four Mile Creek, approximately four kilometres northeast of the township of Applethorpe.

Releases from Glen Niven dam may have a direct impact on persons and/or property downstream of the dam including property immediately adjacent to Four Mile Creek and local roads. During larger events downstream properties may be impacted by uncontrolled releases from the dam.

During extreme flood events it is possible that Glen Niven Dam may be overtopped and potentially fail, which would require evacuation of population at risk (PAR) in response.

This EAP provides an overview of the dam (including technical data), status activation levels and triggers with respect to the five identified potential emergency conditions and the roles and responsibilities of officers/entities under each emergency condition. Emergency Action Tables and Communication Tables for each of the five emergency conditions have been developed for quick reference of actions, including the priority order for notifications, warnings, and evacuations to PAR; and event and review reporting.

1.1 Dam Owner

Glen Niven Dam is owned by the Queensland Government and managed by Technical Services (TS) on behalf of DNRMMRRD.

1.2 Outline of the Dam

Glen Niven dam was constructed around the beginning of the 1900s with its exact date of design and construction unknown. During construction an original low level pipe outlet was installed through the base of the embankment near its highest point. This outlet is no longer operational and has been decommissioned.

It is believed that the dam was originally constructed as an earth fill embankment with a clay core. The exact design of the original dam including the thickness of the dam's clay core is unknown. The majority of the original embankment, apart from its clay core is believed to have been constructed from locally obtained silty-sandy clay. This embankment material is typical of that found throughout the area. This area is known for its granite formations and the original embankment material is the product from the weathering of the granite.

The dam was upgraded in 2019 to ensure that it could safely pass extreme floods and meet modern engineering standards. The upgrade included the widening of the primary spillway, raising of the dam wall and addition of a secondary spillway on the left abutment. The upgrade was constructed using a downstream raise methodology and included the installation of internal filters, a large weighting zone, spillway training walls and rock armouring. Whilst the original Full Supply Level of the dam was reinstated during the upgrade no modifications were made to the storage capacity of the dam as a result of the dam upgrade.

Glen Niven Dam does not have a gated structure or large outlet structure, which would allow upstream water levels to be lowered quickly if required. Downstream releases are limited to spillway releases through uncontrolled open channels or embankment failures. The primary spillway is located at the right abutment of the dam and consists of a broad crested weir with concrete control structure that extends into a wide spillway channel. A secondary by wash style

spillway with its crest set at a higher elevation than the main spillway has been constructed on the left abutment to further increase the ability of the dam to pass large to extreme floods.

The approximate travel time for flow discharging from Glen Niven Dam to reach the nearest PAR is regarded as short (potentially less than 40 minutes), refer to Table 4, however this time would vary according to the scale of the failure hazard or downstream release hazard event.

1.3 Travel Directions to Glen Niven Dam

Glen Niven Dam is approximately eight kilometres north-northeast of Stanthorpe on Four Mile Creek, as indicated in Figure 1.

Access to Glen Niven Dam is gained via a Council easement from Old Warwick Road to the right bank of the dam. From the township of Stanthorpe, travel north on the New England Highway for approximately 4.7 km, turn right briefly on to Border Road, crossing the railway line and turning immediate left onto Old Warwick Road. Travel for approximately 4.7km, before turning right onto unnamed dirt road, with a large shade structure on the left. In 120m proceed through the wire swing gate (with no entry signage) and at the end of the shade structure turn left. After approximately 550m, at the next intersection turn right and proceed with the fence on your left-hand side. The dam right bank and pump sheds are in approximately 200m.

Roads are both sealed and unsealed and are predominately all-weather accessible.

When the spillway is not discharging it is possible for vehicles and pedestrians to access the dam crest from the downstream side of the dam via a locked gate.

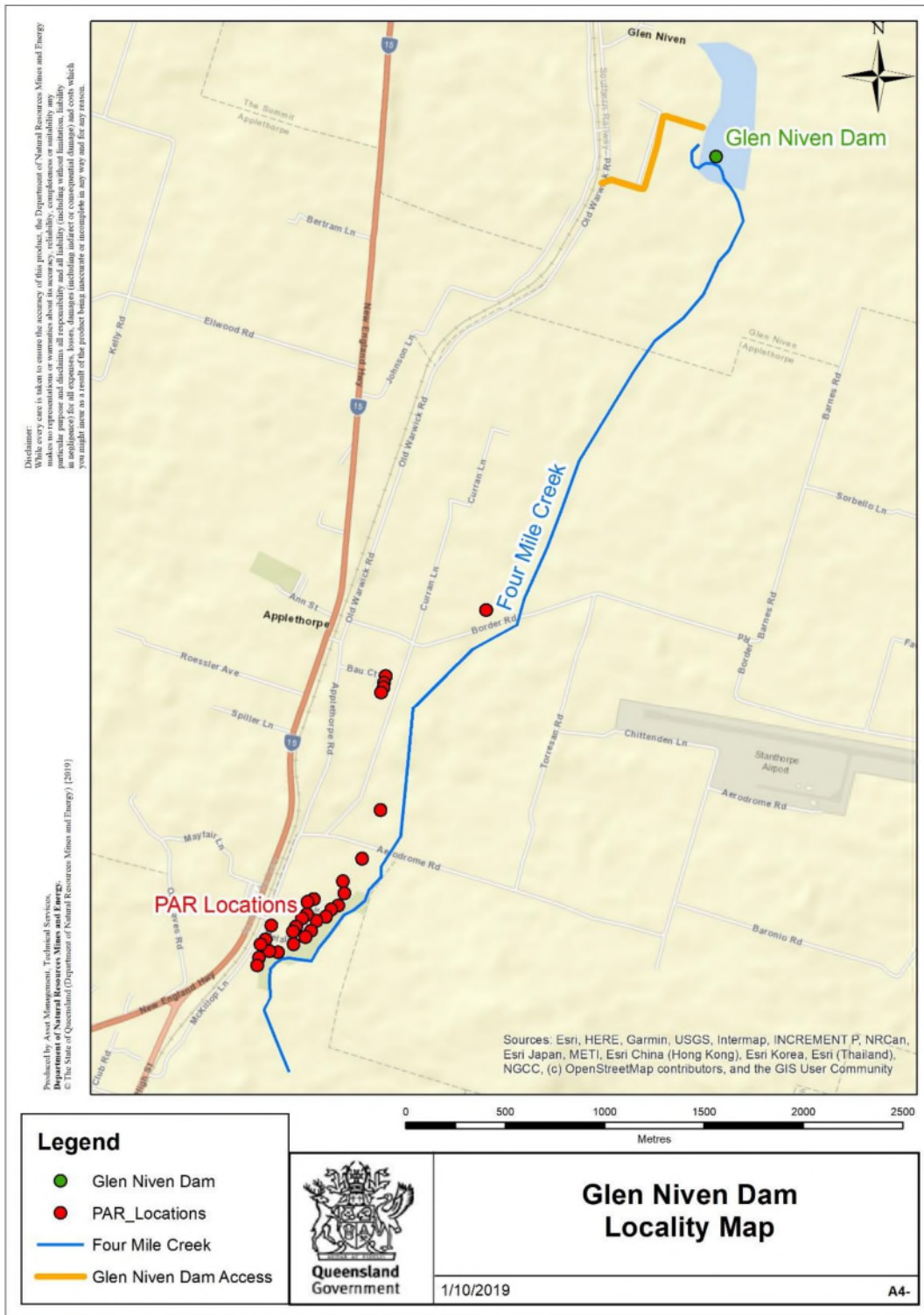


Figure 1 - Glen Niven Dam Locality Plan

1.4 EAP Requirements under the *Water Supply (Safety and Reliability) Act 2008*

Under the Water Supply (Safety and Reliability) Act 2008 (the Act), the owner of a referable dam must have an approved EAP for the dam. Referable dams, by definition, would put lives at risk if they were to fail.

Summary of Legal Requirements – Section 352H

Section 352H (1) of the Act requires that the EAP must identify each dam hazard for the dam; and for each of these dam hazard (e.g. flood operations):

1. Identify the area likely to be affected by a dam hazard event or emergency event arising from the dam hazard, including, for example, by attaching to the plan maps showing areas vulnerable to flooding if the event were to happen; and
2. Identify each circumstance that indicates a material increase in the likelihood of the dam hazard event or emergency event happening; and
3. State when and how the owner of the dam plans to warn persons who may be harmed, or whose property may be harmed, by the dam hazard event or emergency event, including the order of priority in which the persons or categories of persons are to be warned; and State when and how the owner plans to notify the relevant entities for the dam, if a dam hazard event or emergency event happens or, there is a material increase in the likelihood of such an occurrence, including the order of priority in which the relevant entities are to be notified; and
4. State the actions the owner of the dam plans to take in response to a dam hazard event or emergency event.

In accordance with section 352H(2) of the Act, the EAP may provide for the dam owner to make arrangements with a relevant entity for warnings to be given by the relevant entity on behalf of the dam owner in appropriate circumstances.

Section 352HA of the Act states that before giving the chief executive an EAP, the owner of the dam must give a copy of the plan to each local government whose area may be affected by a dam hazard identified in the plan, and each district group for the plan.

Section 352HB of the Act states that the local government must assess the EAP for consistency with its disaster management plan. In its assessment, the local government must consult with the local group for the plan.

The local government whose area may be affected by a dam hazard for Glen Niven Dam has been assessed as Southern Downs Regional Council (SDRC). SDRC, through the LDMG, is provided a draft copy of the EAP following each comprehensive review to ensure consistency with its disaster management plans.

Within 30 business days of receiving the EAP, the local government must give the owner of the dam a notice, which states whether it considers the plan is consistent with its disaster management plan; and if not, give reason why it considers the EAP is not consistent. The EAP must include any such notices, provided to the owner of the dam by local government (or district group); and any responses which the owner gives to these notices. Section 352H (1) further stipulates that an EAP must include any other relevant matter prescribed by regulation.

Section 352HC of the Act states that a district group may review the EAP for consistency with its disaster management plan. The district group for Glen Niven Dam is Warwick District Disaster Management Group (DDMG).

1.5 Objective of the Glen Niven Dam EAP

The objective of this EAP is to:

1. Outline a detailed plan for TS officers to follow to minimise the risk of harm to persons or property if a dam hazard event or emergency event for the dam occurs.
2. Identify dam hazard events that could occur at Glen Niven Dam and the areas likely to be affected.

3. Provide emergency actions taken by the dam owners and operating personnel in identifying and responding to dam hazard emergency/emergency events and notifying and coordinating responses for relevant entities.
4. Outline the communications and actions for informing SDRC, relevant disaster management groups (DMGs), and the broader community during the activation of this EAP.

1.6 Development of the Glen Niven Dam EAP and Continuous Improvement

This EAP has been prepared in accordance with Chapter 4 of the Act and has involved continuous collaboration over a number of years with local government, DMGs and downstream PAR. Operational elements of the EAP have been refined over time as the lessons have been identified during various activations of the EAP.

The triggers and messages have been carefully crafted based on discussions and feedback from all relevant entities that have been identified within this EAP. Each year TS staff:

Consult with all relevant stakeholders with the aim of making improvements when the EAP is reviewed.

Meet or talk with the downstream PAR, SDRC and DMG representatives to discuss any proposed changes to the EAP, and to ensure that the Warwick DDMG is well informed on the dam safety issues surrounding Glen Niven Dam. This allows all parties to understand their role and responsibility during the activation of the EAP, and what actions they may need to take.

Actively seeks feedback from all relevant entities to ensure that improvements can be made on a continual basis.

1.6.1 Training

TS has taken a proactive and collaborative approach to EAP training and running exercises. Each year, typically before the wet season, TS runs a series of workshops and scenarios to test the effectiveness of the EAP. Depending on availabilities, external agencies and/or Local Government may be included to test various scenarios. This ensures that all stakeholders understand their role and responsibility under this EAP and that it appropriately aligns with local and district disaster management plans.

New employees to TS are given a briefing and walkthrough of the EAP to understand their role and responsibility during an event. If an event occurs, new employees will be assisted through the processes to ensure all important communications and actions are undertaken.

1.7 EAP Activation Decision Making Process

This EAP can be activated by the EEC, EEM or DM when the situation reaches ALERT except in the event of a terrorist threat or event which goes straight to STANDUP.

When a dam hazard event or emergency event is occurring, an Emergency Response team (ERT), comprised of the DM, EEM, and EEC for the dam, is formed to monitor the event and undertake actions where required.

To escalate or de-escalate the EAP, the ERT will discuss the current situation at the dam and any logistical issues which need to be managed (e.g. the management of staff resourcing, the timing of contacting PAR) before making a decision. Although ultimately it is the DM's call, an outcome is agreed amongst the ERT before a formal decision is made.

As an example, for a flood event the following information would be assessed on a qualitative and/or quantitative basis as part of the decision-making process:

Current reservoir water level and the rate of rise

Rainfall recorded by nearby rain gauges

The intensity of rainfall over the dam catchment measured by the BOM Brisbane (Marburg) Radar.

Time of day – when should notifications be made to ensure a high likelihood that they are seen/heard.

Once the ERT has an agreed position, actions will be undertaken as outlined by the EAP.

Logistical Issues

To ensure logistical flexibility for the ERT during a dam hazard event or emergency event, the ERT may elect to modify some of actions and communications within the EAP, including (but not limited to);

Timing of EAP activation, notifications and warnings – It is important to note that each event is unique in circumstance and that the ERT may elect to activate the EAP before said triggers are reached if the above information sources suggest that the EAP will require activation. The EAP may be pre-emptively activated if it can be established that trigger levels are likely to be reached late at night or very early in the morning. This proactive approach allows a ‘plan of attack’ for the ERT to be put in place and for messaging to be sent out during normal community waking hours.

Content of the notifications and warnings – messaging may be changed subject to minor change by approval of EEM to reflect the unique circumstances of the dam hazard event or dam emergency event.

1.8 Dam Hazard Identification

The emergency action planning for Glen Niven Dam has identified each potential hazard for the dam below and has determined how dam hazards could become a dam hazard event or a dam emergency event. The areas likely to be impacted by a dam hazard event or dam emergency event can vary greatly depending on the circumstances of the event, the RWL and whether the dam fails. This EAP contains the likely impacts during SDF, DCF and PMPDF scenarios; therefore, covering the areas likely to be impacted in worst-case scenarios for the following dam hazards:

Dam hazard	May become a dam hazard event or emergency event when
Flood event	Spillway outflows from the dam may harm persons or property or there is a failure of the dam, where the water level is between FSL and DCL, which may harm persons or property.
Chemical/toxic spill	A chemical or toxic spill may harm persons or property.
Structural issue	The embankment is breached, causing a dam failure and the subsequent outflows from the dam may harm persons or property.
Earthquake	A structural issue is caused which initiates a dam failure and outflows from the dam may harm persons or property.
Terrorist Threat/Activity or High Energy Impact	A structural issue is caused which initiates a dam failure and outflows from the dam may harm persons or property.

Although not reportable to the Queensland Dam Safety Regulator, water contamination events within the dam storage are managed in accordance with the procedures included in this EAP.

Dam Hazard Event

A dam hazard becomes a dam hazard event when persons or property may be harmed due to the event, but the actions undertaken by the dam owner is unlikely to require a coordinated response involving two or more relevant entities.

This applies when notifications are given to all relevant entities but there is no requirement for an evacuation.

Dam Emergency Event

A dam emergency event is an event arising from a dam hazard where persons or property may be harmed and coordinated response involving two or more relevant entities is needed.

This applies when warnings are given during Stand up to all relevant entities and evacuations have been recommended.

Emergency Event Report

An Emergency Event Report (EER) will be provided as required by section 352T of The Act. Generally, an EER will be provided by the EEM to DDS if there has been a flood of record or the dam has reached Stand up activation level and a coordinated response with relevant entities is needed.

The following colour coding has been used in this EAP that corresponds to each level of alert or status:

Table 2 - Alert Status Colour Coding

Status	Description / Situation
<p>NORMAL SPILLWAY DISCHARGES (SOP 14)</p>	<p>Conditions identified or developing that could escalate and impact on Glen Niven Dam and may include: Observed, monitored or forecast rainfall to result in inflows and Reservoir Water Level (RWL) rising above the SOP14 trigger level (discharge through the main spillway above EL 879.46m) Normal spillway discharge up to EL 879.90m</p>
<p>ALERT</p>	<p>Conditions identified or developing that could escalate and impact on Glen Niven Dam include: Development of conditions (or received information) that warrants more frequent or continuous monitoring of weather forecasts, rainfall, RWL or seepage RWL is above EL 879.90m Other situations or issues that compromises the structural integrity of Glen Niven Dam resulting in possible failure of the dam.</p>
<p>LEAN FORWARD</p>	<p>Conditions identified or developing that have the potential to place a population and/or property at risk (i.e. flooding, identified, observed or reported dam safety issues) include: Observed, monitored or forecast rainfall resulting in inflows and RWL rising above EL 880.25m Flows begin to discharge from the secondary spillway Identification of dam structural issues that may compromise the structural integrity of the dam. The dam embankment is intact but there is the potential for it to fail.</p>

Status	Description / Situation
STAND UP 1 & 2	<p>Conditions have been identified or exist where an emergency situation has been identified and there is a population and/or property at risk from flooding include:</p> <p>STAND UP 1 (Flooding)</p> <ul style="list-style-type: none"> ○ Observed, monitored or forecast rainfall resulting in inflows and RWL rising above EL 880.50m ○ Discharges taking place or forecast to take place through both the main spillway and secondary spillway ○ Flooding downstream of Glen Niven Dam requiring evacuations to take place. <p>STAND UP 2 (Flooding)</p> <ul style="list-style-type: none"> ○ Observed, monitored or forecast rainfall resulting in inflows and RWL rising above EL 881.60m ○ Forecast for Reservoir Levels to reach or exceed dam crest level ○ Flooding at Glen Niven Dam is nearing the dam crest and failure of the dam by overtopping is possible. ○ Flooding downstream of Glen Niven Dam requiring evacuations to take place <p>Reports of significant damage to the dam</p>
STAND DOWN	<p>Conditions exist or are developing where rainfall and inflows to Glen Niven Dam are reducing and discharges from the dam are reducing. Conditions may include:</p> <p>Reduction in RWL and spillway discharges to EL 879.90m and falling with no rain forecast in the catchment.</p> <p>Downstream flooding has reduced and is no longer a threat to the public and PAR.</p> <p>Risks are reassessed as being low.</p>

1.9 Flood Releases and Agreed Coordinated Response

Flood modelling for the upgraded Glen Niven Dam conducted in 2019 has determined that:

There is no identified downstream Population at Risk (PAR) for the Sunny Day Failure Scenario.

There are identified downstream incremental Population at Risk (PAR) of three persons (1 house) for all Flood Event Scenarios greater than the 1 in 500 AEP event.

The dam has been upgraded to pass the Acceptable Flood Capacity event and is no longer likely to fail during frequent events.

The maximum EAP PAR (Total PAR) for any event is the PMPDF event with up to 29 properties impacted. 28 of these properties are affected by non-failure flooding and only 1 property was found to be incrementally affected by failure of the dam during this event

The minimum travel time for a flood or change in flow conditions at Glen Niven Dam to impact on Border Road is approximately 15 minutes and Aerodrome Road 35 minutes.

Other identified downstream risks in smaller flooding events include inundation of Border Road and Aerodrome Road as soon as Glen Niven dam is full and the uncontrolled spillway release begins.

DNRMMRRD and LDC agreed response to flooding events are:

EEC will liaise with LDC by phone when the Glen Niven Dam spillway depth exceeds 879.46m AHD and the spillway begins to operate at SOP14 levels. LDC will assess the need to close Border Road and Aerodrome Road

EEC will liaise with LDC by phone prior to Burst SMS messaging. ALERT status NOTIFICATIONS at EL 879.90m, when Glen Niven Dam spillway depth exceeds 0.5m,

EEC will liaise with LDC by phone prior to Burst SMS messaging. EEC will distribute Burst SMS messaging LEAN FOWARD Status NOTIFICATION updates to LDC and commence Burst SMS messaging LEAN FOWARD status NOTIFICATIONS to PAR and RDSWU at, EL 880.25m, when spillway depth exceeds 0.85m and there is potential to reach EL 880.5m.

EEC will liaise with LDC by phone prior to distributing Burst SMS messaging STAND UP 1 status WARNINGS to LDC, RDSWU and PAR, recommending evacuation at, EL 880.5m, spillway depth exceeds 1.1m.

EEC will liaise with LDC by phone prior to requesting 'Flood Failure' Emergency Alert at STAND UP 2 when the dam water level reaches EL 881.60m, 0.2m below dam crest level.

EEC will liaise with LDC by phone prior to distributing update message by Burst SMS recommending Stand Down to LDC, DIO, RDSWU and PAR when a receding RWL trend is observed and no additional rain in the catchment and reservoir water level is less than EL 879.90m and falling.

It has been agreed with the LDMG and LDC that co-ordination for the evacuation of the population at risk (PAR) would be carried out, where possible, by the SES and/or QPS and coordinated through the LDMG. This aligns with the Local Disaster Management Plan and/or sub plan. Therefore, DNRMMRRD must communicate effectively with the LDC at all times, from start to finish of any event.

Other downstream simultaneous release hazards exist for Glen Niven Dam during normal spillway operation and at the Alert status in priority order which include:

Border Road and Aerodrome Roads may be inundated, and the LDMG/Council should consider closure

Fencing, pumps and stock

Internal property access roads may be impacted

1.10 Communications

1.10.1 Notifications and Warnings

The activity tables provided in this EAP provide when notifications, warnings and, if required, evacuations of impacted landholders/residents needs to take place. It is however noted that for other reasons initial warnings and evacuation of impacted residents at an earlier stage than that outlined in this EAP may have occurred (i.e. other local emergency plans have been activated, for example the Local Disaster Management Plan held by SDRC).

Due to the short flood travel times early warning will be given to PAR on being aware of a potential dam break event or flooding issues from the dam. Depending on the event a proactive response and early notification, warning and/or evacuation may occur, rather than waiting for triggers to be reached. During a dam hazard event or dam emergency event TS maintains an open line of communication with relevant entities to ensure that all parties are kept well informed. Contextualised messaging, contact lists and evacuation plans are contained in the subsequent sections and appendices of this EAP. Messaging for each activation level has been developed to reflect the level of attention or urgency needed by the downstream community, local government or relevant DMGs.

Minor changes may be made to the messaging outlined in this EAP by approval of the EEM to reflect the unique circumstances of the dam hazard event or dam emergency event.

The process for issuing notifications and warnings is outlined in the activity tables in this EAP and notification flowcharts in Appendix 2. It is important to note that priority order is implied by the order in which persons/entities are listed within the communication tables. During an event where the EAP is activated, TS aims to keep all entities well informed with sitreps provided at stated times or if the conditions affecting the dam change. It is important to note that;

Internal sitreps are sent by the EEM to the ERT via email.

External sitreps are sent by the DM or EEM. It will include a summary of the dam/s status and the required actions.

An example of internal SitReps is provided below. The content of sitreps may be altered to suit the circumstances of individual dam hazard events or dam emergency events.

Template SitRep

SITUATION REPORT – GLEN NIVEN DAM Technical Services Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development		
EVENT: xxxxx (e.g. flooding)		
Daily Sitrep No:	Date:	Timing:
XXX	Xx/xx/xxxx	e.g. 0800
Reviewed		
Emergency Manager	<div style="background-color: #c0e0e0; height: 15px; margin-bottom: 5px;"></div> <div style="background-color: #c0e0e0; height: 15px; margin-bottom: 5px;"></div> <div style="background-color: #c0e0e0; height: 15px; margin-bottom: 5px;"></div> <p style="text-align: center; margin: 10px 0;"><<< OR >>></p> <div style="background-color: #c0e0e0; height: 15px; margin-bottom: 5px;"></div> <div style="background-color: #c0e0e0; height: 15px; margin-bottom: 5px;"></div> <div style="background-color: #c0e0e0; height: 15px; margin-bottom: 5px;"></div>	
Approved and from:		
Director Asset Management	<div style="background-color: #c0e0e0; height: 15px; margin-bottom: 5px;"></div> <div style="background-color: #c0e0e0; height: 15px; margin-bottom: 5px;"></div> <div style="background-color: #c0e0e0; height: 15px; margin-bottom: 5px;"></div>	
<p>Glen Niven Dam Located 8km north of Stanthorpe https://www.qld.gov.au/environment/water/catchments/state-owned-dams</p> <p>Current Status EAP activation status: ALERT/LEAN FORWARD/STAND UP/STAND DOWN Reservoir water level trend is steady/rising/falling Current level is XXX.XXm (XXX.XXm over spillway) (current at DATE/TIME) BOM forecast is XXX Upstream gauging station shows XXXX</p> <p>Current actions: Frequency of monitoring xxxxx Inspections Xxxxx Notifications to xxxxxx</p> <p><u>Background Information about Glen Niven Dam and EAP</u> Full Supply Level 879.41m Moderate Flood Level (Alert) occurs at 879.9m – Provide notifications Moderate/Major Flood Level (Lean Forward) occurs at 880.25m – Prepare for evacuations Major Flood Level (Stand Up) occurs at 880.5m – Advise Evacuations</p>		

1.10.2 Communication Systems

Communications shall include both communication to the PAR as well as communications between the dam owner and the relevant entities required to deliver the appropriate response, scalable to the emergency event.

The means of communication to be engaged for this EAP shall include:

- Landline Telephone
- Mobile Telephone
- Email
- SMS/Text Message
- SitRep

1.11 References and Associated Documents

The following list of references, including relevant legislation and key documentation applicable to this EAP.

- Disaster Management Act 2003
- Water Supply (Safety and Reliability) Act 2008
- Department of Natural Resources, Mines and Energy, November 2018. *“Guideline for failure impact assessment of water dams.”*
- Department of Regional Development, Manufacturing and Water, October 2023. *“Emergency Action Plan for Referable Dam Guideline.”*
- Department of Regional Development, Manufacturing and Water, March 2024. *“Dam Safety Management Guideline”.*
- ANCOLD Guidelines
- IGEM Review of Seqwater and SunWater Warnings Communications Report 1/2016
- IGEM Review of Paradise Dam Preparedness Review Report 1/2019

1.12 Other Risks and Issues

The weather event(s) likely to lead to activation of this EAP may also have the following implications:

- Access roads to the dam may be impassable due to localised flooding, slippery road conditions, downed power lines and trees or vegetation across the roads;
- High winds making road travel difficult or unsafe;
- The embankment will not be accessible while there is a flow in the spillway above EL 879.41m. Do not attempt to cross the spillway above this level.
- DIOs will be unable to travel to dam site due to road closures;
- Emergency services already occupied with other storm or flood events;
- Limited number of resources available within Applethorpe and surrounding area to assist with implementation of the EAP;
- Potential communication issues.

The Remote Sensing and Alert System (RSAS) has been installed as the control measure to address the above risks, allowing critical readings at the dam to be monitored remotely in real time. The monitoring system at Glen Niven Dam relies on a telemetry system that utilises both the mobile and satellite phone network. Adverse weather conditions or storm damage to either phone network or onsite equipment (such as from a lightning strike), temporary high demand or high cloud cover may impact on the systems connectivity and updates.

DIOs are to cease all routine inspections of the dams once the flooding activation status reaches or exceeds (or is likely to exceed) the Lean Forward status. The DIOs are only to go to the site while the EAP remains above Lean Forward if requested or approved by the EEC, and if it is safe to do so.

1.13 Technical Data

The following technical data is provided for Glen Niven Dam:

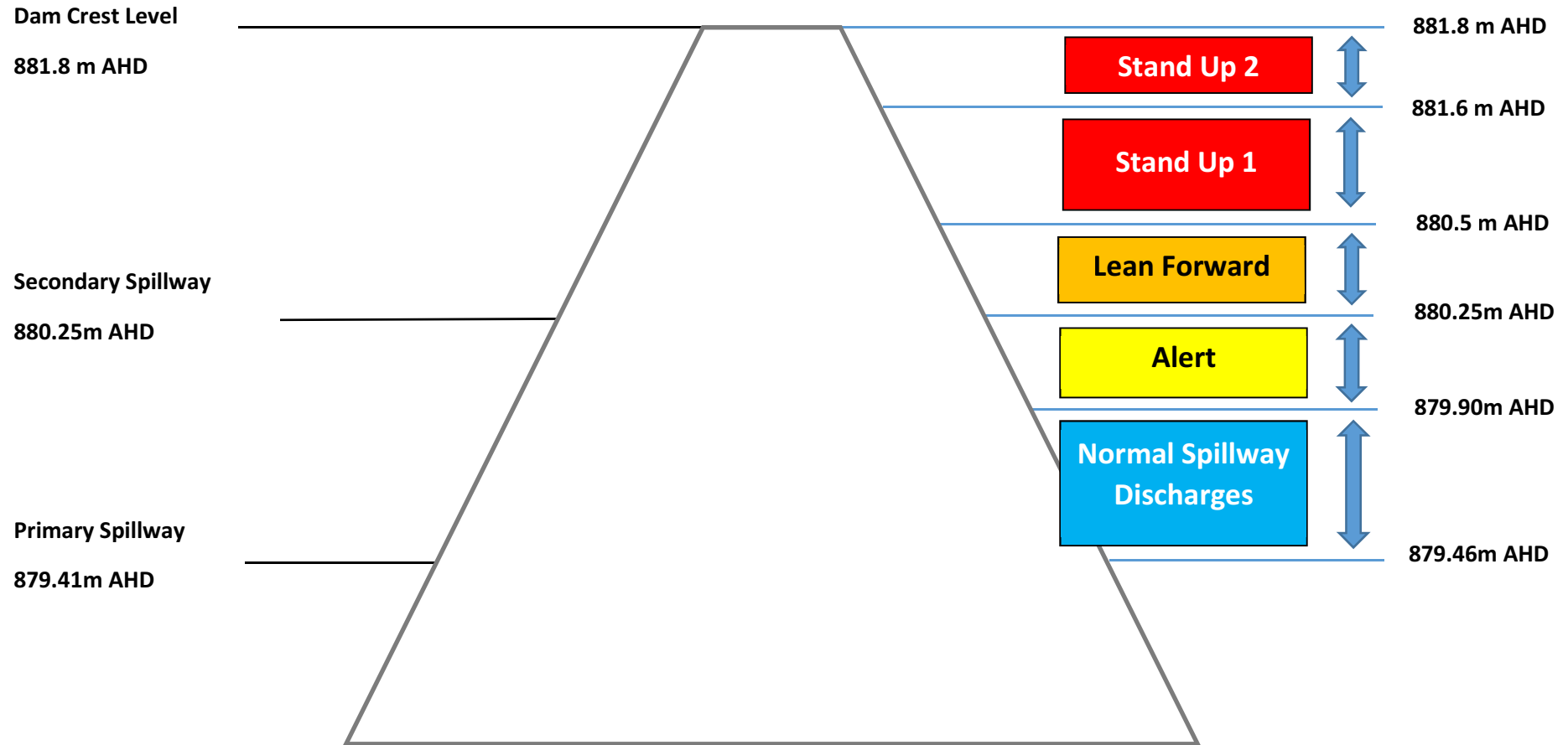
Table 3 - Glen Niven Dam Technical Data

Location and Ownership	
Council	Southern Downs Regional Council (SDRC)
Nearest Town	Applethorpe, 3km, Southwest
Stream and AMTD	Four Mile Creek, AMTD 6.5km
Referable Dam Number	Dam ID 276
Embankment Coordinates	28 ^o 35' 40.999"S 151 ^o 58' 18.001"E
Current Owner	Queensland Government (managed by Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development)
Designer (Date)	1900
Designer of Upgrade (2019)	GHD Pty Ltd
Construction Contractor of Upgrade	FK Gardner and Sons
Construction Period	1900
Construction of Upgrade	January 2019 – May 2019
Dam Safety review dates	2019 - Dam upgrade design and as constructed reporting Next Review required by 1 October 2037
Dam Information	
Dam Type	Zoned earth fill dam with clay core and downstream filters
Purpose	Water supply for irrigation and stock.
Main Dam Height (above lowest toe)	8.5m
Main Dam Length	260m
Primary Spillway Type	Natural bedrock and soil chute with concrete control structure, Spillway Crest 879.41m.
Primary Spillway Description	Spillway width approximately 33.5 m
Outlet Description	Decommissioned
Reservoir characteristics	
Full supply level (FSL)	EL 879.41m
Reservoir capacity	185 ML

Surface area	9ha at FSL
Length of shoreline	unknown
Main Spillway capacity	216m ³ /s at DCL
Secondary Spillway Capacity	65m ³ /s at DCL
Dam crest level (DCL)	881.8m (AHD)
Catchment area	8.1km ²
Estimated time of concentration	Approximately 1.5 hours
Catchment description	Low undulating hills with flat land, sparsely vegetated.
Design Rainfall Review	
Methods	Design rainfall intensities were estimated using the procedure described in Australian Rainfall and Runoff (1999). Rainfall estimates for rare floods between the 1:100 and 1:2,000 AEPs were based on the CRC-Forge technique. Rainfall estimates were made for short-duration Probable Maximum Precipitation (PMP) storms using the generalised short duration method (BOM, 2003). Rainfall intensities between 1:2,000 AEP and the PMP were interpolated using methods prescribed in AR&R (1999).
Dam characteristics	
Wall Description (dimensions and zone arrangements)	4 m wide crest with 1 on 2 upstream slope and 1 on 2.5 downstream slope. The wall is a zoned earth-fill with blanket and chimney filters and a toe drain.
Slope Protection	Rock protection on the upstream face. The downstream face has been seeded for grass to become established on the downstream face.

1.14 Critical reservoir water level triggers

Figure 2 – Dam Embankment Cross Section showing Critical Reservoir Water Level Triggers



1.15 Glen Niven Dam - Remote Sensing and Alert System (RSAS)

The RSAS at Glen Niven Dam provides real time monitoring at preset time intervals of the conditions listed below.

- upstream reservoir water levels
- rainfall tipping bucket measuring rainfall intensity
- downstream V-notch weir water levels
- vibrating wire piezometer readings

Automatically activated SMS alerts are sent to key DNRMMRRD personnel at various predetermined critical trigger levels based on the upstream reservoir water level.

The system uses the mobile (4G) and satellite networks to communicate the site data to Qteq and other users.

The RSAS and the site instruments are powered by batteries which are electrically maintained by solar panels located on the top of each cabinet. The systems are capable of operating for several days with minimal charge, however may be impacted by extensive periods of cloud cover or wet weather reducing the efficiency of the solar panels and the level of charge in the batteries. A persistent low battery voltage reading on the portal website may pre-empt a detrimental impact to the system.

Details on the use of the RSAS portal website are in Appendix 7 – Weather Monitoring, RSAS and BOM.

1.16 RSAS Redundancy Strategy

In the event that the real time RSAS fails the redundant strategy is to revert to relying upon local intelligence and BOM to provide weather conditions, predictive rainfall depths and intensities likely for the dam.

1.17 Bureau of Meteorology

A large amount of real time information can be obtained from the Bureau of Meteorology (BOM) web site (www.bom.gov.au) that can assist in assessing actual and predicted rainfall and development of flood inflows to Glen Niven Dam. The information includes “weather radar” images from either Marburg, Mt Stapylton or Moree Weather Watch Radars and localised surrounding rainfall weather stations.

Details of the use of BOM site to assist in assessing impacts to the dam are in Appendix 7 – Weather Monitoring, RSAS and BOM.

This information should be used to verify the veracity of the RSAS data.

1.18 Maintenance and Inspections

The dam is maintained and inspected in accordance with the safety conditions relevant to the dam and the Queensland Dam Safety Management Guidelines.

The dam is inspected regularly including:

- Weekly surveillance inspections by experienced dam inspection officers.
- Quarterly inspections by TS officers and certified by a qualified dam engineer (RPEQ).
- Annual engineering inspections by an independent RPEQ.
- Comprehensive engineering inspections on a 5 yearly basis.
- Dam safety reviews on a 20 yearly basis.

Special inspections are also undertaken following any major events such as major flood inflows and discharges through the dam spillway or reports of any major damage or interference to the dam. Refer to SOP 6 and SOP 7 for further information.

2. Uncontrolled Downstream Releases

Glen Niven Dam has no ability to control releases from the dam (for example outlet pipes or gated structures), all releases pass through the spillways only and are therefore uncontrolled.

3. Downstream Release Hazards

3.1 Persons

Flooding downstream of Glen Niven Dam does not impact on residential properties until discharges are in the order of a 1% AEP event.

All flooding events in excess of 1:50,000 AEP have the potential to fail the embankment by overtopping and have a direct impact on downstream properties. Properties likely to be impacted by flooding during this event are identified in this EAP as the Population at Risk (PAR). Impacts will include above ground flooding around houses at various depths and the requirement for evacuation. Evacuation of the PAR is initiated earlier at a reservoir elevation of 880.5m AHD.

The notifiable PAR are identified on the evacuation plans, the numbers on the plans are the property numbers (not street addresses) and directly correspond with PAR list and contact details (Refer to Appendix 1 - Notification List and Contact Details, PAR within Inundation area as identified in the PMPDF event and Appendix 11 – PAR Evacuation Plans .

The notifiable PAR identified in this EAP are those properties which are likely to be affected by natural flooding and/or dam failure flooding during an emergency event. Flood modelling undertaken for Glen Niven Dam has shown that only 1 property is likely be affected incrementally by flooding as a result of failure of the dam for scenarios greater than the 1 in 500 AEP event.

3.2 Property

Events may impact properties surrounding and downstream of the dam other than the identified PAR. The landholders associated with these properties have been identified in this EAP as the Riparian and Downstream Water Users (RDSWU). Impacts may include but are not limited to internal access, grazing activities, fences, stock and pumps. The RDSWU are therefore included in all simulcast broadcast messaging.

3.3 Road Inundation / Road Closure

The two culvert road crossings on Border Road and Aerodrome Road located just downstream of Glen Niven dam may be inundated whenever there is any release from Glen Niven Dam. SDRC and LDC will be notified of uncontrolled releases and advised the roads may require closing. Large and/or long duration releases may cause damage to Border Road and Aerodrome Roads which should be assessed by SDRC after each event.

A proactive approach is encouraged in respect to road closures. Warning signs should be erected ahead of any adverse weather systems approaching the area. The SDRC should liaise with the relevant entities to assist with road closures and the placement of signage and barricades.

Refer to Appendix 10 – Critical Reservoir Water Levels and Trigger Justification, Figure 1 - Glen Niven Dam Locality Plan, Appendix 1 - Notification List and Contact Details for RDSWU Contact List and Appendix 12 – Riparian and Downstream Water Users (RDSWU) Locality Map .

4. Communications

4.1 Notifications and warnings

The process for issuing notifications and warnings is outlined in the Emergency Action Tables and Communication Tables in Section 6 in this EAP.

Particular attention should be paid to the listed order in these tables, being the notification priority order in which individuals or organisations are to be notified as the order can vary for different Emergency Events and for different Activation Status' within events.

Flooding in Four Mile Creek and discharges from Glen Niven Dam are expected as a result of a large low, rain depressions or thunderstorms entering the area. The Emergency Action Tables in this EAP provide an indication of identifying triggers and indicate when notifications and warnings from the Communication Tables need to be distributed. It is however noted, that for other reasons initial warnings and evacuation of impacted residents at an earlier stage than that outlined in this EAP may have occurred (i.e. other local emergency plans have been activated, for example the Local Disaster Management Plan held by SDRC or for other reasons Queensland Police Services (QPS) initiate evacuation of impacted residents (PAR) at an earlier stage than that outlined in this EAP. A proactive response and early notification, warning and/or evacuation is encouraged, rather than waiting for reservoir water triggers to be reached.

If the dam is likely to fail or failure is already in progress, DNRMMRRD will inform the LDMG and LDC immediately. DNRMMRRD will prepare for appropriate dissemination of emergency alert warnings (see Appendix 17 – Glen Niven Dam Flood **Emergency Alert Request** Emergency Alert) in consultation with the SDCC. The LDMG have informed DNRMMRRD that in an emergency situation where evacuations are necessary, the LDMG and SES will door knock the potentially impacted houses and evacuate people to the Stanthorpe Civic Centre or other evacuation centres nominated under the LDMP sub plan.

4.2 Communication Systems

Communications includes both communication to the public (PAR, RDSWU and other dam users) as well as communications between DNRMMRRD (EEC), DIO and the relevant emergency response entities required to deliver the appropriate response, scalable to the emergency event.

The listed order in the Emergency Action Tables and Communication Tables is the intended priority order. However, the primary communication mode "Burst" is capable of broadcasting SMS messages to target groups simultaneously via mobile telephones and provide instantaneous details on delivery success or failure.

The means of communication to be engaged for this EAP in priority order includes:

- Communication with PAR and RDSWU from EEC.

- Burst SMS messaging, primary communication mode (Appendix 13 – Burst SMS Sending messages).

- Landline Telephone, secondary communication mode.

- Mobile Telephone, secondary communication mode.

- Social media, Facebook and external website.

5. EAP Roles and Responsibilities

5.1 DNRMMRRD as the Dam Owner

DNRMMRRD acts on behalf of the State Government as the owner of Glen Niven Dam. The dam owner is responsible for preparing a regulator approved EAP under *the Water Supply (Safety and Reliability) Act 2008*. DNRMMRRD has a contract with SDRC to deliver certain functions under this EAP on its behalf as outlined below.

5.1.1 Emergency Event Coordinator (EEC), Technical Services, DNRMMRRD

The EEC is the TS officer who is responsible for coordinating an emergency event and activating the EAP. Refer to Appendix 16 – Emergency Event Coordination.

During an event the EEC shall:

- Activate the EAP in consultation with the EEM, as per the EEC Emergency Action Tables in Section 6.

- Advise EEM, TS that EEC is coordinating the response to the event; and confirm that the EAP is activated in response to an event.

- Record details of the emergency event in the Event Log. This shall include details of all communications received and sent, observations, decisions and actions taken.

- Monitor conditions at Glen Niven Dam using a combination of information from the RSAS web site and BOM web site.

- Notify SDRC LDC that Glen Niven Dam is spilling, and downstream roads Border Road and Aerodrome Road may be affected.

- Monitor all emergency events.

- When an event at Glen Niven Dam has reached or is likely to reach a reservoir safety trigger level make notifications as per Emergency Action Tables and Communication Table 5 to Table 50.

- In the event that this EAP is activated undertake actions required as per Emergency Action Tables and Communication Table 5 to Table 50.

- Refer high risk activities to the EEM, as appropriate and/or as per Departmental policy.

- Provide regular updates during emergency events to LDC.

- Provide technical assistance and information to the LDC as necessary to assist in the implementation of this EAP.

- Within thirty (30) business days of an event, investigate and present an Emergency Event Report to the EEM, if required.

5.1.2 Dam Inspection Officer (DIO)

If requested by the EEC, and safe to do so, the DIO on-duty shall undertake a special inspection of the dam.

5.1.3 Dam Inspection Engineer (DE)

If directed by the EEC, the DE shall undertake a special inspection of the dam. Provide a verbal update in the first instance, followed up by comprehensive report including observations and photographs.

5.1.4 Emergency Event Manager (EEM)

The EEM on-duty rotates each fortnight, or as required for fatigue management, between the primary and secondary EEM. The EEM shall undertake the following:

Annually

- Review the EAP prior to 1 October each year.

- Check that the disaster management entities are conversant with the EAP.

- Establish and maintain the SMS Alert Area Polygon when mobile coverage is available.

- Distribute the EAP and any amendments / updates according to the Distribution List.

When required, supervise PAR door Knock with the EEC and LDMG to distribute updated evacuation plans.

During an Event

Monitor conditions at Glen Niven Dam using a combination of reports from the RSAS web-based portal and BOM website.

Verify the veracity of the information from the EEC.

Confirm that this EAP is implemented in response to an event at Glen Niven Dam.

In the event that this EAP is activated, provide technical assistance and information to the LDMG as necessary to assist in the implementation of this EAP.

Make notifications and SitReps as per Table 5 to Table 50.

Refer high risk activities to the DM, as appropriate and/or as per Departmental policy.

Consider providing messaging to the DNRMMRRD media and communications team to update the DNRMMRRD social media notifications and warnings on Facebook and DNRMMRRD external website if applicable.

Maintain an Event Log of all communications received and sent, observations and actions taken.

Within thirty (30) working days of an event requiring an Emergency Event Report (EER), investigate and present the EER to the DDS.

5.1.5 Director Asset Management, DNRMMRRD

The Director Asset Management (DM), Technical Services, DNRMMRRD shall undertake the following:

Annually

Review the EAP in consultation with the EEM by 1 October each year.

Endorses this EAP.

Initiate a review as and when there are changes to the operating environment or assessed risk.

During an Event

Review event reports and notifications as per Emergency Action Tables and Communication Table 5 to Table 50.

Provide advice and/or assistance to the EEM and back up EEM as required.

Direct actions of Departmental Personnel during an emergency to protect life and property to the maximum extent considered possible under the prevailing conditions and with the resources available.

Coordinates staff rostering and fatigue management of ERT personnel in accordance with the relevant Award (clause 4.3 of the *State Government Entities Certified Agreement 2023*).

Maintain an event log of all communications received, communications sent, actions taken and observations.

Approve repairs and procurement for the emergency event and subsequent repairs or remediation.

5.1.6 Executive Director, Technical Services, DNRMMRRD

The Executive Director of Technical Services, DNRMMRRD shall undertake the following:

Ensure departmental personnel protect life and property to the maximum extent considered possible under the prevailing conditions and with the resources available.

Review event reports and notify the Deputy Director-General, Georesources Division, DNRMMRRD of the event.

5.1.7 Deputy Director-General, Georesources, DNRMMRRD

The Deputy Director-General, Georesources, DNRMMRRD shall monitor the event reports and keep the Director General informed as necessary.

5.1.8 Director-General, DNRMMRRD

The Director-General, DNRMMRRD shall monitor the event reports and keep the Minister informed as necessary.

5.2 Local Government

The local government has responsibilities related to this EAP under the *Local Government Act 2009* and the *Disaster Management Act 2003*.

5.2.1 Chairperson, LDMG

The Chairperson, Local Disaster Management Group (LDMG), shall undertake the following actions:

- Responsible for preparing a local disaster management plan for Southern Downs Regional Council, with the assistance of the Southern Downs Regional Council local disaster management group including arrangements for public information and warnings.
- Coordinating community education activities, including information on warnings.
- Having a disaster response capability available for Southern Downs Regional Council, including the establishment and convening of the LDMG and resourcing of the Local Disaster Coordination Centre (LDCC).
- Performing other functions given to local government under the *Disaster Management Act 2003*.

Annually

- Ensuring disaster management and disaster operations in the area are consistent with the state group's strategic policy framework for disaster management for the state.
- Developing effective disaster management with Southern Downs Regional Council, and regularly reviewing and assessing the disaster management.
- Identifying and providing advice to the Southern Downs Regional Council Local Disaster Management Group (SDRC LDMG); about support services required to facilitate disaster management and disaster operations as required for an event.
- Ensuring the community is aware of ways to mitigate adverse effects of an event.

During an Event

- Ensuring information about a disaster in the area is promptly given to the Southern Downs Local Disaster Management Group.
- Issue of all media releases and responses to media communications. Liaise with Queensland Police Service and other agencies as necessary on wording of media releases.

5.2.2 Queensland Police Service

The QPS has responsibilities related to this EAP and disaster management arrangements.

The Queensland Police Communications Centre shall respond to notification of terrorist threat or activity. The QPS will coordinate its resources and responses as required for terrorist threat or activity. The QPS is part of the SDRC LDMG, and all messaging and responses shall be coordinated through the LDMG so there is no breakdown in communication, particularly during evacuation activities.

The QPS also has responsibilities with regard to evacuations.

6. Emergency Events and Action Tables and Communication Tables

In a flood and dam safety emergency, all persons involved in activation, management and implementation of this EAP are to note the following:

Weather situations likely to lead to implementation of this EAP are also likely to see intense rainfall conditions elsewhere in the area. This will increase the hazards and risks associated with implementing this plan. Hazards may include dangerous road conditions, reduced visibility, flooding of local roads, downed power lines and trees being blown over.

Resources required to respond to a dam safety event at Glen Niven Dam and Applethorpe may be limited due to these resources being deployed elsewhere in the region as a result of the wet weather event (downed trees, house roof damage etc.), and the limited number of resources available locally.

Under this EAP the following scenarios / situations are provided as a guide to the possible dam safety events and emergency situations associated with Glen Niven Dam:

Flood Events – Section 6.1

Structural Issues – Section 6.2

Water Contamination – Section 6.3

Terrorist or High Energy Impact – Section 6.4

Earthquake/Sunny day Failure – Section 6.5

6.1 Flood Events

6.1.1 Dam Hazard Overview

A flood event occurs at Glen Niven Dam when natural catchment inflows raises the storage level above the threshold for normal spillway operation (SOP 14, EL 879.46 m). The greater the inflow rate, the higher the storage level will rise. Increased storage levels place greater loads on the dam structure and increases the risk of dam failure.

Increased inflows also result in greater spillway discharges. As discharge rates increase, the likelihood of downstream flood impacts increases at low-level road crossings and at properties along Four Mile Creek. Detailed information on downstream flood impacts, including inundation maps, is presented in Appendix 9.

Remote dam monitoring activities is intensified during flood events. However, the performance of routine inspection is likely to be affected as floodwaters are likely to cut off access to the dam wall.

Forecasts of heavy rainfall from the Bureau of Meteorology (BOM) and rising storage levels are circumstances which indicate an increased likelihood of a flood event dam hazard occurring.

6.1.2 Estimate of Population at Risk (PAR)

The following table provides estimates of the potential number of PAR associated with failure of Glen Niven Dam, travel time for water discharging from the dam to locations of PAR, and peak inundation timeframes.

Table 4 – Estimated Natural Flooding (Non-Failure) Persons at Risk (PAR)

Flood Event	Event Description	Approx. times to peak flood impact ¹	Time of Inundation	Natural flood PAR ²	Incremental (dam failure) PAR ²
Sunny Day Failure	Dam Breach (Piping)	150 minutes	4 to 6 hours	0	0
1:500 AEP	Dam Breach (Piping)	80 minutes	4 to 6 hours	2	1
Dam Crest Flood	Dam Breach (Overtopping)	60 minutes	4 to 6 hours	6	1
PMP Design Flood	Dam Breach (Overtopping)	40 minutes	4 to 6 hours	29	1

Note 1: The approximate times to peak in minutes is a nominal estimate that is assuming start time (T=0 minutes) is when a sudden change in flow condition commences. Harmful flooding could already be experienced at a location of interest prior to these approximate time estimates.

Note 2: Inundation maps included in Appendix 9.

This information was derived from flood modelling undertaken by DNRMMRRD in 2019. While the flood events modelled for this assessment only considered flow into Four Mile Creek and do not include concurrent flooding from tributaries downstream of the dam or cascade failure of downstream weir structures, simulation up to the PMP Design Flood was undertaken. Therefore, information reflected in the EAP covers the maximum area likely impacted in a worst-case flood failure scenario.

The previous failure impact assessment (FIA) for Glen Nive Dam, completed by GHD in 2016 also investigated cascade failure scenarios involving Baronio Weir, which is located about 4.5 km downstream of Glen Niven Dam. The predicted afflux from failure of the weir during the 1 in 2000 AEP and 1 in 20,000 AEP flood events was minor, resulting in additional incremental PAR at up to two properties within the PMP Design Flood failure impact zone. In the PMP Design Flood scenario, the weir would be effectively drowned out.

Glen Niven Dam does not have any outlet works other than the spillway. There are no facilities available to lower the water level in Glen Niven Dam other than by providing pumps. Pumping to reduce the water level in Glen Niven Dam is unlikely to be effective in lowering the water level of the dam rapidly, especially if there are inflows to the dam.

6.1.3 Flood Durations

Lead time from the start of the event to when dam failure threat is detected (Alert > Stand up) is dependent on the flood event but could be as short as 30 minutes. The travel time for a flood wave or change in flow conditions at Glen Niven Dam to impact on the PAR could be as short as 15 minutes to Border Road and 35 minutes to Aerodrome Road. A high level of flooding for a duration of at least 4.0 hours can be expected.

6.1.4 Flood Depths

Refer to Appendix 9 – Inundation Mapping for estimated Flood Failure Inundation Mapping for various flood events.

Table 5 - Flooding Event - DIO Emergency Action Table

Activation Status	Normal Spillway Discharges	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Down
Activation Trigger	Reservoir water level above EL 879.46m	Reservoir water level above EL 879.90m and rising.	Reservoir water level above EL 880.25m and rising	Reservoir water level above EL 880.5m and rising	Reservoir water level above EL 881.6 and rising	Reservoir water level below EL 879.90m and falling
Actions	Undertake Special Inspections if requested by EEC	As per previous activation status	As per previous activation status	As per previous activation status	As per previous activation status	As per previous activation status
Notifications	EEC	EEC	EEC	EEC	EEC	EEC

Table 6 - Flooding Event - EEC Emergency Action Table

Activation Status	Normal Spillway Discharges	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Down
Activation Trigger	Reservoir water level above (FSL) EL 879.46m	Reservoir water level above EL 879.90m and rising.	Reservoir water level above EL 880.25m and rising.	Reservoir water level above EL 880.5m and rising	Reservoir water level above EL 881.60m and rising	Reservoir water level below EL 879.90m and falling.
Actions	<p>Notify EEM LDC, Glen Niven Dam is spilling and the downstream road crossings may be flooded.</p> <p>Advise SDRC to monitor Border and Aerodrome Roads. Send Burst SMS to notify RDSWU that SOP 14 is in place Monitor RSAS and BOM as per Appendix 7 – Weather Monitoring, RSAS and BOM</p>	<p>As per previous status, plus Activate EAP in consultation with EEM</p> <p>Notify the following of EAP activation</p> <ul style="list-style-type: none"> ○ PAR ○ LDC ○ RDSWU <p>Record data of the event and maintain an event log of all actions and communications</p> <p>Provide SitRep to EEM.</p>	<p>As per previous activation status, plus Notify EEM.</p> <p>Notify the following of EAP Escalation</p> <ul style="list-style-type: none"> ○ PAR ○ LDC ○ RDSWU 	<p>As per previous activation status, plus.</p> <p>Notify EEM.</p> <p>Notify the following of status Escalation.</p> <ul style="list-style-type: none"> ○ Warn PAR to evacuate where safe to do so. ○ LDC ○ RDSWU 	<p>As per previous activation status plus</p> <p>Notify EEM</p> <p>Notify the following of status Escalation</p> <ul style="list-style-type: none"> ○ Warn PAR to evacuate. ○ LDC ○ RDSWU <p>‘Glen Niven Dam Flood’ Emergency Alert Request at EL881.60m.</p>	<p>Stand down EAP in consultation with EEM</p> <p>Phone LDC</p> <p>Notify the following of EAP Stand Down</p> <ul style="list-style-type: none"> ○ LDC ○ PAR ○ RDSWU ○ EEM <p>Prepare and forward EER to EEM to forward to DDS within 30 working days if the RWL exceeds 880.50m.</p>
Notifications and Warnings	EEM LDC RDSWU	EEM LDC PAR RDSWU	EEM LDC PAR RDSWU	EEM LDC PAR RDSWU Provide warning update	EEM LDC PAR RDSWU Provide warning update	EEM LDC PAR RDSWU

Table 7 - Flooding Event - EEM Emergency Action Table

Activation Status	Normal Spillway Discharges	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Down
Activation Trigger	Reservoir water level above (FSL) EL 879.46m	Reservoir water level above EL 879.90m and rising	Reservoir water level above EL 880.25m and rising	Reservoir water level above EL 880.5m and rising	Reservoir water level above EL 881.60m and rising	Reservoir water level below EL 879.90m and falling
Actions	None	Activate EAP in consultation with EEC Notify DM of EAP Activation with SitReps	Escalate EAP in consultation with the EEC Notify DM of status Escalation with SitReps	Escalate EAP in consultation with the EEC Notify DM of status Escalation with SitReps	Escalate EAP in consultation with the EEC Notify DM of status Escalation with SitReps	Deactivate EAP in consultation with the EEC Notify DM of EAP Stand Down with SitRep Prepare and forward EER ² if required to DM
Notifications and Warnings	None	DM SitRep	DM SitRep	DM SitRep	DM SitRep	DM SitRep EER if required

² Forward EER to DDS within 30 days of the event as specified in the *Water Supply (Safety and Reliability) Act 2008*.

Table 8 - Flooding Event - DM Emergency Action Table

Activation Status	Normal Spillway Discharges	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Down
Activation Trigger	Reservoir water level above (FSL) EL 879.46m	Reservoir water level above EL 879.90m and rising	Reservoir water level above EL 880.25m and rising	Reservoir water level above EL 880.5m and rising	Reservoir water level above EL 881.60m and rising	Reservoir water level below EL 879.90m and falling
Actions	None	Provide SitRep to stakeholders Notify EDTS, DDS ¹ , DEMU, DDGGEO and external stakeholders (including Police, LDMG, SDCC)	Provide SitRep to stakeholders Update EDTS, DDS ¹ , DEMU and external stakeholders (including Police, LDMG, SDCC)	Provide SitRep to stakeholders Update EDTS, DDS ¹ , DEMU and external stakeholders (including Police, LDMG, SDCC)	Provide SitRep to stakeholders Update EDTS, DDS ¹ , DEMU and external stakeholders (including Police, LDMG, SDCC)	Notify stakeholders that the event is over with SitRep Review EER ² , if required and forward to DDS & DDGGEO
Notifications and Warnings	None	EDTS DDS DEMU DDGGEO External stakeholders	EDTS DDS DEMU DDGGEO External stakeholders	EDTS DDS DEMU DDGGEO External stakeholders	EDTS DDS DEMU DDGGEO External stakeholders	EDTS DDS DEMU DDGGEO External stakeholders

¹ Notify DDS within 48 hours of event. ² Forward EER to DDS within 30 days of the event as specified in the *Water Supply (Safety and Reliability) Act 2008*.

Table 9 - Flood Event - DIO Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Code	Message Text
Alert	Request from EEC for special inspection	EEC	Phone	N/A	N/A
Lean Forward	Request from EEC for special inspection	EEC	Phone	N/A	N/A
Stand Up 1	Request from EEC for special inspection	EEC	Phone	N/A	N/A
Stand Up 2	Request from EEC for special inspection	EEC	Phone	N/A	N/A
Stand Down	Request from EEC for special inspection	EEC	Phone	N/A	N/A

Table 10 - Flood Event - EEC Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Code	Message Text (subject to minor change by EEM approval)
Normal Spillway Discharges	Reservoir water level above (FSL) EL 879.46m Updates from RSAS and BoM	EEM LDC SDRC	SMS/ Email	Glen Niven Flood	Dept of Natural Resources ADVICE DAM: Glen Niven Dam EVENT: Spillway Discharge STATUS: Glen Niven Dam has started spilling excess water due to heavy rain. Border and Aerodrome Roads may be affected. WHAT YOU SHOULD DO: No action required. Avoid fast flowing or deep water near waterways and floodplains. UPDATE: Further updates will only be provided as required.
Alert	Reservoir water level above EL 879.90m and rising Updates from RSAS and BoM	LDC	Phone first then BURST SitRep	Glen Niven Flood Alert	Dept of Natural Resources ADVICE DAM: Glen Niven Dam EVENT: Flooding STATUS: Glen Niven Dam water level is above EL 879.90 m (0.49 m above spillway) and rising/steady/falling . The dam water level that requires evacuation is EL 880.50 m. Moderate flows from the dam are happening now and raising the height of flow in Four Mile Creek. Houses are not currently at risk. Border and Aerodrome Roads may be impacted. WHAT YOU SHOULD DO: Monitor local weather conditions and forecasts. Avoid fast flowing or deep water near waterways and floodplains. UPDATE: Further updates will be provided as required.
		PAR	BURST		
		RDSWU	BURST		
		EEM	BURST		
Lean Forward	Reservoir water level above EL 880.25m and rising Updates from RSAS and BoM	LDC	Phone first then BURST SitRep	Glen Niven Flood Lean Forward	Dept of Natural Resources WATCH AND ACT DAM: Glen Niven Dam EVENT: Flooding STATUS: Glen Niven Dam water level is above EL 880.25 m (0.84 m above spillway and rising/steady/falling . The dam water level that requires evacuation is EL 880.50 m.
		PAR	BURST		
		RDSWU	BURST		

		EEM	BURST		<p>Moderate flows from the dam are happening now and raising the height of flow in Four Mile Creek.</p> <p>WHAT YOU SHOULD DO: Consider you evacuation preparedness. Refer to evacuation plan, await further notifications or self-evacuate at early at signs of increased flooding.</p> <p>UPDATE: Further updates will be provided as required.</p>
Stand Up 1	Reservoir water level above EL 880.5m and rising (0.3m from Crest EL) Updates from RSAS and BoM	LDC	Phone first then BURST SitRep	Glen Niven Flood Stand Up	<p>Dept of Natural Resources EMERGENCY WARNING DAM: Glen Niven Dam</p> <p>EVENT: Flooding</p> <p>STATUS: Emergency Warning! Glen Niven Dam water level is above 880.50m and rising/steady/falling. Major flows from the dam are happening now. Downstream houses may be impacted by floodwaters.</p> <p>For more info contact SDRC at [REDACTED]</p> <p>WHAT YOU SHOULD DO: Act now to stay safe! Follow your evacuation plan. Move to higher ground if safe to do so. If your life is in danger, call Triple Zero (000) immediately.</p> <p>UPDATE: Further updates will be provided as required.</p>
		QPS	Phone		
		PAR	BURST		
		RDSWU	BURST		
		EEM	BURST		
Stand Up 2	Reservoir water level above EL 881.60m and rising (0.2m from Crest EL) Updates from RSAS and BoM	LDC	Phone first then BURST SitRep	Glen Niven Flood Stand Up 2	<p>Dept of Natural Resources EMERGENCY WARNING DAM: Glen Niven Dam</p> <p>EVENT: Flooding</p> <p>STATUS: Glen Niven Dam water level is above EL 881.60 m and rising/steady/falling. Dam failure is likely.</p> <p>WHAT YOU SHOULD DO: Act now to stay safe! Follow your evacuation plan. Move to higher ground if safe to do so. If your life is in danger, call Triple Zero (000) immediately.</p> <p>UPDATE: Further updates will be provided as required.</p> <p>'Glen Niven Dam Flood' Emergency Alert request to be actioned if determined necessary. See Appendix 17 – Glen Niven Dam Flood Emergency Alert Request for further information and message content</p>
		QPS	Phone		
		PAR	BURST		
		RDSWU	BURST		
		EEM	BURST		

		General Public within polygon	Emergency Alert		
Stand Down	Reservoir water level below EL 879.90m and falling Updates from RSAS and BoM	LDC	Phone first then BURST SitRep	Glen Niven Flood Stand Down	Dept of Natural Resources ADVICE DAM: Glen Niven Dam EVENT: Flooding STATUS: Stand down – event over. Glen Niven Dam water level is below 879.90 m and steady/falling . Border and Aerodrome Roads may remain impacted. WHAT YOU SHOULD DO: No action required. Avoid fast flowing or deep water near waterways and floodplains. UPDATE: No further updates provided for this event.
		QPS	Phone		
		PAR	BURST		
		RDSWU	BURST		
		EEM	BURST		

Table 11 - Flooding Event - EEM Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Text
Normal Spillway Discharges	Reservoir water level above (FSL) EL 879.46m Updates from RSAS and BoM	N/A		
Alert	Reservoir water level above EL 879.90m and rising Updates from RSAS and BoM	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the EEM as required to suit the circumstances of individual dam hazard events or dam emergency events. These SitReps will be distributed by Email to the DM. Refer to SitRep template in Section 1.10.
Lean Forward	Reservoir water level above EL 880.25m and rising Updates from RSAS and BoM	DM	SitReps Phone SMS Email	
Stand Up 1	Reservoir water level above EL 880.5m and rising Updates from RSAS and BoM	DM	SitReps Phone SMS Email	
Stand Up 2	Reservoir water level above EL 881.60m and rising (0.2m from Crest EL) Updates from RSAS and BoM	DM	SitReps Phone SMS Email	
Stand Down	Reservoir water level below EL 879.90m and falling Updates from RSAS and BoM	DM DDS	SitReps Phone SMS Email	

Table 12 - Flooding Event - DM Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Text
Normal Spillway Discharges	Reservoir water level above (FSL) EL 879.46m Updates from RSAS and BoM	N/A		
Alert	Reservoir water level above EL 879.90m and rising Updates from RSAS and BoM	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	SitReps Phone SMS Email	External SitReps are escalated by the DM as required to suit the circumstances including a summary dam(s) event status, hazards and required actions. These SitReps will be distributed by Email to the EMT and DNRMMRRD Senior Management. Refer to SitRep template in Section 1.10.
Lean Forward	Reservoir water level above EL 880.25m and rising Updates from RSAS and BoM	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	SitReps Phone SMS Email	
Stand Up 1	Reservoir water level above EL 880.5m and rising Updates from RSAS and BoM	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	SitReps Phone SMS Email	
Stand Up 2	Reservoir water level above EL 881.60m and rising (0.2m from Crest EL) Updates from RSAS and BoM	EDTS DDS DEMU DDGGEO	SitReps Phone SMS Email	

		External Stakeholders (including Police, LDMG, SDCC)		
Stand Down	Reservoir water level below EL 879.90m and falling Updates from RSAS and BoM	EDTS DDS DEMU DDGCEO External Stakeholders (including Police, LDMG, SDCC)	SitReps Phone SMS Email	

6.2 Structural/Sunny Day Failure Issues

6.2.1 Dam Hazard Overview

Concerns may arise if the structural stability of the dam structure and/or its ancillary works are compromised. Dam safety structural issues may include:

- Deformation or differential movement of the embankment or spillway training walls
- Scour affecting the stability of the dam embankment or spillway training walls
- Internal erosion (piping) through the dam embankment, abutments or foundation

Circumstances which indicate an increased likelihood of a structural issue dam hazard occurring include:

- Abnormal instrument readings (piezometers indicating increased hydrostatic pressures)
- Cracking, deformation, slumping or land slip on the embankment
- Settlement, sliding or movement of the spillway training walls
- Increasing seepage or development of new seepage areas with cloudy water (through the dam wall, foundations, abutments, or downstream toe).

Structural failure of the dam can occur when the storage is at or below FSL as well as during a flood event when the dam is spilling. It is important to note that structural issues can become more likely during a flood event due to higher hydrostatic pressures on the structure and through the foundations.

A Sunny Day Failure (SDF) is the failure of the dam, resulting in the uncontrolled release of stored water, when there is low or no rainfall inflow to the dam and no inclement weather. This type of failure is unexpected and may occur with little or no warning. If the embankment is breached (considered to have failed), it is expected that the breach will increase in size with a corresponding increase in water discharges through the breach until such time as the reservoir water level drains down.

An SDF may develop over time with the initial evidence being an increased rate of seepage, cloudiness of seepage, noticeable cracks or displacement, slumping or bulging of the embankment. It is however difficult to determine a precise timing for a dam safety issue to develop to the point where failure of the dam occurs. Any response to dam safety issues under these circumstances should be taken early in the event rather than waiting for the dam to actually fail or for flood flows to commence.

Glen Niven Dam was upgraded in 2019 to meet modern engineering standards for dam design. The design of the upgrade includes measures to slow or arrest the progression to failure of the dam as a result of any of the above dam safety issues occurring. However, in the event that a serious and developing dam safety issue is identified at Glen Niven Dam it may not be possible to undertake any repairs or mitigation during the event to arrest the issue from developing or to slow its development.

Table 13 - Structural Concerns - DIO Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up	Stand Down
Activation Trigger	A structural concern has been identified AND No change detected during surveillance inspection	A structural concern has been identified AND Change detected during surveillance inspection OR A possible failure path has been identified	Failure in progress or likely, seepage increasing and/or cloudy	Risk Assessment has determined that structural risk has reduced
Actions	Notify EEC Undertake Special Inspections if requested by EEC	As per previous activation status	As per previous activation status	As per previous activation status
Notifications	EEC	EEC	EEC	Nil

Table 14 - Structural Concerns - EEC Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up	Stand Down
Activation Trigger	A structural concern has been identified AND No change detected during surveillance inspection	A structural concern has been identified AND Change detected during surveillance inspection OR A possible failure path has been identified	Failure in progress or likely, seepage increasing and/or cloudy	Risk Assessment has determined that structural risk has reduced
Actions	Notify EEM Activate EAP in consultation with EEM Notify LDC of EAP Activation	Notify EEM Notify the following of EAP Activation or status Escalation LDC RDSWU (if applicable) PAR (if applicable) Request DE undertake inspection of dam if safe to do so Make preparations for mobilisation of remedial work materials and machinery if required	As per previous activation status, plus Notify EEM Notify the following of EAP Escalation Notify LDC Warn RDSWU Warn PAR Notify DE Request advice from DE regarding the current condition of the dam and the structural risk if required	Stand down EAP in consultation with EEM and DE (if applicable) Phone LDC Notify the following of EAP Stand Down LDC RDSWU PAR EEM Prepare and forward EER ² to EEM within 30 days if Activation status reaches Stand Up or the dam requires remedial work
Notifications and Warnings	EEM LDC	EEM LDC RDSWU (if applicable) PAR (if applicable) Provide notification update	EEM LDC RDSWU PAR Provide notification update	EEM LDC RDSWU PAR

NB: Undertake Risk Assessment before considering action.

²Emergency Event Report (EER) to EEM within 30 business days of the event if stand up is reached, as specified in the *Water Supply (Safety and Reliability) Act 2008*

Table 15 - Structural Concerns - DE Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up	Stand Down
Activation Trigger	A structural concern has been identified AND No change detected during surveillance inspection	A structural concern has been identified AND Change detected during surveillance inspection OR A possible failure path has been identified	Failure in progress or likely, seepage increasing and/or cloudy	Risk Assessment has determined that structural risk has reduced
Actions	Not Applicable	Conduct inspection of the dam if requested by EEC and safe to do so Report findings to EEC immediately after inspection Prepare report including any observations, photographs, sketches or data collected during inspection and provide to EEC	Provide advice to the EEC and EEM regarding the current condition of the dam and the structural risk	Provide advice to the EEC and EEM regarding the current condition of the dam and the structural risk Prepare and forward event report including any observations, photos data and sketches collected to EEC
Notifications and Warnings	Not Applicable	EEC	EEC EEM	EEC EEM

Table 16 - Structural Concerns - EEM Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up	Stand Down
Activation Trigger	A structural concern has been identified AND No change detected during surveillance inspection	A structural concern has been identified AND Change detected during surveillance inspection OR A possible failure path has been identified	Failure in progress or likely, seepage increasing and/or cloudy	Risk Assessment has determined that structural risk has reduced
Actions	Activate EAP in consultation with the EEC Notify DM of EAP Activation with SitReps	Notify DM of EAP status Escalation with SitReps Direct EEC to investigate availability of machinery and materials	As per previous activation level Notify DM of EAP status Escalation with SitReps	Notify DM of EAP Stand Down Prepare and forward EER ² to DM within 30 working days if Activation status reaches Stand Up or the dam requires remedial work
Notifications and Warnings	DM SitRep	DM SitRep	DM SitRep	DM

²Emergency Event Report (EER) to EEM within 30 business days of the event if stand up is reached, as specified in the *Water Supply (Safety and Reliability) Act 2008*

Table 17 - Structural Concerns - DM Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up	Stand Down
Activation Trigger	A structural concern has been identified AND No change detected during surveillance inspection	A structural concern has been identified AND Change detected during surveillance inspection OR A possible failure path has been identified	Failure in progress or likely, seepage increasing and/or cloudy	Risk Assessment has determined that structural risk has reduced
Actions	Notify EDTS, DDS ¹ , DEMU, DDGCEO and external stakeholders (including Police, LDMG, SDCC) Provide SitRep to above	Notify EDTS, DDS ¹ , DEMU, DDGCEO and external stakeholders (including Police, LDMG, SDCC) Provide SitRep to above	Notify EDTS, DDS ¹ , DEMU, DDGCEO and external stakeholders (including Police, LDMG, SDCC) Provide SitRep to above	Notify EDTS, DDS ¹ , DEMU, DDGCEO and external stakeholders (including Police, LDMG, SDCC) Provide SitRep to above Review EER ² , if required, and forward to DDS & DDGCEO
Notifications and Warnings	EDTS DDS DEMU DDGCEO External Stakeholders (including Police, LDMG, SDCC)	EDTS DDS DEMU DDGCEO External Stakeholders (including Police, LDMG, SDCC)	EDTS DDS DEMU DDGCEO External Stakeholders (including Police, LDMG, SDCC)	EDTS DDS DEMU DDGCEO External Stakeholders (including Police, LDMG, SDCC)

¹ Notify DDS within 48 hours of event. ² Forward EER to DDS within 30 days of the event as specified in the *Water Supply (Safety and Reliability) Act 2008*.

Table 18 - Structural Concerns - DIO Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Code	Message Text
Alert	Request from EEC for special inspection				
Lean Forward	Request from EEC for special inspection	EEC	Phone	N/A	N/A
Stand Up	Request from EEC for special inspection	EEC	Phone	N/A	N/A
Stand Down	Request from EEC for special inspection	EEC	Phone	N/A	N/A

Table 19 - Structural Concerns - EEC Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Code	Message Text (subject to minor change by EEM approval)
Alert	A structural concern has been identified AND No change detected during surveillance inspection	LDC	Phone first then BURST SitRep	Glen Niven Structural Alert	Dept of Natural Resources ADVICE DAM: Glen Niven Dam EVENT: Structural Concerns STATUS: An investigation is underway at the dam. Houses are not at risk. WHAT YOU SHOULD DO: No action is required. UPDATE: Further updates will be provided as required.
		EEM	BURST		
Lean Forward	A structural concern has been identified AND Change detected during surveillance inspection OR A possible failure path has been identified	LDC	Phone first then BURST SitRep	Glen Niven Structural Lean Forward	Dept of Natural Resources WATCH AND ACT DAM: Glen Niven Dam EVENT: Structural Concerns STATUS: A structural concern affecting Given Niven Dam has been identified. Investigations are currently ongoing. Houses are not at risk. WHAT YOU SHOULD DO: Await further notifications. UPDATE: Further updates will be provided as required.
		EEM	BURST		
		RDSWU	BURST		
		PAR	BURST		
Stand Up	Failure in progress or likely, seepage increasing and/or cloudy	LDC	Phone first then BURST SitRep	Glen Niven Structural Stand Up	Dept of Natural Resources EMERGENCY WARNING DAM: Glen Niven Dam EVENT: Structural Concerns STATUS: Emergency Warning! Failure of Glen Niven Dam is in progress/possible as at [time, day, date, year]. Applethorpe residents are advised that water levels in Four Mile Creek and connecting streams may rise rapidly. Flood waters likely to be contained in waterways – houses are unlikely to be at risk. WHAT YOU SHOULD DO: Follow emergency services instructions. Avoid fast flowing or deep water near waterways and floodplains. UPDATE: Further updates will be provided as required.
		EEM	BURST		
		RDSWU	BURST		
		PAR	BURST		
Stand Down	Risk Assessment has determined that structural risk has reduced	LDC	Phone first then BURST SitRep	Glen Niven Structural Stand Down	Dept of Natural Resources ADVICE DAM: Glen Niven Dam EVENT: Structural Concerns

		EEM	BURST		STATUS: Stand down – event over. Glen Niven Dam is not affected by a structural concern. WHAT YOU SHOULD DO: No action required. UPDATE: No further updates will be provided..
		RDSWU	BURST		
		PAR	BURST		

Table 20 - Structural Concerns - DE Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Code	Message Text
Alert	No actions required by DE at this stage				
Lean Forward	Request from EEC for inspection of dam	EEC	Phone	N/A	N/A
		EEC	Report	N/A	N/A
Stand Up 1	Request from EEC or EEM for advice regarding dam condition and/or structural risk	EEC	Phone	N/A	N/A
		EEM	Phone	N/A	N/A
Stand Down	Request from EEC or EEM for advice regarding dam condition and/or structural risk	EEC	Phone	N/A	N/A
		EEM	Phone	N/A	N/A

Table 21 - Structural Concerns - EEM Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Text
Alert	A structural concern has been identified AND No change detected during surveillance inspection	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the EEM as required to suit the circumstances of individual dam hazard events or dam emergency events. These SitReps will be distributed by Email to the DM. Refer to SitRep template in Section 1.10.
Lean Forward	A structural concern has been identified AND Change detected during surveillance inspection OR A possible failure path has been identified	DM	SitReps Phone SMS Email	
Stand Up	Failure in progress or likely, seepage increasing and/or cloudy	DM	SitReps Phone SMS Email	
Stand Down	Risk Assessment has determined that structural risk has reduced	DM	SitReps Phone SMS Email	

Table 22 - Structural Concerns - DM Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Text
Alert	A structural concern has been identified AND No change detected during surveillance inspection	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	Sitreps Phone SMS Email	External SitReps are escalated by the DM as required to suit the circumstances including a summary dam(s) event status, hazards and required actions. These SitReps will be distributed by Email to the EMT and DNRMMRRD Senior Management. Refer to SitRep template in Section 1.10
Lean Forward	A structural concern has been identified AND Change detected during surveillance inspection OR A possible failure path has been identified	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	SitReps Phone SMS Email	
Stand Up	Failure in progress or likely, seepage increasing and/or cloudy	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	SitReps Phone SMS Email	
Stand Down	Risk Assessment has determined that structural risk has reduced	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	SitReps Phone SMS Email	

6.3 Water Contamination

6.3.1 Dam Hazard Overview

Contamination of the dam storage could be the result of a toxic spill incident, biological processes, or chemical pollution from current or past activities in the dam catchment.

Biological events within the dam water storage include blue-green algae blooms or a high level of microscopic pathogens such as cryptosporidium and giardia. After long periods of low inflow, oxygen depletion can cause fish deaths, polluting the water storage as the fish decay.

The contamination of dam water may have an impact on upstream and downstream riparian water users and others water users connected to the dam water pipeline.

During periods of dry weather, with no discharge from Glen Niven Dam, any water contamination will be contained within the impounded water of Glen Niven Dam.

In the event that contamination takes place during a period when water is discharging through the spillway, any toxicity is likely to be diluted and have less of an impact.

Table 23 - Water Contamination - DIO Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up	Stand Down
Activation Trigger	Reports of contamination or potential contamination in the reservoir or catchment area	Not Applicable	Confirmation of or high probability of significant contamination found in the reservoir or catchment area	Risk Assessment that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result
Actions	Notify EEC Undertake Special Inspection if requested by EEC Investigate to ascertain the accuracy and details of reports Sketch, measure, photograph and locate contamination position in the storage catchment Logbook Entry	Not Applicable	Notify EEC Undertake Special Inspections if requested by EEC Collect water samples if directed by DNRMMRRD Logbook entry	Prepare and forward event report including any water test results, photos and sketches to EEC Logbook entry Return to routine activities and routine inspections
Notifications	EEC	Not Applicable	EEC	EEC

Table 24 - Water Contamination - EEC Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up	Stand Down
Activation Trigger	Reports of contamination or potential contamination in the reservoir or catchment area	Not Applicable	Confirmation of or high probability of significant contamination found in the reservoir or catchment area	Risk Assessment that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result
Actions	Notify EEM Activate EAP in consultation with EEM Notify the following of EAP Activation LDC RDSWU Seek advice for sampling and testing Appendix 1, toxic spill contacts Request DIO to do a special inspection Record data of the event and maintain an event log of all actions and communications	Not Applicable	Notify EEM Phone LDC Issue WARNING to the following of EAP Escalation LDC RDSWU - Do not use the water until further notice Notify DIO of EAP Escalation	Stand down EAP in consultation with EEM Phone LDC Notify the following of EAP Stand Down Notify LDC Notify DIO Notify RDSWU Notify EEM Prepare and forward EER ² to EEM within 30 Days if Activation status reaches Stand Up
Notifications and Warnings	EEM LDC RDSWU DIO	Not Applicable	EEM LDC RDSWU DIO	EEM LDC RDSWU DIO

² Forward EER to DDS within 30 days of the event as specified in the *Water Supply (Safety and Reliability) Act 2008*.

Table 25 - Water Contamination - EEM Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up	Stand Down
Activation Trigger	Reports of contamination or potential contamination in the reservoir or catchment area	Not Applicable	Confirmation of or high probability of significant contamination found in the reservoir or catchment area	Risk Assessment that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result
Actions	Notify DM of EAP Activation with SitReps	Not Applicable	Notify DM of EAP status escalation with SitReps	Notify DM that the event is over with SitRep
Notifications and Warnings	DM	None	DM	DM

Table 26 - Water Contamination - DM Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up	Stand Down
Activation Trigger	Reports of contamination or potential contamination in the reservoir or catchment area	Not Applicable	Confirmation of or high probability of significant contamination found in the reservoir or catchment area	Risk Assessment that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result
Actions	Notify the following of EAP Activation with SitReps EDTS DDS DEMU DDGGEO External Stakeholders	Not Applicable	Notify the following of status Escalation with SitReps and incident report EDTS DDS DEMU DDGGEO External Stakeholders	Notify the following of EAP Stand Down with SitRep EDTS DDS DEMU DDGGEO External Stakeholders Submit EER to DDS (if required)
Notifications and Warnings	EDTS DDS DEMU DDGGEO External Stakeholders	None	EDTS DDS DEMU DDGGEO External Stakeholders	EDTS DDS DEMU DDGGEO External Stakeholders

Table 27 - Water Contamination - DIO Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Text
Alert	Reports of contamination or potential contamination in the reservoir or catchment area	EEC	Phone	DIO Emergency NOTIFICATION DAM: Glen Niven EVENT: Water Quality Contamination STATUS: ALERT TRIGGER. Possible chemical spill – Investigation underway ACTION: STAND BY UPDATE: Next update due by XX am/pm Relay EEC messages if required
Lean Forward	Not Applicable			
Stand Up	Confirmation of or high probability of contamination found in the reservoir/catchment	EEC	Phone or SMS	DIO Emergency NOTIFICATION DAM: Glen Niven EVENT: Water Quality Contamination STATUS: STAND UP – Contamination Confirmed UPDATE: Next update due by XX am/pm Relay EEC messages if required
Stand Down	Risk Assessment that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result	EEC	Phone or SMS	DIO Emergency Notification DAM: Glen Niven EVENT: Water Quality Contamination STATUS: STAND DOWN – Event over ACTION: No contamination detected

Table 28 - Water Contamination - EEC Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Code	Message Text (subject to minor change by EEM approval)
Alert	Reports of contamination or potential contamination in the reservoir or catchment area	LDC	Phone first then BURST SitRep	Glen Niven Quality Alert	Dept of Natural Resources ADVICE DAM: Glen Niven Dam EVENT: Water Quality Contamination STATUS: Reports of contamination or potential contamination of water in Glen Niven Dam. An investigation is underway at the dam. WHAT YOU SHOULD DO: Avoid all use of contact with water until further notice. UPDATE: Further updates will be provided as required.
		DIO	BURST		
		RDSWU	BURST		
		EEM	BURST		
Lean Forward	Not Applicable				
Stand Up	Confirmation of or high probability of a large amount of contamination found in the reservoir/catchment	LDC	Phone first then BURST SitRep	Glen Niven Quality Stand Up	Dept of Natural Resources EMERGENCY WARNING DAM: Glen Niven Dam EVENT: Water Quality Contamination STATUS: Emergency Warning! Confirmed contamination of water in Glen Niven Dam. WHAT YOU SHOULD DO: Avoid all use or contact with water until further notice. UPDATE: Further updates will be provided as required.
		DIO	Phone		
		RDSWU	BURST		
		EEM	BURST		
Stand Down	Risk Assessment that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result	LDC	Phone first then BURST SitRep	Glen Niven Quality Stand Down	Dept of Natural Resources ADVICE DAM: Glen Niven Dam EVENT: Water Quality Contamination STATUS: Stand down – Event over. Water is safe to use. WHAT YOU SHOULD DO: No action required. UPDATE: No further updates will be provided.
		DIO	Phone		
		RDSWU	BURST		
		EEM	BURST		

Table 29 - Water Contamination - EEM Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Text
Alert	Reports of contamination or potential contamination in the reservoir or catchment area	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the EEM as required to suit the circumstances of individual dam hazard events or dam emergency events. These SitReps will be distributed by Email to the DM. Refer to SitRep template in Section 1.10.
Lean Forward	Not Applicable			
Stand Up	Confirmation of or high	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the EEM as required to suit the circumstances of individual dam hazard events or dam emergency events. These SitReps will be distributed by Email to the DM. Refer to SitRep template in Section 1.10.
Stand Down	Risk Assessment that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result	DM	SitReps Phone SMS Email	

Table 30 - Water Contamination - DM Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Text
Alert	Reports of contamination or potential contamination in the reservoir or catchment area	EDTS DDS DEMU DDGGEO External Stakeholders	SitReps Phone SMS Email	External SitReps are escalated by the DM as required to suit the circumstances including a summary dam(s) event status, hazards and required actions. These SitReps will be distributed by Email to the EMT and DNRMMRRD Senior Management. Refer to SitRep template in Section 1.10.
Lean Forward	Not Applicable			
Stand Up	Confirmation of or high probability of a large amount of Chemical Spill/Toxic Conditions found in the storage/catchment	EDTS DDS DEMU DDGGEO External Stakeholders	SitReps Phone SMS Email	External SitReps are escalated by the DM as required to suit the circumstances including a summary dam(s) event status, hazards and required actions. These SitReps will be distributed by Email to the EMT and DNRMMRRD Senior Management. Refer to SitRep template in Section 1.10.
Stand Down	Risk Assessment that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result	EDTS DDS DEMU DDGGEO External Stakeholders	SitReps Phone SMS Email	

6.4 Terrorist or High Energy Impact

6.4.1 Dam Hazard Overview

There is infrastructure located at Glen Niven that may be the target of sabotage or vandalism. This infrastructure includes but is not limited to:

- Glen Niven Dam embankment
- Glen Niven Dam spillways and training walls
- Pumping facilities
- RSAS and monitoring instrumentation
- Security fencing and safety signs

Any identified sabotage or vandalism should be treated as serious and the following actions are recommended:

- Immediately report the incident to Emergency Event Manager, Technical Services (EEM) at the earliest opportunity.
- Take photographs of the damage or incident site.
- If possible and safe to do so, record and photograph unusual vehicle details including registration, description, time, date etc.
- Barricade the area to enable the incident site to be inspected and investigated.
- Report the incident to Police.
- Conduct a dam safety inspection to confirm if the incident has caused other damage to the dam.

Table 31 - Terrorist or High Energy Impact - DIO Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Up 3	Stand Down
Activation Trigger	Not Applicable	Possible terrorist activity/suspicious noticed at the dam	THREAT Threat received indicating potential sabotage of dam	EVENT Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit)	Failure in progress or likely due to impact or explosion	Risk Assessment has determined that failure risk has reduced
Actions	None	Notify Police Notify EEC Inspect dam (if safe) and ensure all security measures in place Maintain photo record Logbook entry If police appoint incident manager, follow instructions	As per previous activation status, plus Undertake surveillance, inspect dam (if safe) Logbook entry	As per previous activation status, plus Vacate the immediate vicinity of the embankment and downstream areas Logbook entry	As per previous activation status, plus Vacate the immediate vicinity of the embankment and downstream areas Close Border and Aerodrome Roads, erect road closed signs. Logbook entry	Prepare and forward event report including photos to EEC Reopen Border and Aerodrome Roads, remove road closed signs. Return to routine activities and routine inspections Logbook entry
Notifications	None	1. Triple Zero (000) if lives at immediate risk. 2. Police Link/Local Police Station if no immediate life threat. 3. EEC 4. National Security Hotline	1. Triple Zero (000) if lives at immediate risk. 2. Police Link/Local Police Station if no immediate life threat. 3. EEC 4. National Security Hotline	1. Triple Zero (000) if lives at immediate risk. 2. Police Link/Local Police Station if no immediate life threat. 3. EEC 4. National Security Hotline	1. Triple Zero (000) if lives at immediate risk. 2. Police Link/Local Police Station if no immediate life threat. 3. EEC 4. National Security Hotline	1. Triple Zero (000) if lives at immediate risk. 2. Police Link/Local Police Station if no immediate life threat. 3. EEC 4. National Security Hotline

Table 32 - Terrorist or High Energy Impact - EEC Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Up 3	Stand Down
Activation Trigger	Not Applicable	Possible terrorist activity/suspicions noticed at the dam	THREAT Threat received indicating potential sabotage of dam	EVENT Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit)	Failure in progress or likely due to impact or explosion	Risk Assessment has determined that failure risk has reduced
Actions	None	Phone National Security Hotline and Police Activate EAP in consultation with EEM Phone LDC Phone DIO If police appoint incident manager support and follow instructions Monitor situation and assess risks	As per previous activation level Notify the following of EAP Activation RDSWU PAR	As per previous activation level Request DE to undertake an inspection of the dam when safe to do so	As per previous activation level	Stand down EAP in consultation with EEM and DE (if applicable) Phone LDC Phone Police Notify the following of EAP Stand Down DIO RDSWU PAR EEM Prepare and forward EER ² to EEM within 30 days if the Activation status reaches Stand UP 2 or dam requires remedial work
Notifications and Warnings	None	EEM LDC DIO	EEM LDC DIO RDSWU PAR	EEM LDC DIO RDSWU PAR	EEM LDC DIO RDSWU PAR	EEM LDC DIO RDSWU PAR

Table 33 – Terrorist or High Energy Impact - DE Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Up 3	Stand Down
Activation Trigger	Not Applicable	Possible terrorist activity/suspicious noticed at the dam	THREAT Threat received indicating potential sabotage of dam	EVENT Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit)	Failure in progress or likely due to impact or explosion	Risk Assessment has determined that failure risk has reduced
Actions	None	None	None	Conduct inspection of the dam if requested by EEC and safe to do so Report findings to EEC immediately after inspection Prepare report including any observations, photographs, sketches or data collected during inspection and provide to EEC	Provide advice to the EEC and EEM regarding the current condition of the dam and the structural risk	Provide advice to the EEC and EEM regarding the current condition of the dam and the structural risk Prepare and forward event report including any observations, photos data and sketches collected to EEC
Notifications and Warnings	None	None	None	EEC	EEC EEM	EEC EEM

Table 34 - Terrorist or High Energy Impact - EEM Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Up 3	Stand Down
Activation Trigger	Not Applicable	Possible terrorist activity/suspicious noticed at the dam	THREAT Threat received indicating potential sabotage of dam	EVENT Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit)	Failure in progress or likely due to impact or explosion	Risk Assessment has determined that failure risk has reduced
Actions	Not Applicable	Notify DM of EAP Activation with SitReps If police appoint incident manager support and follow instructions Monitor situation and assess risks	Notify DM of EAP Activation or Update DM if applicable with SitReps If police appoint incident manager support and follow instructions Monitor situation and assess risks	As per previous activation level Update DM Provide SitRep to DM	As per previous activation level	Notify DM of EAP Stand Down with SitRep Prepare and Forward EER to DM within 30 days if the Activation status reaches Stand UP 2 or dam requires remedial work
Notifications and Warnings	Not Applicable		DM	DM	DM	DM

Table 35 - Terrorist or High Energy Impact - DM Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Up 3	Stand Down
Activation Trigger	Not Applicable	Possible terrorist activity/suspicious noticed at the dam	THREAT Threat received indicating potential sabotage of dam	EVENT Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit)	Failure in progress or likely due to impact or explosion	Risk Assessment has determined that failure risk has reduced
Actions	Not Applicable	Provide SitRep to EDTS, DDS ¹ , DEMU, DDGGEO and external stakeholders (including Police, LDMG, SDCC)	Provide SitRep to EDTS, DDS ¹ , DEMU, DDGGEO and external stakeholders (including Police, LDMG, SDCC)	Provide SitRep to EDTS, DDS ¹ , DEMU, DDGGEO and external stakeholders (including Police, LDMG, SDCC)	Provide SitRep to EDTS, DDS ¹ , DEMU, DDGGEO and external stakeholders (including Police, LDMG, SDCC)	Provide SitRep to EDTS, DDS ¹ , DEMU, DDGGEO and external stakeholders (including Police, LDMG, SDCC) Review EER ² , if required, and forward to DDS & DDGGEO
Notifications and Warnings	Not Applicable	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)

¹ Notify DDS within 48 hours of event. ² Forward EER to DDS within 30 days of the event as specified in the *Water Supply (Safety and Reliability) Act 2008*.

Table 36 - Terrorist or High Energy Impact - DIO Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Text
Alert	Not Applicable			
Lean Forward	Possible terrorist activity/suspicious noticed at the dam	Triple Zero (000) if lives are at immediate risk.	Phone	DIO Emergency NOTIFICATION DAM: Glen Niven EVENT: Terrorist or High Energy Impact STATUS: LEAN FORWARD – Possible terrorist activity/suspicious UPDATE: Next update due by XX am/pm
		Police link OR Local Police Station if no immediate life threat.		
		EEC		
		National Security Hotline		
Stand Up 1	THREAT Threat received indicating potential sabotage of dam	Triple Zero (000)	Phone	DIO Emergency NOTIFICATION DAM: Glen Niven EVENT: Terrorist or High Energy Impact STATUS: STAND UP 1 – Received/Noted Terrorist Threat UPDATE: Next update due by XX am/pm
		EEC		
		National Security Hotline		
Stand Up 2	EVENT Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit)	Triple Zero (000)	Phone	DIO Emergency NOTIFICATION DAM: Glen Niven EVENT: Terrorist or High Energy Impact STATUS: STAND UP 2 – Large Explosion reported at dam UPDATE: Next update due by XX am/pm
		EEC		
		Failure in progress or likely due to impact or explosion		
Stand Up 3	Failure in progress or likely due to impact or explosion	Triple Zero (000)	Phone	DIO Emergency NOTIFICATION DAM: Glen Niven EVENT: Terrorist or High Energy Impact STATUS: STAND UP 3 – Dam failure in progress UPDATE: Next update due by XX am/pm
		EEC	Phone	
		National Security Hotline		
Stand Down	Risk Assessment has determined that failure risk has reduced	Police link OR Local Police Station	Phone	DIO Emergency NOTIFICATION DAM: Glen Niven EVENT: Terrorist or High Energy Impact STATUS: STAND DOWN- Event over.
		EEC		
		National Security Hotline		

Table 37 - Terrorist or High Energy Impact - EEC Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Code	Message Text (subject to minor change by EEM approval)
Alert	Not Applicable				
Lean Forward	Possible terrorist activity/suspicious noticed at the dam	EEM	Phone	Glen Niven Emergency Lean Forward	Dept of Natural Resources STAND WATCH AND ACT DAM: Glen Niven Dam EVENT: Terrorist or High Energy Impact STATUS: Possible terrorist activity/suspicious noticed at Glen Niven Dam. An investigation is underway at the dam. Houses are unlikely to be at risk. WHAT YOU SHOULD DO: Await further notifications. UPDATE: Further updates will be provided as required.
		LDC			
		DIO			
Stand Up 1	THREAT Threat received indicating potential sabotage of dam	EEM	Phone	Glen Niven Emergency Stand Up 1	Dept of Natural Resources EMERGENCY WARNING DAM: Glen Niven Dam EVENT: Terrorist or High Energy Impact STATUS: Emergency Warning! Threat received indicating potential sabotage of Glen Niven Dam. An investigation is underway at the dam. Houses are unlikely to be at risk. WHAT YOU SHOULD DO: Await further notifications. UPDATE: Further updates will be provided as required.
		LDC	Phone First then BURST		
		DIO	Phone First then BURST		
		RDSWU	BURST		
		PAR	BURST		
Stand Up 2	EVENT Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit)	EEM	Phone	Glen Niven Emergency Stand Up 2	Dept of Natural Resources EMERGENCY WARNING DAM: Glen Niven Dam EVENT: Terrorist or High Energy Impact STATUS: Emergency Warning! Terrorist threat confirmed at Glen Niven Dam. Large explosion reported at the dam. Investigations are currently ongoing. Houses are unlikely to be at risk. WHAT YOU SHOULD DO: Await further notifications. UPDATE: Further updates will be provided as required.
		LDC	Phone First then BURST		
		DIO	Phone First then BURST		
		RDSWU	BURST		
		PAR	BURST		

Stand Up 3	Failure in progress or likely due to impact or explosion	EEM	Phone	Glen Niven Emergency Stand Up 3	Dept of Natural Resources EMERGENCY WARNING DAM: Glen Niven Dam EVENT: Terrorist or High Energy Impact STATUS: Emergency Warning! Failure of Glen Niven Dam is in progress/possible as at [time, day, date, year]. Applethorpe residents are advised that water levels in Four Mile Creek and connecting streams may rise rapidly. Flood waters will be contained in waterways – houses are unlikely to be at risk. WHAT YOU SHOULD DO: Follow emergency services instructions. Avoid fast flowing or deep water near waterways and floodplains. UPDATE: Further updates will be provided as required.
		LDC	Phone First then BURST		
		DIO	Phone		
		RDSWU	BURST		
		PAR	BURST		
Stand Down	Risk Assessment has determined that failure risk has reduced	EEM	Phone	Glen Niven Emergency Stand Down	Dept of Natural Resources ADVICE DAM: Glen Niven Dam EVENT: Terrorist or High Energy Impact STATUS: Stand down – Event over. Glen Niven Dam is not affected by a structural concern. WHAT YOU SHOULD DO: No action required. UPDATE: No further updates will be provided.
		LDC	Phone First then BURST		
		DIO	Phone		
		RDSWU	BURST		
		PAR	BURST		

Table 38 - Terrorist or High Energy Impact - DE Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Code	Message Text
Alert	No actions required by DE at this stage				
Lean Forward	No actions required by DE at this stage				
Stand Up 1	No actions required by DE at this stage				
Stand Up 2	Request from EEC for inspection of dam	EEC	Phone	N/A	N/A
		EEC	Report	N/A	N/A
Stand Up 3	Request from EEC or EEM for advice regarding dam condition and/or structural risk	EEC	Phone	N/A	N/A
		EEM	Phone	N/A	N/A
Stand Down	Request from EEC or EEM for advice regarding dam condition and/or structural risk	EEC	Phone	N/A	N/A
		EEM	Phone	N/A	N/A

Table 39 - Terrorist or High Energy Impact - EEM Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Text
Alert	Not Applicable			
Lean Forward	Possible terrorist activity/suspicious noticed at the dam	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the EEM as required to suit the circumstances of individual dam hazard events or dam emergency events. These SitReps will be distributed by Email to the DM. Refer to SitRep template in Section 1.10.
Stand Up 1	THREAT Threat received indicating potential sabotage of dam	DM	SitReps Phone SMS Email	
Stand Up 2	EVENT Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit)	DM	SitReps Phone SMS Email	
Stand Up 3	Failure in progress or likely due to impact or explosion	DM	SitReps Phone SMS Email	
Stand Down	Risk Assessment has determined that failure risk has reduced	DM	SitReps Phone SMS Email	

Table 40 - Terrorist or High Energy Impact - DM Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Text
Alert	Not Applicable			
Lean Forward	Possible terrorist activity/suspicious noticed at the dam	EDTS DDS DEMU DDGGEO External Stakeholders	SitReps Phone SMS Email	External SitReps are escalated by the DM as required to suit the circumstances including a summary dam(s) event status, hazards and required actions. These SitReps will be distributed by Email to the EMT and DNRMMRRD Senior Management. Refer to SitRep template in Section 1.10.
Stand Up 1	THREAT Threat received indicating potential sabotage of dam	EDTS DDS DEMU DDGGEO External Stakeholders	SitReps Phone SMS Email	
Stand Up 2	EVENT Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit)	EDTS DDS DEMU DDGGEO External Stakeholders	SitReps Phone SMS Email	
Stand Up 3	Failure in progress or likely due to impact or explosion	EDTS DDS DEMU DDGGEO External Stakeholders	SitReps Phone SMS Email	
Stand Down	Risk Assessment has determined that failure risk has reduced	EDTS DDS DEMU DDGGEO External Stakeholders	SitReps Phone SMS Email	

6.5 Earthquake

6.5.1 Dam Hazard Overview

The Glen Niven Dam embankment is not considered to be especially susceptible to slip failure induced by an Earthquake due to its robust nature and gentle downstream slope. However, if there was an Earthquake event in close proximity to Glen Niven Dam, damage to the dam may occur.

Possible signs of damage include:

- Cracking of the embankment.
- Slipping or slumping of the embankment.
- Increased rate of seepage.
- Damage to the concrete spillway training walls.

An earthquake notification from Geoscience Australia or report from someone who has felt an earthquake in the area are circumstances that indicate an increased likelihood of an earthquake dam hazard occurring.

In the event of an earthquake being monitored and reported in the area the following actions are recommended:

- Log into and review the readings for the dam on the Remote Sensing and Alert System (RSAS).
- Continue to monitor the RSAS for any changes on a regular basis (at least 3 hourly) over the next 48 hours or until such time as an inspection of the dam or risk assessment has confirmed that the failure risk as a result of the earthquake has reduced.
- Arrange for a dam inspection to be undertaken as soon as possible.

An earthquake may contribute to, or cause, a structural issue which could result in dam failure. If a structural issue is identified through an inspection refer to section 6.2.

Table 41 - Earthquake - DIO Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Down
Activation Trigger	Earthquake reported or felt in the area AND Intensity <u>less than</u> or equal to 5MM AND Change detected during surveillance	Earthquake reported or felt in the area AND Intensity <u>greater than</u> or equal to 5MM AND Change detected during surveillance	Earthquake reported or felt in the area AND Change detected during surveillance AND A possible failure path has been identified	Failure possible or in progress due to earthquake	Risk assessment has determined that failure risk has reduced
Actions	Notify EEC Inspect the Dam Embankment, Spillway, Abutments and Spillway training walls (if safe to do so) checking for leaks, deformation, erosion and concrete damage Report to EEC Maintain photographic record Record data of the event and maintain an event log of all actions and communications Logbook entry	As per previous activation status Close Border and aerodrome Roads, erect road closed signs Vacate the immediate vicinity of the reservoir and downstream Support/ supervise remedial works as required Repeat the inspection as directed by EEC Provide inspection report to EEC Logbook entry	As per previous activation status Support/ supervise remedial works as required Maintain surveillance of the area immediately downstream as directed by EEC Logbook entry	As per previous activation status	Forward event report including photos for EEC Dam logbook is the be updated after every Emergency Event Return to routine activities and routine inspections Reopen Border and Aerodrome Roads, remove road closed signs when directed by EEC
Notifications	EEC	EEC		EEC	EEC

Table 42 - Earthquake - EEC Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Down
Activation Trigger	Earthquake reported or felt in the area AND Intensity <u>less than</u> or equal to 5MM AND Change detected during surveillance	Earthquake reported or felt in the area AND Intensity <u>greater than</u> or equal to 5MM AND Change detected during surveillance	Earthquake reported or felt in the area AND Change detected during surveillance AND A possible failure path has been identified	Failure possible or in progress due to earthquake	Risk assessment has determined that failure risk has reduced
Actions	Activate EAP in consultation with EEM Notify the following of EAP Activation LDC DIO	Provide update to EEM Activate the EAP in consultation with EEM (if not already undertaken) Phone LDC Request DE undertake inspection of the dam Notify LDC, DIO, RDSWU, PAR of EAP Activation or status Escalation Investigate availability of machinery and materials Place machinery operators on stand by	As per previous activation status, plus Provide update to EEM	As per previous activation status, plus Provide update to EEM Phone LDC WARNING to LDC, DE, DIO, RDSWU, PAR, EEM of status Escalation and to evacuate Request advice from DE regarding the current condition of the dam and the structural risk if required	Stand Down the EAP in consultation with EEM and DE (if required) Phone LDC Notify LDC, DIO, RDSWU, PAR, EEM of EAP Stand Down Prepare and forward EER ² to EEM within 30 days if Stand UP is reached or dam requires remedial work
Notifications and Warnings	EEM LDC DIO	EEM DE LDC DIO RDSWU PAR	EEM DE LDC DIO RDSWU PAR	EEM LDC DE DIO RDSWU PAR	EEM DE LDC DIO RDSWU PAR

Table 43 – Earthquake – DE Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Down
Activation Trigger	Earthquake reported or felt in the area AND Intensity <u>less than</u> or equal to 5MM AND Change detected during surveillance	Earthquake reported or felt in the area AND Intensity <u>greater than</u> or equal to 5MM AND Change detected during surveillance	Earthquake reported or felt in the area AND Change detected during surveillance AND A possible failure path has been identified	Failure possible or in progress due to earthquake	Risk assessment has determined that failure risk has reduced
Actions	Not Applicable	Conduct inspection of the dam if requested by EEC and safe to do so Report findings to EEC immediately after inspection Prepare report including any observations, photographs, sketches or data collected during inspection and provide to EEC	Provide advice to the EEC and EEM regarding the current condition of the dam and the structural risk if requested	Provide advice to the EEC and EEM regarding the current condition of the dam and the structural risk if requested	Provide advice to the EEC and EEM regarding the current condition of the dam and the structural risk if requested Prepare and forward event report including any observations, photos data and sketches collected to EEC
Notifications and Warnings	Not Applicable	EEC	EEC EEM	EEC EEM	EEC EEM

Table 44 - Earthquake - EEM Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Down
Activation Trigger	Earthquake reported or felt in the area AND Intensity <u>less than</u> or equal to 5MM AND Change detected during surveillance	Earthquake reported or felt in the area AND Intensity <u>greater than</u> or equal to 5MM AND Change detected during surveillance	Earthquake reported or felt in the area AND Change detected during surveillance AND A possible failure path has been identified	Failure possible or in progress due to earthquake	Risk assessment has determined that failure risk has reduced
Actions	Notify DM	Notify DM of EAP Activation or Escalation with SitReps	Notify DM of EAP Escalation with SitReps	Notify DM of EAP Escalation with SitReps	Notify DM of EAP Stand Down with SitRep Prepare and forward EER ² to DM within 30 working days if Activation status reaches Stand Up or the dam requires remedial work
Notifications and Warnings	DM	DM	DM	DM	DM

² Forward EER to DDS within 30 days of the event as specified in the *Water Supply (Safety and Reliability) Act 2008*.

Table 45 - Earthquake - DM Emergency Action Table

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Down
Activation Trigger	Earthquake reported or felt in the area AND Intensity <u>less than</u> or equal to 5MM AND Change detected during surveillance	Earthquake reported or felt in the area AND Intensity <u>greater than</u> or equal to 5MM AND Change detected during surveillance	Earthquake reported or felt in the area AND Change detected during surveillance AND A possible failure path has been identified	Failure possible or in progress due to earthquake	Risk assessment has determined that failure risk has reduced
Actions	None	Notify EDTS, DDS ¹ , DEMU, DDGGEO and external stakeholders (including Police, LDMG, SDCC) Provide SitRep to above	Notify EDTS, DDS ¹ , DEMU, DDGGEO and external stakeholders (including Police, LDMG, SDCC) Provide SitRep to above	Notify EDTS, DDS ¹ , DEMU, DDGGEO and external stakeholders (including Police, LDMG, SDCC) Provide SitRep to above	Notify EDTS, DDS ¹ , DEMU, DDGGEO and external stakeholders (including Police, LDMG, SDCC) Review EER ² , if required, and forward to DDS & DDGGEO
Notifications and Warnings	None	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)	EDTS DDS DEMU DDGGEO External Stakeholders (including Police, LDMG, SDCC)

¹ Notify DDS within 48 hours of event. ² Forward EER to DDS within 30 days of the event as specified in the *Water Supply (Safety and Reliability) Act 2008*.

Table 46 - Earthquake - DIO Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Communications Content
Alert	Earthquake reported or felt in the area AND Intensity <u>less than</u> or equal to 5MM AND Change detected during surveillance	EEC	Phone	DIO Emergency NOTIFICATION DAM: Glen Niven EVENT: Earthquake STATUS: ALERT - Earthquake reported or felt in the area, Investigation underway UPDATE: Next update due by XX am/pm
Lean Forward	Earthquake reported or felt in the area AND Intensity <u>greater than</u> or equal to 5MM AND Change detected during surveillance	EEC	Phone	DIO Emergency NOTIFICATION DAM: Glen Niven EVENT: Earthquake STATUS: LEAN FORWARD – Earthquake confirmed, dam affected, surveillance continuing Reservoir Water level: XXX.XXm AHD UPDATE: Next update due by XX am/pm
Stand Up 1	Earthquake reported or felt in the area AND Change detected during surveillance AND A possible failure path has been identified	EEC	Phone	DIO Emergency NOTIFICATION DAM: Glen Niven EVENT: Earthquake STATUS: STAND UP – Dam failure possible Reservoir Water level: XXX.XXm AHD UPDATE: Next update due by XX am/pm
Stand Up 2	Failure possible or in progress due to earthquake	EEC	Phone	DIO Emergency NOTIFICATION DAM: Glen Niven EVENT: Earthquake STATUS: STAND UP – Dam failure in progress Reservoir Water level: XXX.XXm AHD UPDATE: Next update due by XX am/pm
Stand Down	Risk Assessment has determined that failure risk has reduced	EEC	Phone	DIO Emergency NOTIFICATION DAM: Glen Niven EVENT: Earthquake STATUS: STAND DOWN – Event over Reservoir Water Level: XXX.XXm AHD

Table 47 - Earthquake - EEC Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Code	Message Text (subject to minor change by EEM approval)
Alert	Earthquake reported or felt in the area AND Intensity <u>less than</u> or equal to 5MM AND Change detected during surveillance	EEM	Phone BURST	Glen Niven Quake Alert	Dept of Natural Resources ADVICE DAM: Glen Niven Dam EVENT: Earthquake STATUS: Earthquake felt or reported in proximity to Glen Niven Dam. An investigation is underway at the dam. Houses are not at risk. WHAT YOU SHOULD DO: No action required. UPDATE: Further updates will be provided as required.
		LDC	BURST		
		DIO	BURST		
Lean Forward	Earthquake reported or felt in the area AND Intensity <u>greater than</u> or equal to 5MM AND Change detected during surveillance	EEM	Phone BURST	Glen Niven Quake Lean Forward	Dept of Natural Resources WATCH AND ACT DAM: Glen Niven Dam EVENT: Earthquake STATUS: Intense earthquake felt or reported in proximity to Glen Niven Dam. Dam may be affected. Investigations are currently ongoing. Houses are not at risk. WHAT YOU SHOULD DO: Await further notifications. UPDATE: Further updates will be provided as required.
		DE	Phone		
		LDC	Phone first then BURST		
		DIO	Phone		
		RDSWU	BURST		
		PAR	BURST		
Stand Up 1	Earthquake reported or felt in the area AND Change detected during surveillance AND A possible failure path has been identified	EEM	Phone BURST	Glen Niven Quake Stand Up 1	Dept of Natural Resources EMERGENCY WARNING DAM: Glen Niven Dam EVENT: Earthquake STATUS: Emergency Warning! Glen Niven Dam has been affected by earthquake. A possible pathway to failure of the dam has been identified. Flood waters will be contained in waterways – houses are not at risk. WHAT YOU SHOULD DO: Await further notifications. Avoid fast flowing or deep water near waterways and floodplains. UPDATE: Further updates will be provided as required.
		LDC	Phone first then BURST		
		DE	Phone BURST		
		DIO	Phone		
		RDSWU	BURST		
		PAR	BURST		

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Code	Message Text (subject to minor change by EEM approval)
Stand Up 2	Failure possible or in progress due to earthquake	EEM	Phone BURST	Glen Niven Quake Stand Up 2	Dept of Natural Resources EMERGENCY WARNING DAM: Glen Niven Dam EVENT: Earthquake STATUS: Emergency Warning! Failure of Glen Niven Dam is in progress/possible as at [time, day, date, year]. Applethorpe residents are advised that water levels in Four Mile Creek and connecting streams may rise rapidly. Flood waters will be contained in waterways – houses are not at risk. WHAT YOU SHOULD DO: Follow emergency services instructions. Avoid fast flowing or deep water near waterways and floodplains. UPDATE: Further updates will be provided as required.
		LDC	Phone first then BURST		
		DE	Phone BURST		
		DIO	Phone		
		RDSWU	BURST		
		PAR	BURST		
Stand Down	Risk Assessment has determined that failure risk has reduced	EEM	Phone BURST	Glen Niven Quake Stand Down	Dept of Natural Resources ADVICE DAM: Glen Niven Dam EVENT: Earthquake STATUS: Stand down – Event over. Glen Niven Dam is not affected by a structural concern. WHAT YOU SHOULD DO: No action required. UPDATE: No further updates will be provided.
		DE	Phone		
		LDC	Phone first then BURST		
		DIO	Phone		
		RDSWU	BURST		
		PAR	BURST		

Table 48 - Earthquake - DE Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Code	Message Text
Alert	No actions required by DE at this stage				
Lean Forward	Request from EEC for inspection of dam	EEC	Phone	N/A	N/A
		EEC	Report	N/A	N/A
Stand Up 1	Request from EEC or EEM for advice regarding dam condition and/or structural risk	EEC	Phone	N/A	N/A
		EEM	Phone	N/A	N/A
Stand Up 2	Failure possible or in progress due to earthquake	EEC	Phone	N/A	N/A
		EEM	Phone	N/A	N/A
Stand Down	Request from EEC or EEM for advice regarding dam condition and/or structural risk	EEC	Phone	N/A	N/A
		EEM	Phone	N/A	N/A

Table 49 - Earthquake - EEM Communication Table

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Text
Alert	Earthquake reported or felt in the area AND Intensity <u>less than</u> or equal to 5MM AND Change detected during surveillance	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the EEM as required to suit the circumstances of individual dam hazard events or dam emergency events. These SitReps will be distributed by Email to the DM. Refer to SitRep template in Section 1.10.
Lean Forward	Earthquake reported or felt in the area AND Intensity <u>greater than</u> or equal to 5MM AND Change detected during surveillance	DM	SitReps Phone SMS Email	
Stand Up 1	Earthquake reported or felt in the area AND Change detected during surveillance AND A possible failure path has been identified	DM	SitReps Phone SMS Email	
Stand Up 2	Failure possible or in progress due to earthquake	DM	SitReps Phone SMS Email	
Stand Down	Risk Assessment has determined that failure risk has reduced	DM	SitReps Phone SMS Email	

Table 50 - Earthquake - DM Communication Table

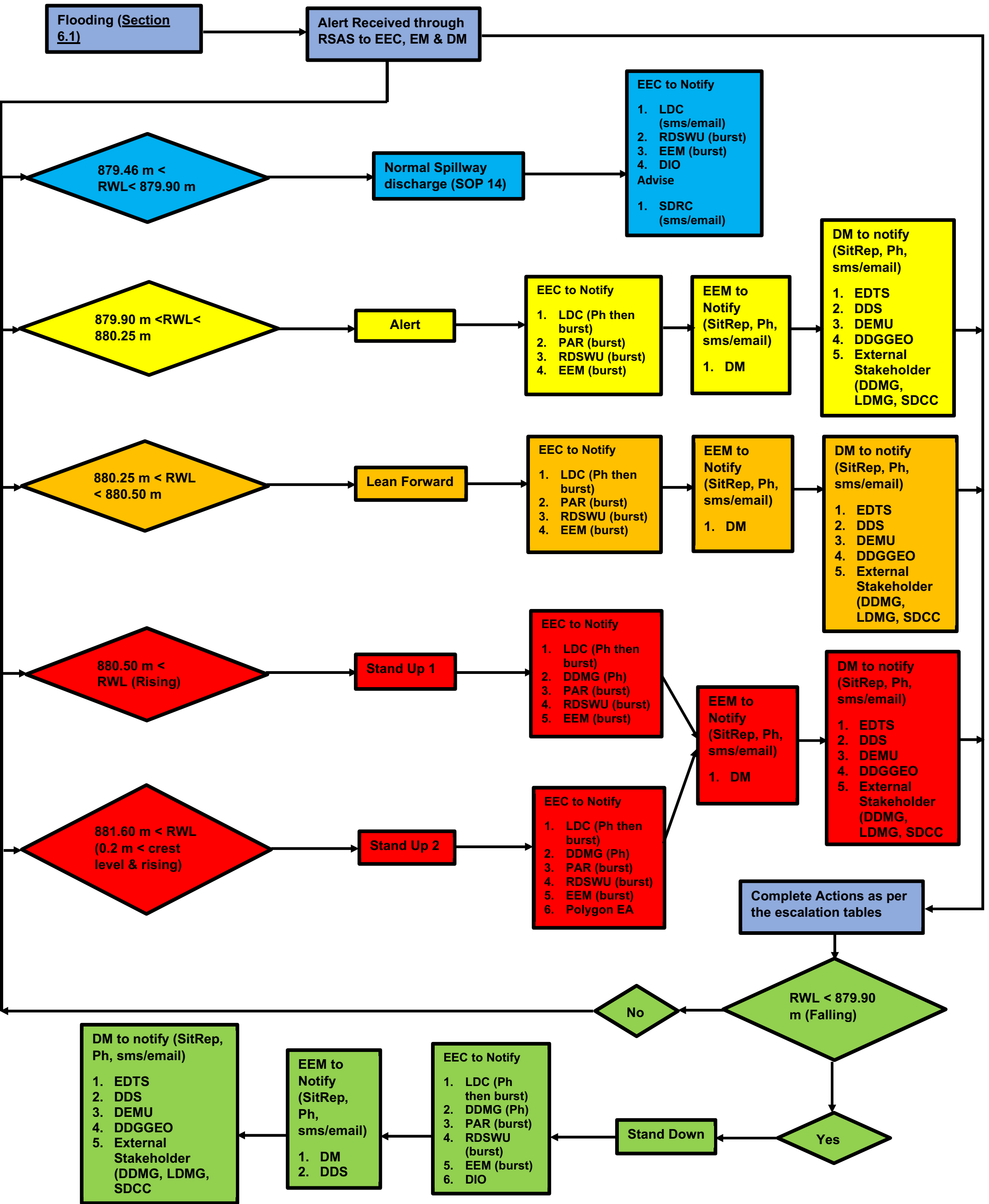
Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Method	Message Text
Alert	Earthquake reported or felt in the area AND Intensity <u>less than</u> or equal to 5MM AND Change detected during surveillance	EDTS DDS DEMU DDGCEO External Stakeholders (Police LDMG SDCC)	SitReps Phone SMS Email	External SitReps are escalated by the DM as required to suit the circumstances including a summary dam(s) event status, hazards and required actions. These SitReps will be distributed by Email to the EMT and DNRMMRRD Senior Management. Refer to SitRep template in Section 1.10.
Lean Forward	Earthquake reported or felt in the area AND Intensity <u>greater than</u> or equal to 5MM AND Change detected during surveillance	EDTS DDS DEMU DDGCEO External Stakeholders (Police LDMG SDCC)	SitReps Phone SMS Email	
Stand Up 1	Earthquake reported or felt in the area AND Change detected during surveillance AND A possible failure path has been identified	EDTS DDS DEMU DDGCEO External Stakeholders (Police LDMG SDCC)	SitReps Phone SMS Email	
Stand Up 2	Failure possible or in progress due to earthquake	EDTS DDS DEMU DDGCEO External Stakeholders (Police LDMG SDCC)	SitReps Phone SMS Email	
Stand Down	Risk Assessment has determined that failure risk has reduced	EDTS DDS DEMU DDGCEO External Stakeholders (Police LDMG SDCC)	SitReps Phone SMS Email	

Appendices

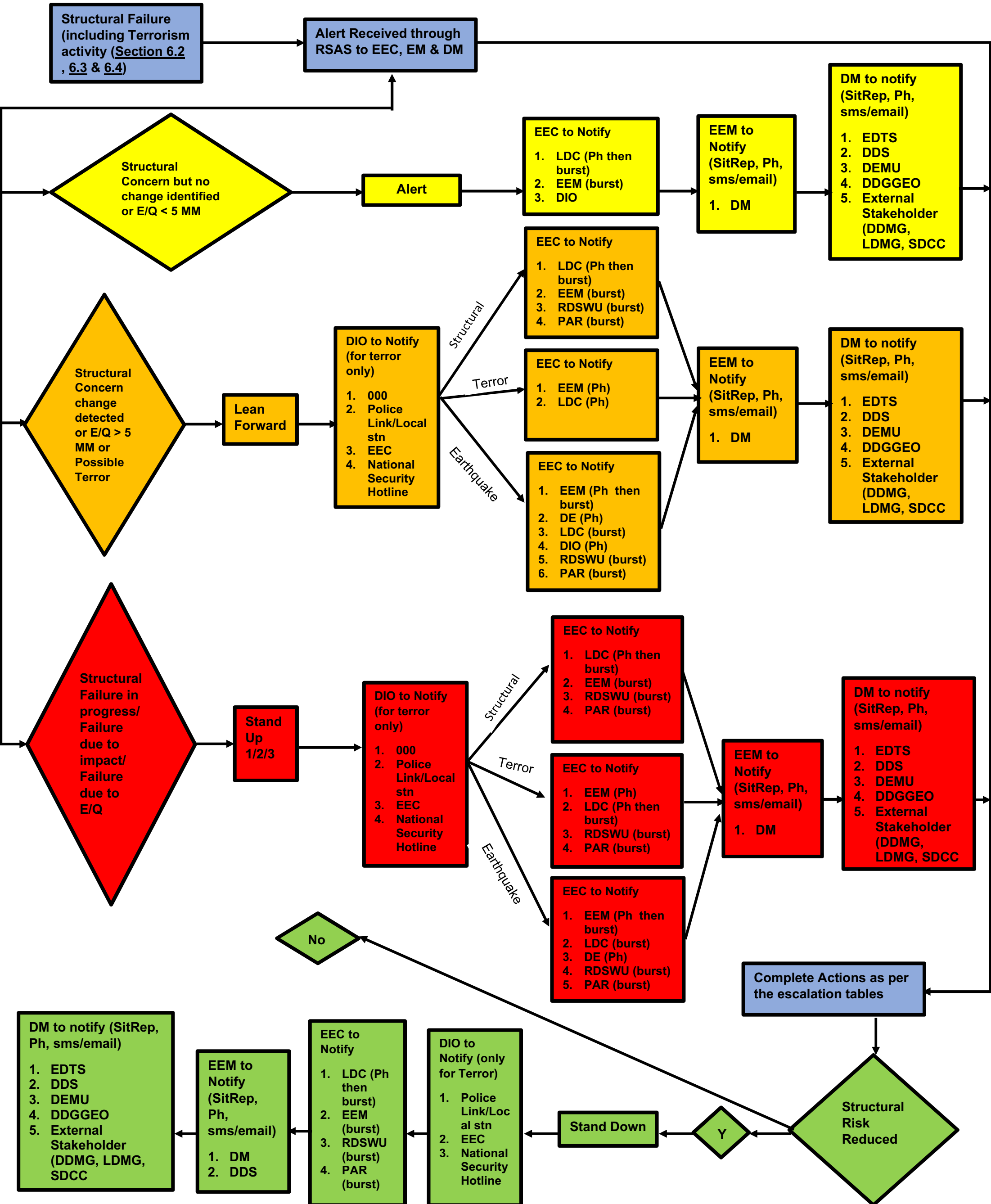
- Appendix 1 - Notification List and Contact Details
- Appendix 2 – Notification Flow Charts
- Appendix 3 - Glen Niven Dam Locality Plan and Access Route
- Appendix 4 - Glen Niven Dam Catchment Boundary Map
- Appendix 5 – Inspection Safety Protocol
- Appendix 6 – Potential Problem Identification
- Appendix 7 – Weather Monitoring, RSAS and BOM
- Appendix 8 – Spillway Rating Tables and Flood Duration Curves
- Appendix 9 – Inundation Mapping
- Appendix 10 – Critical Reservoir Water Levels and Trigger Justification
- Appendix 11 – PAR Evacuation Plans
- Appendix 12 – Riparian and Downstream Water Users (RDSWU) Locality Map
- Appendix 13 – Burst SMS Sending messages
- Appendix 14 – Glen Niven Dam Drawings
- Appendix 15 – Training
- Appendix 16 – Emergency Event Coordination
- Appendix 17 – Glen Niven Dam Flood Emergency Alert Request
- Appendix 18 – SOP 14 – Normal Spillway Discharge

Appendix 1 has been redacted

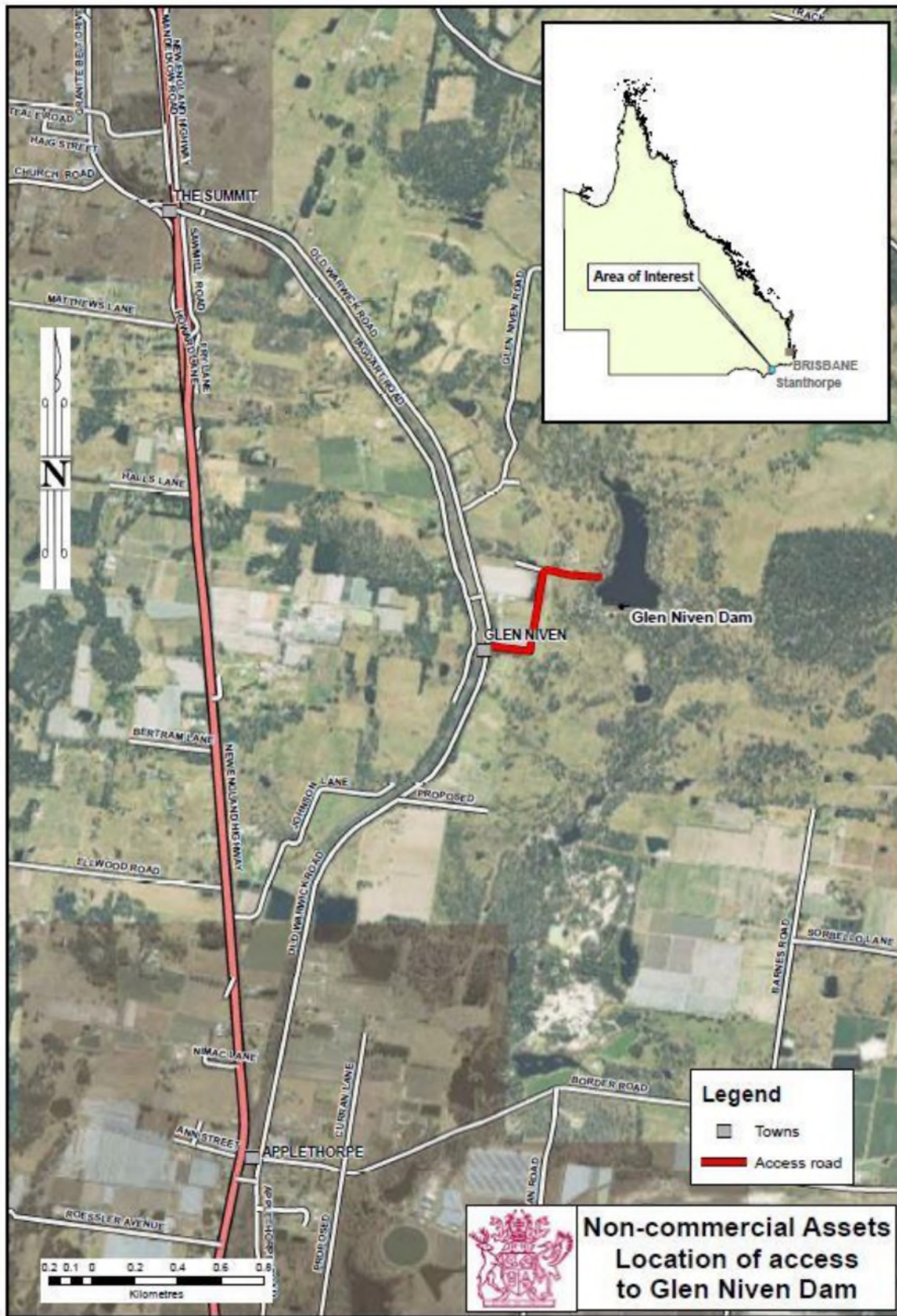
Appendix 2 – Notification Flow Charts
1. Flooding Notification Flow Chart



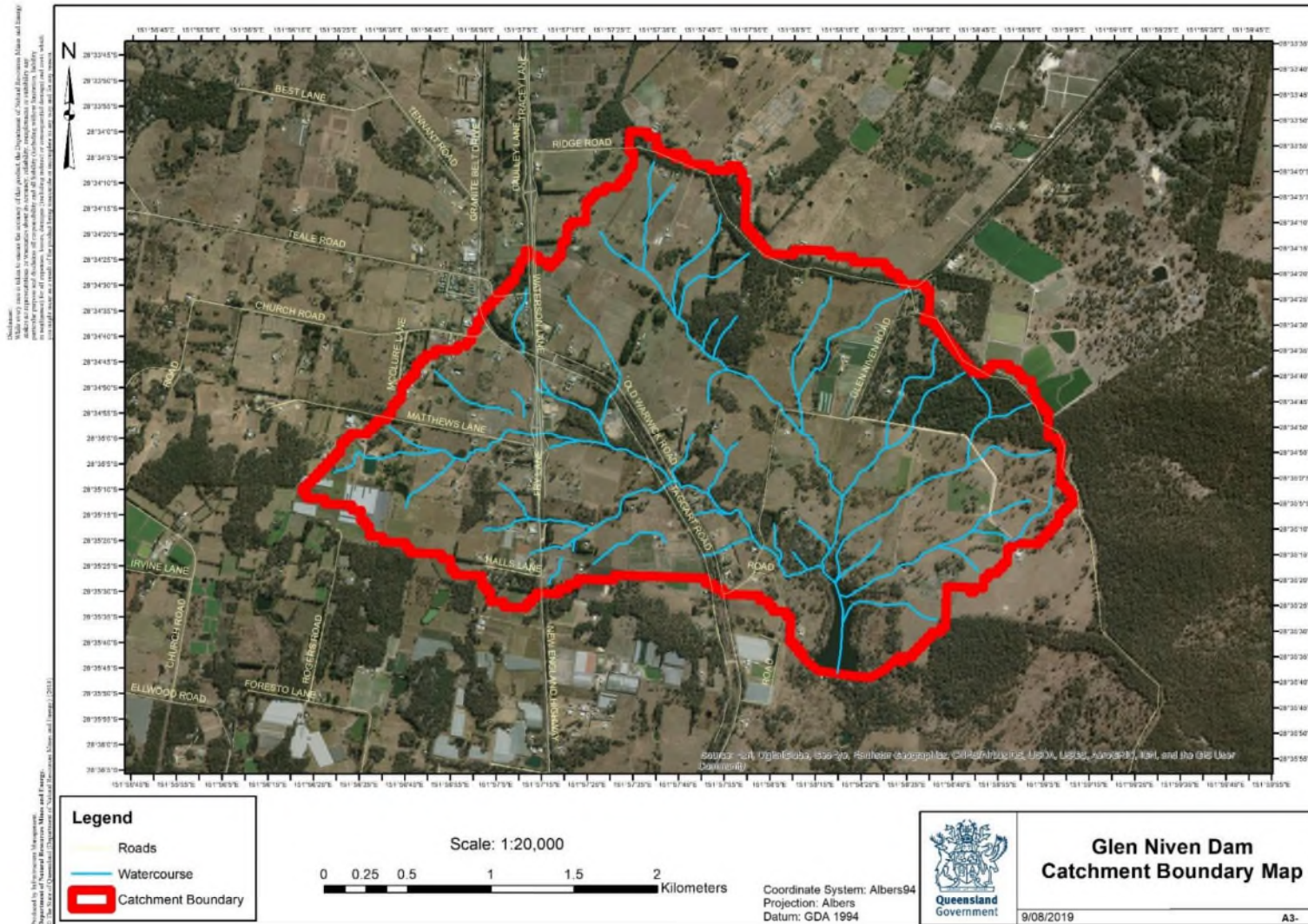
2. Structural Deficiency (including Earthquake & Terrorism activity) Notification Flow Chart



Appendix 3 - Glen Niven Dam Locality Plan and Access Route



Appendix 4 - Glen Niven Dam Catchment Boundary Map



Appendix 5 – Inspection Safety Protocol

All officers who visit the dam site are to observe this protocol.

- 1) Inspections are to be carried out only when conditions are deemed to be safe as per inspection and risk assessment/s.
- 2) Once the EAP has been activated (i.e. at or above Alert level) only personnel authorised by the EEC or EEM are to visit the dam site during the event.
- 3) DI officers must be accompanied by another officer when on the site, for safety reasons.
- 4) Mobile phone coverage is available in this area and a minimum of one handset (fully charged) is to be carried by each visiting group.
- 5) During an emergency event access to dam structure or main spillway is not to be made by boat.

For more detailed safe work practice and health information, practices and procedures refer to the Glen Niven Dam Health Safety and Environment Management Plan and SOP 4 – Safety and Health.

Appendix 6 – Potential Problem Identification

INSPECTION OF EMBANKMENT DAMS

INSPECTING FOR DEFICIENCIES: SUMMARY

TYPE OF DEFICIENCY	LOOK FOR
SEEPAGE	<p>A water flow or sand boil on the lower portion of the downstream slope or toe area, especially at the groins.</p> <p>Wet areas or areas where the vegetation appears greener or lusher on the embankment slope or toe area.</p> <p>An increase in the amount of water being released from toe drains and relief wells. (Remember to take into account changes in the reservoir level.)</p> <p>Turbidity or cloudiness of the seepage.</p>
CRACKING	<p>Desiccation Cracking: A random honeycomb pattern of cracks usually found on the crest and the downstream slope.</p> <p>Transverse Cracking: Cracks that are perpendicular to the length of the dam usually found on the crest.</p> <p>Longitudinal Cracking: Cracks that are parallel to the length of the dam. Longitudinal cracks may be associated with stability problems in the slopes.</p>
INSTABILITY	<p>Slides on the upstream or downstream slopes.</p> <p>Bulging, especially at the toe of the dam.</p>
DEPRESSIONS	<p>Misalignment in the crest and embankment slopes found by sighting along fixed points.</p> <p>Sinkholes found by checking and probing each depression.</p> <p>Remember, sinkholes have steep, bucket like sides while minor depressions have gently sloped, bowl like sides.</p>
MAINTENANCE CONCERNS	<p>Inadequate Slope Protection: Check for bald areas or areas where the protection is sparse or damaged.</p> <p>Surface Runoff Erosion: Check for gullies or other signs of erosion. Make sure to check the low points along the upstream and downstream shoulders and groins since surface runoff can collect in these areas.</p> <p>Inappropriate Vegetative Growth: Check for excessive and deep-rooted vegetative growth.</p> <p>Debris: Check for debris on and around the dam, especially near the spillways.</p> <p>Animal Burrows: Check for damage caused by burrowing animals.</p>

Note: This tabulation taken from Dam Safety Surveillance Field Manual-August 2005

INSPECTION OF Concrete and Masonry Dams

INSPECTING FOR DEFICIENCIES: SUMMARY

NOTE: The summary below contains key identifiers of damage to concrete structures on dam sites. In the case of Glen Niven Dam this table should only be utilised when identifying damage to the concrete training walls adjacent to the spillways

TYPE OF DEFICIENCY	LOOK FOR
Surface Defects	Honeycomb: Voids around aggregate. Stratification: Non-uniform layers of aggregate in concrete. Form Slippage: Uneven joints and surfaces. Stains. Impact damage.
Displacement	Displacement at joints Volume change in concrete. Closing or opening of joints. Loss of joint filler. Cracking. Debonding of lifts. Tilting, shearing, or shifting of hardware or machinery.
Leakage and Seepage	Significant new leakage Wetness in abutment or foundation adjacent to toe. Major changes in leakage/seepage pattern or flow. Water spurting or running out of joints or cracks. Turbidity of the seepage. Blocked drains.
Maintenance Concerns	Vegetation in joints. Large accumulations of debris. Missing or deteriorated joint filler. Quality and condition of previous repairs.

Note: This tabulation taken from Dam Safety Surveillance Field Manual-August 2005

WHEN TO GET FURTHER ASSISTANCE

These deficiencies are very serious. If you observe any of the following, you should consult with the EEC or EEM.

- Sand boils or turbid seepage.
- Seepage that has increased since the last inspection (taking the reservoir level into consideration).
- Cracking that extends below the reservoir level or potential reservoir level.
- Transverse and longitudinal cracking.
- Deep seated slides or bulging associated with slides.
- Sinkholes or other large depressions.
- Deep rooted vegetation that might need to be removed.

Remember, whenever you are unsure whether or not a condition poses a threat to the safety of the dam, you should discuss your findings with EEC or EEM, Technical Services.

Appendix 7 – Weather Monitoring, RSAS and BOM

Weather monitoring sampling frequencies by EEC

It is the responsibility of the EEC to closely monitor the storage behaviour on RSAS and weather conditions on BOM before and during flooding events, interpret data and make decisions including issuing directions and initiating emergency messaging.

The required sampling frequency will vary during different stages of a flooding event and the sampling rationale provided below should be followed.

Preliminary sampling of the RWL will commence in advance to assess available storage air space if significant rainfall event is forecast for the area.

Sampling of a new inflow event will commence on an hourly basis when an Activation Trigger, Normal Spillway Discharges is received, sampling needs to be more frequent (hourly) during the start or rising stage of a flooding event to assess the rate of increase and likelihood and timing of status escalation up to the flood event peak before the EEM and/or DM may consider and recommend less frequent sampling during the recession stage until the event is considered over.

Hourly sampling will recommence if additional rainfall causes a subsequent rising trend in RWL.

The frequency of sampling may be increased from the above specification during an event at the discretion of the EEM or DM. This is most likely to occur as the EAP is escalated to higher levels of activation or during a rapidly escalating flood event.

Remote Sensing and Alert System (RSAS)

The RSAS provides two primary functions;

Displays monitored instrumentation on the Qteq Portal providing real time, updates of the following storage attributes at appropriate frequencies;

- Storage (Reservoir) level (m)

- Cumulative Rainfall (mm)

- V-Notch Weir Level (m)

- Vibrating Wire Piezometer Reading

- Automatically sends SMS alerts to a preselected DNRMMRRD RSAS Notification List at pre-set instrumentation trigger levels.

The RSAS system is contained within two separate installations. The rainfall and water level gauging system is located on the right bank of the storage within the secured pumping compound. The V-Notch Weir levels and vibrating wire piezometer readout system is located on the dam crest, near the right abutment.

The location of the remotely monitored installation is outlined below:

Remote Sensing and Alert System Location



Logging in to the Qteq Portal to view storage attributes

[Qteq Portal](#)

Note: To Log in to the portal you must have prior approval as a registered user with an assigned password and log in.

Enter your assigned login details in the appropriate fields and left click '**Sign In**'.

The portal displays information on all DNRMMRRD dam monitoring sites, the link above is specific to Glen Niven Dam.

Data

Data is uploaded to the website at pre-determined intervals which can be as short as 10 minutes.

The dashboard page displays current and recent data values, as well as images of the dam, links to relevant information and resources and a graph of recent data.

Interpreting data trends over time to predict escalation and predict/justify emergency responses

The information and data obtained from the RSAS can be used in the following ways to provide useful information for managing an emergency event, including:-

- Plotting of reservoir water level rate of rise to provide a prediction of when trigger levels will be reached, spillway discharges to commence, plotting of rainfall to identify if the storm event is still developing or has passed; and
- Obtaining overall rainfall totals for the site;
- Establishing trends in seepage rates.

RSAS Output/Readings Guide

RSAS Output/Readings	Possible Interpretation
Reservoir Water Level	
Rapidly falling reservoir water level (>0.2m per hour). Dry Weather (no rainfall recorded)	Sunny Day failure
Rapidly rising reservoir water level (>0.5m per hour). High rainfall recorded or BOM indicates high rainfall in the area	Storm inflows to dam occurring
Rapidly declining reservoir water level and high rainfall recorded	Breach / failure developing or has occurred.
Rainfall Gauge	
Rapid Rise in Rainfall	High intensity rainfall event occurring over the dam.
V-Notch Water Level	
Rise in water level in V-Notch Weir which is not associated with reservoir water level rise	Seepage is increasing and does not correspond to reservoir water level changes; piping failure could be developing
Vibrating Wire Piezometers	
Elevated readings from vibrating wire piezometers which are not associated with reservoir water level rise	The pore pressures within the embankment are increasing and do not correspond to a change in reservoir water levels. Dam is not performing as designed, increased risk of failure of the dam wall.

Automatic SMS alerts

The following pre-set levels are programmed to send an SMS trigger message to the DNRMMRRD RSAS Notification telephone list below. Custom alarm levels can also be set by DNRMMRRD during an event to improve responses or provide alternate warning levels.

Storage Levels

EL 879.41 m	Main Spillway Crest Level (Reset 879.15 m)
EL 879.46 m	SOP14 level
EL 879.90 m	ALERT level
EL 880.25 m	LEAN FORWARD level
EL 880.5 m	STAND UP 1 level
EL 881.60 m	STAND UP 2 level
EL 881.80 m	Main Embankment Crest Level

DNRMMRRD RSAS Notification telephone list for SMS messages

Role	Name	Mobile	Notifications
EEC	[Redacted]	[Redacted]	Automatic
EEM	[Redacted]	[Redacted]	
	[Redacted]	[Redacted]	
DM	[Redacted]	[Redacted]	As required
Backup EEC	[Redacted]	[Redacted]	
	[Redacted]	[Redacted]	
	[Redacted]	[Redacted]	

The Bureau of Meteorology

The Bureau of Meteorology website is www.bom.gov.au.

Accessing and Recording Rainfall data

There is a **BOM weather station** located in Applethorpe, that provides 30-minute rainfalls, however data is only updated every hour on the 30 minute mark.



Accessing and Recording Brisbane Weather Watch Radar data

The Brisbane Weather Watch Radar image covers Glen Niven Dam catchment area.

Hover the cursor over “Rain Radar” Icon, in the middle of the home page, to the right of the Australia map and left click.

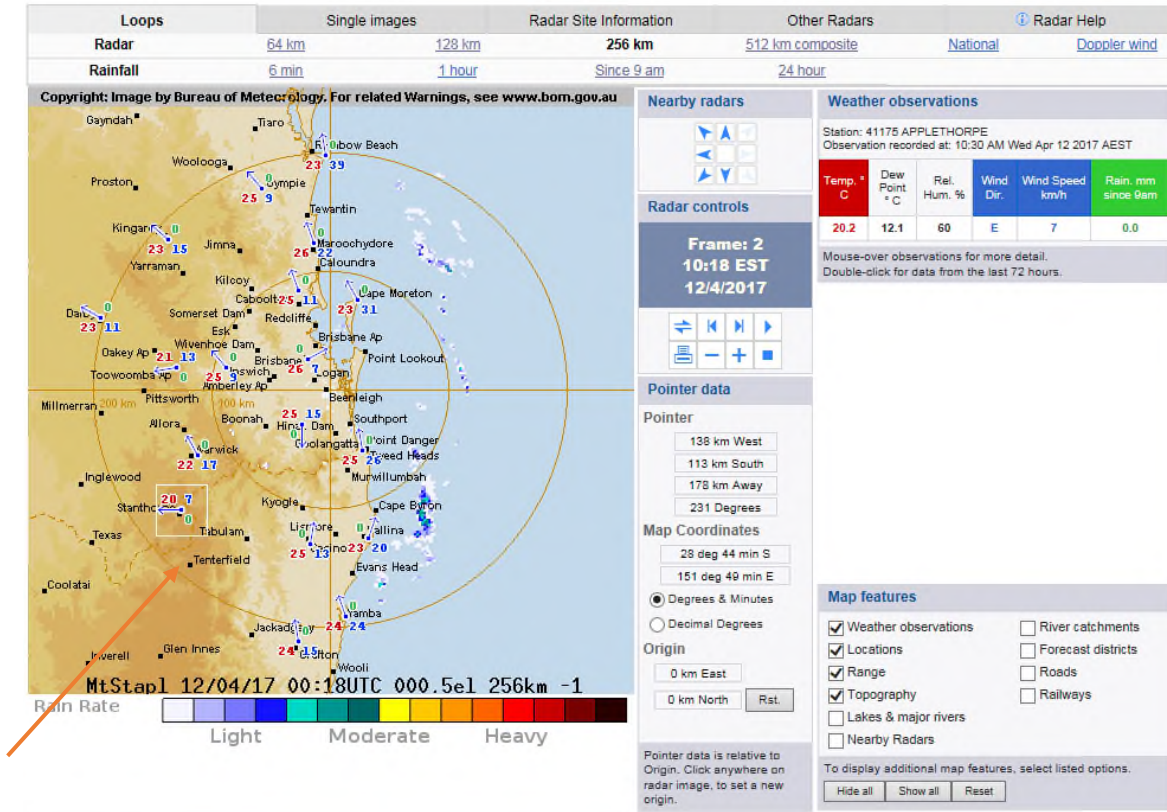
Left click the red triangle immediately left of the “Brisbane” location, select “256km Mt Stapylton Radar Loop” Scale, ensure “Locations” and “weather observations” Tabs under Map Features Legend are ticked.

Analyse radar data for Stanthorpe area. Note location of Glen Niven Dam catchment in Appendix 4 - Glen Niven Dam Catchment Boundary Map. Moderate and Heavy falls for sustained periods of time will require close monitoring.

Note that the 256km Marburg Radar Loop and 256km Moree Radar Loop will also provide radar images for the Stanthorpe Region. It has been identified during previous events that there can

be some discrepancy between these radar loops and care should be taken to check the radar loop being used against the other radar loops available and the observed data at Glen Niven Dam.

These radars can be accessed in the same manner as above and care should be taken to ensure the correct tabs under the Map Features Legend are ticked.



To access 30 minute rainfall totals from 9am

- Click the 'Weather observations' box in Map Features bottom right-hand side of radar screen
- Hover cursor over "Applethorpe" weather station on the 128 km or 256km radars
- Double left click the station and the rainfall totals from 9am will appear (shown below)

Latest Weather Observations for Applethorpe

IDQ60801

Issued at 11:02 am EST Wednesday 12 April 2017 (issued every 30 minutes, with the page automatically refreshed every 10 minutes)

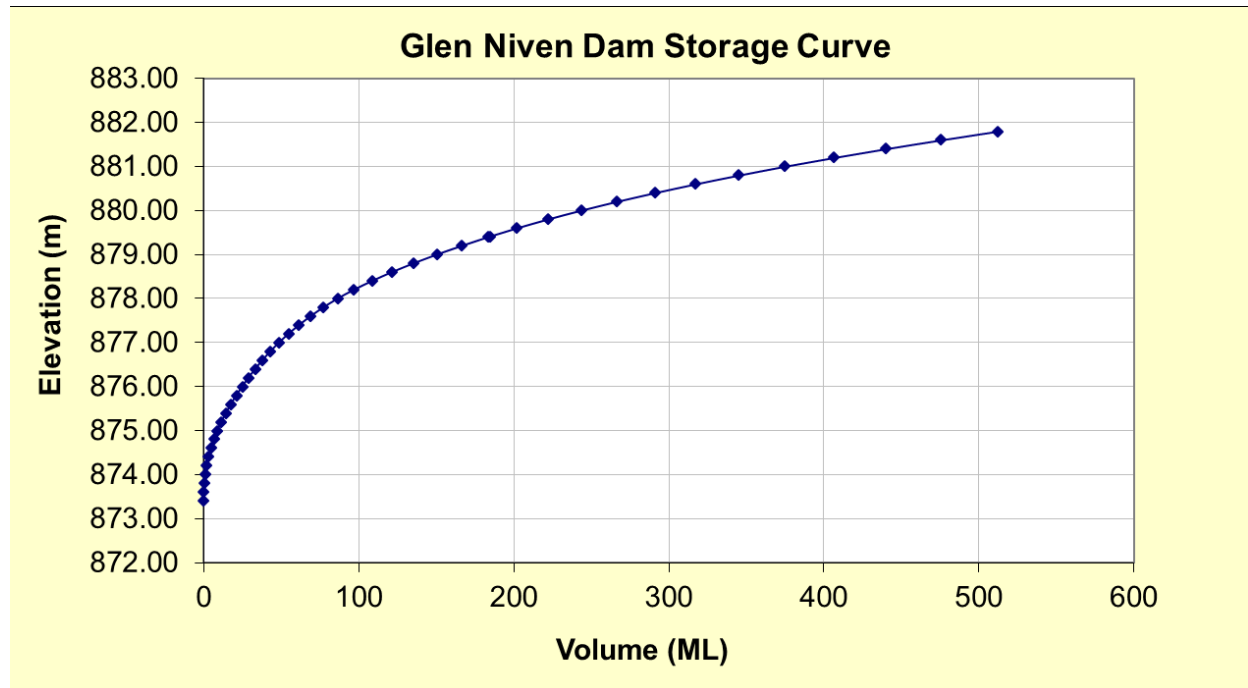
[About weather observations](#) | [Map of weather stations](#) | [Latest weather observations for QLD](#) | [Other Formats](#)

Station Details ID: 041175 Name: APPLETHORPE Lat: -28.62 Lon: 151.95 Height: 871.6 m

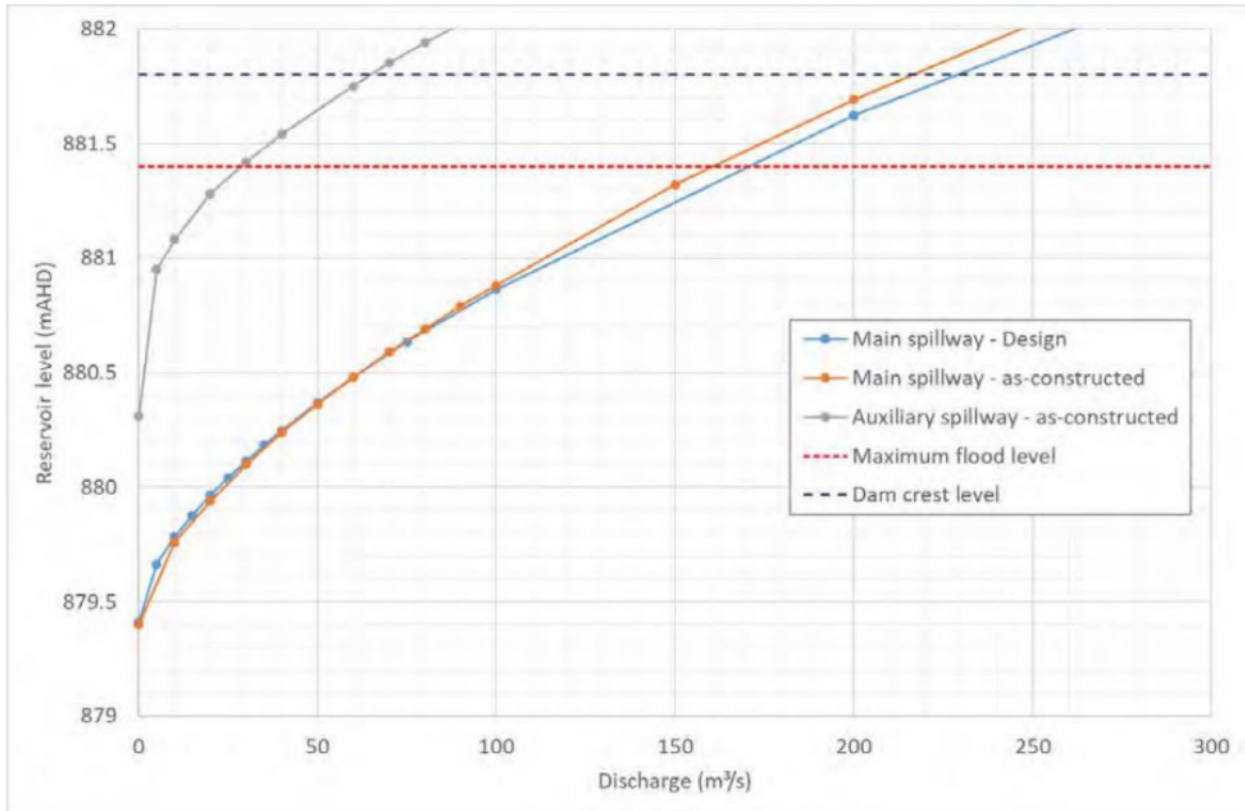
Data from the previous 72 hours. | See also: [Recent months at Applethorpe](#)

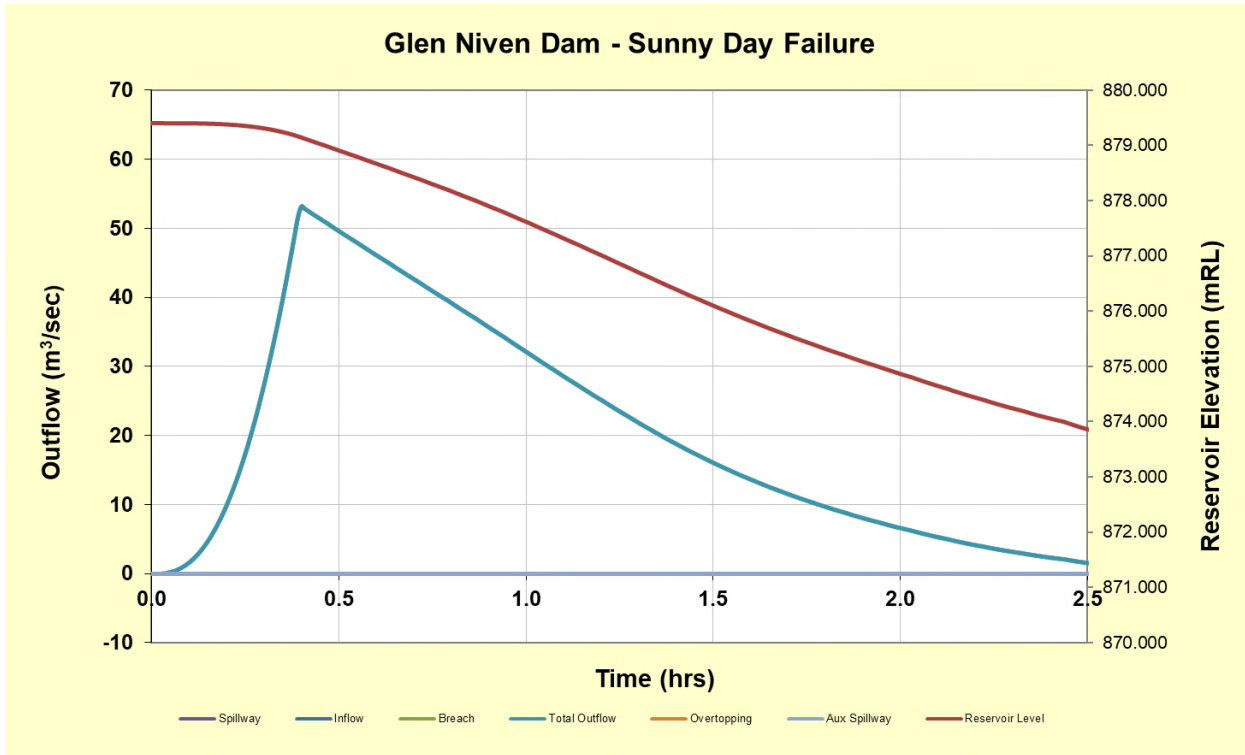
Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
12/11:00am	19.9	19.4	12.1	60	4.5	E	6	11	3	6	1022.6	1019.9	0.0
12/10:30am	20.2	19.5	12.1	59	4.7	E	7	13	4	7	1022.6	1019.9	0.0
12/10:00am	19.3	18.0	11.4	60	4.5	ESE	9	19	5	10	1022.6	1019.9	0.0
12/09:30am	19.3	18.7	11.6	61	4.4	E	6	13	3	7	1022.8	1020.1	0.0
12/09:00am	17.1	16.5	11.8	71	3.0	SE	6	11	3	6	1022.8	1020.1	0.0
12/08:30am	16.0	15.9	12.1	77	2.2	SE	4	9	2	5	1022.8	1020.1	0.0
12/08:00am	13.9	13.6	11.6	86	1.3	SSE	4	7	2	4	1022.8	1020.1	0.0
12/07:30am	11.6	11.8	10.7	94	0.5	CALM	0	0	0	0	1022.5	1019.8	0.0
12/07:00am	7.8	7.2	7.6	99	0.1	CALM	0	0	0	0	1022.2	1019.4	0.0
12/06:30am	7.0	6.2	6.4	96	0.3	CALM	0	0	0	0	1021.6	1018.9	0.0
12/06:00am	6.5	5.6	6.1	97	0.2	CALM	0	0	0	0	1021.5	1018.8	0.0
12/05:30am	6.3	5.3	5.7	96	0.3	CALM	0	0	0	0	1021.5	1018.8	0.0
12/05:00am	6.4	5.5	6.2	99	0.1	CALM	0	0	0	0	1021.1	1018.3	0.0
12/04:30am	6.6	5.7	6.2	97	0.2	CALM	0	0	0	0	1020.7	1018.0	0.0
12/04:00am	6.8	5.9	6.2	96	0.3	CALM	0	0	0	0	1020.5	1017.8	0.0
12/03:30am	6.9	6.1	6.5	97	0.2	CALM	0	0	0	0	1020.6	1017.9	0.0
12/03:00am	7.3	6.6	6.9	97	0.2	CALM	0	0	0	0	1020.4	1017.7	0.0
12/02:30am	7.1	6.4	6.9	99	0.1	CALM	0	0	0	0	1020.4	1017.7	0.0
12/02:00am	7.3	6.6	6.9	97	0.2	CALM	0	0	0	0	1020.9	1018.1	0.0
12/01:30am	7.9	7.3	7.3	96	0.3	CALM	0	0	0	0	1021.1	1018.3	0.0
12/01:00am	8.3	7.8	7.7	96	0.3	CALM	0	0	0	0	1021.2	1018.4	0.0
12/12:30am	8.7	8.2	7.9	95	0.4	CALM	0	0	0	0	1021.3	1018.6	0.0
12/12:00am	8.7	8.3	8.1	96	0.3	CALM	0	0	0	0	1021.3	1018.6	0.0

Appendix 8 – Spillway Rating Tables and Flood Duration Curves Dam Volume



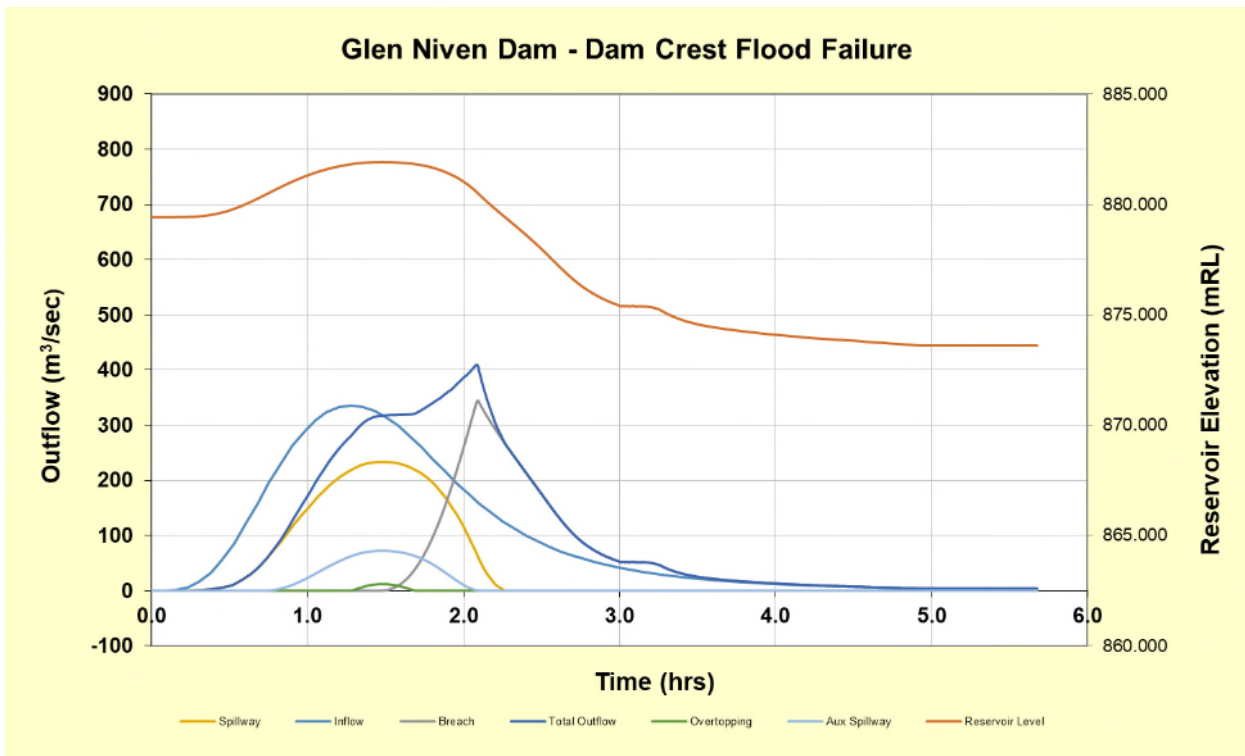
Spillway rating curve





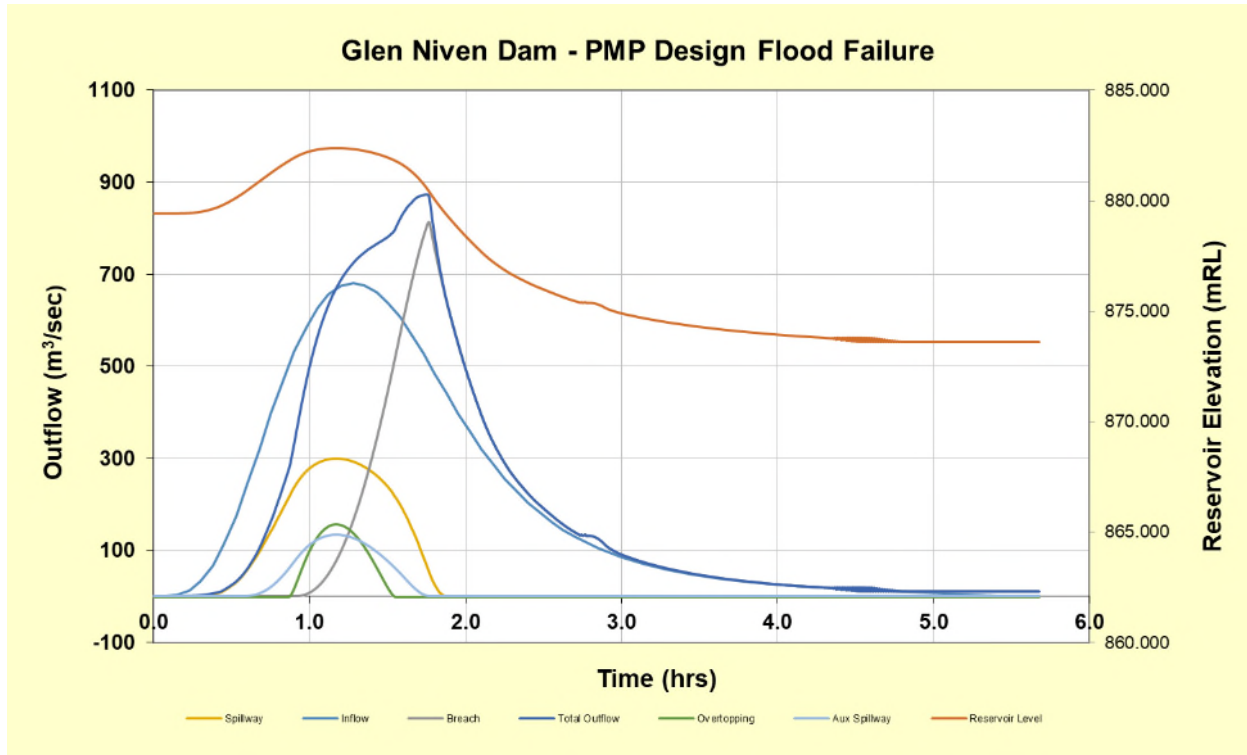
Sunny Day Failure

Time to peak outflow – 25 mins
 Flood duration – 2 hours 30 mins



Flood Failure – Dam Crest Flood

Time to peak outflow – 2 hours
 Flood duration – 4 to 6 hours



Flood Failure - PMPDF

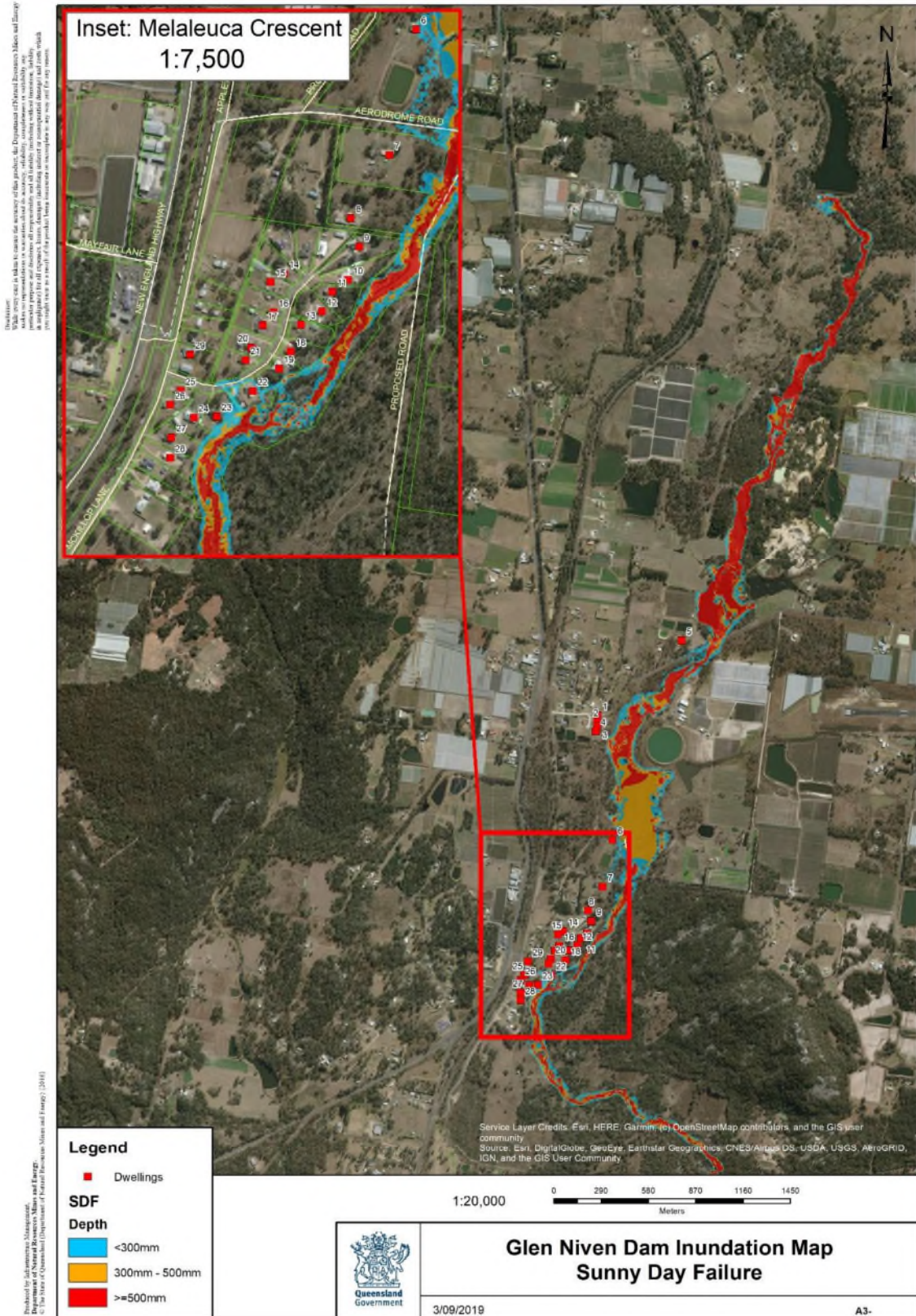
Time to peak outflow - 1 hour 45 mins

Flood duration – 4 to 6 hours

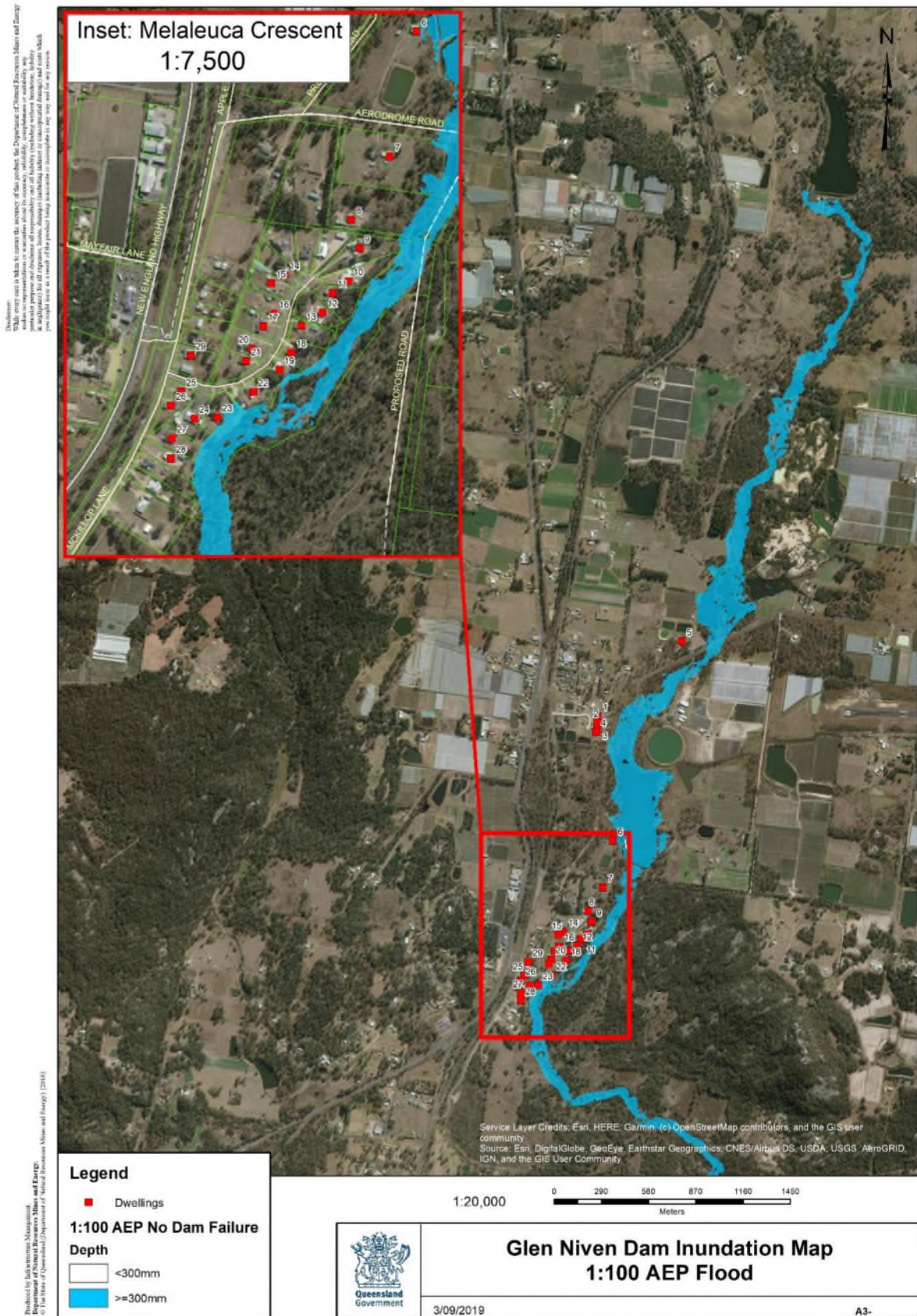
Appendix 9 – Inundation Mapping

Inundation Maps were extracted from 2019 modelling assessment completed by DNRMMRRD.

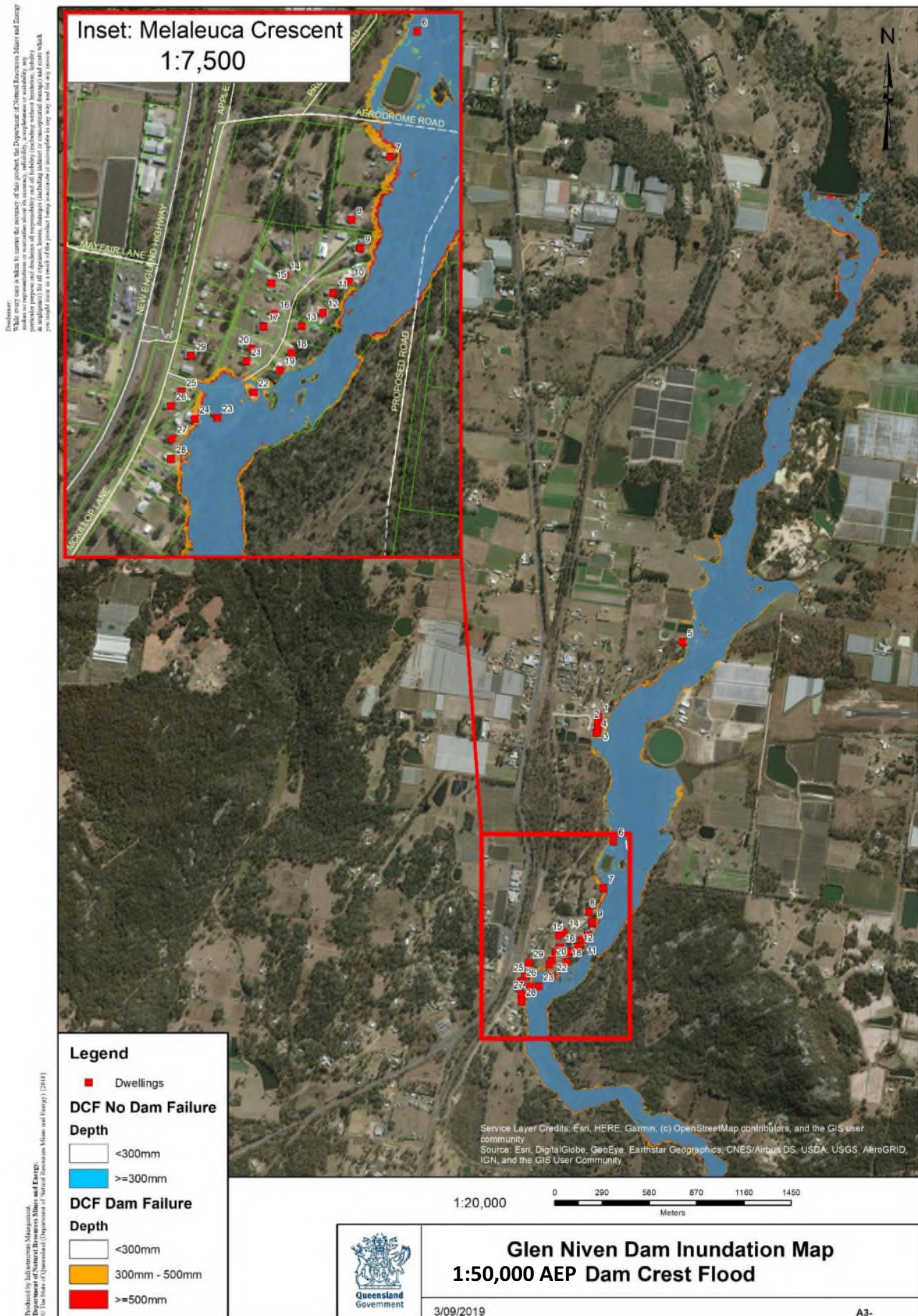
Sunny Day Failure



1% Flood Failure Inundation (1 in 100 AEP)



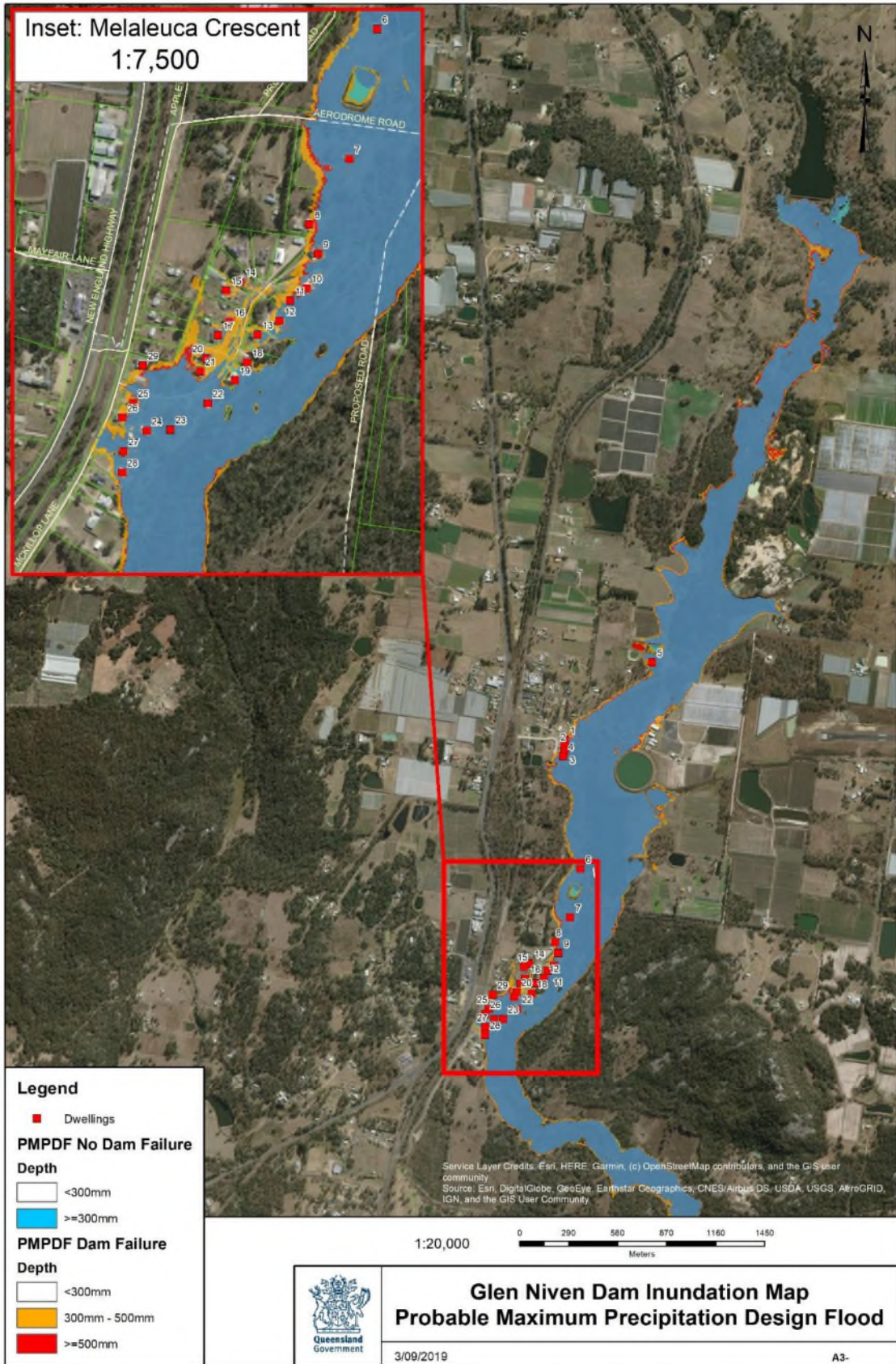
Dam Crest Flood Inundation



PMP Design Flood Dam Failure Inundation

Disclaimer: While every care is taken to ensure the accuracy of this product, the Department of Natural Resources, Mines and Energy makes no representation or warranty about its accuracy, reliability, completeness or suitability, and is not liable for any loss or damage, including consequential loss or damage, arising from its use. This product is provided for all purposes, but is not intended to be used for any purpose other than that for which it is intended.

Produced by: J&M Environmental Management
 Department of Natural Resources, Mines and Energy
 © The State of Queensland (Department of Natural Resources, Mines and Energy) (2019)



Appendix 10 – Critical Reservoir Water Levels and Trigger Justification

EAP Activation triggers, discussion and justifications

The catchment area of Glen Niven Dam is relatively small and the travel time for the flood peak to impact downstream residents could be as low as 40 minutes. Therefore, there is potential for the peak of events to occur and escalate quickly within a limited time. Due to this reason both the Alert and Lean Forward triggers have been set in the earlier stages of a developing event to ensure sufficient lead time is provided to both Disaster Management Groups and PAR.

The Stand Up triggers have been set to provide sufficient time for orderly evacuations of PAR prior to dwellings being impacted by flooding.

Refer to attached table, EAP Triggers, Critical Water Levels and Impacted Features/Actions.

Review of Activation Triggers

In 2022 a review of the activation triggers for flood scenarios for Glen Niven Dam was undertaken by TS engineers. The assessment focused on potential improvements to the flood event activation triggers and reassessed the existing triggers against the latest flood models, historic data, disaster management requirements and experience from previous events. As a result of the review no changes were proposed to the EAP activation trigger levels for flooding scenarios.

Individual Activation triggers

Routine spillway flows, Activation Trigger Justification

Allows for small to medium downstream releases from the dam without activating the EAP – monitoring of the dam increases. Border and Aerodrome Roads may be inundated.

Alert, Activation Trigger Justification

This trigger is set to the highest level which still provides early enough to provide sufficient time for LDMG to make considerations regarding future resources, whilst limiting the potential for message fatigue for a small event. PAR are not typically notified via an advice notification at this stage, however, depending on the circumstances this may be undertaken.

Lean Forward, Activation Trigger Justification

This trigger occurs as flows begin through the auxiliary spillway and just before the flood of record for the dam. PAR are notified at this point, provides time for PAR to prepare for evacuation.

Stand Up 1, Activation Trigger Justification

This trigger occurs just prior to the first incremental PAR location could be impacted in the event of a dam failure. Provides time for PAR evacuation before downstream releases impact houses downstream of the dam.

Stand Up 2, Activation Trigger Justification

Provides time for PAR evacuation (if not already undertaken) before the reservoir water level reaches the embankment crest and overtopping commences.

Stand Down, Activation Trigger Justification

Set low enough to ensure any event is over and reactivation of EAP is unlikely.

Ensures all impacted features are no longer affected.

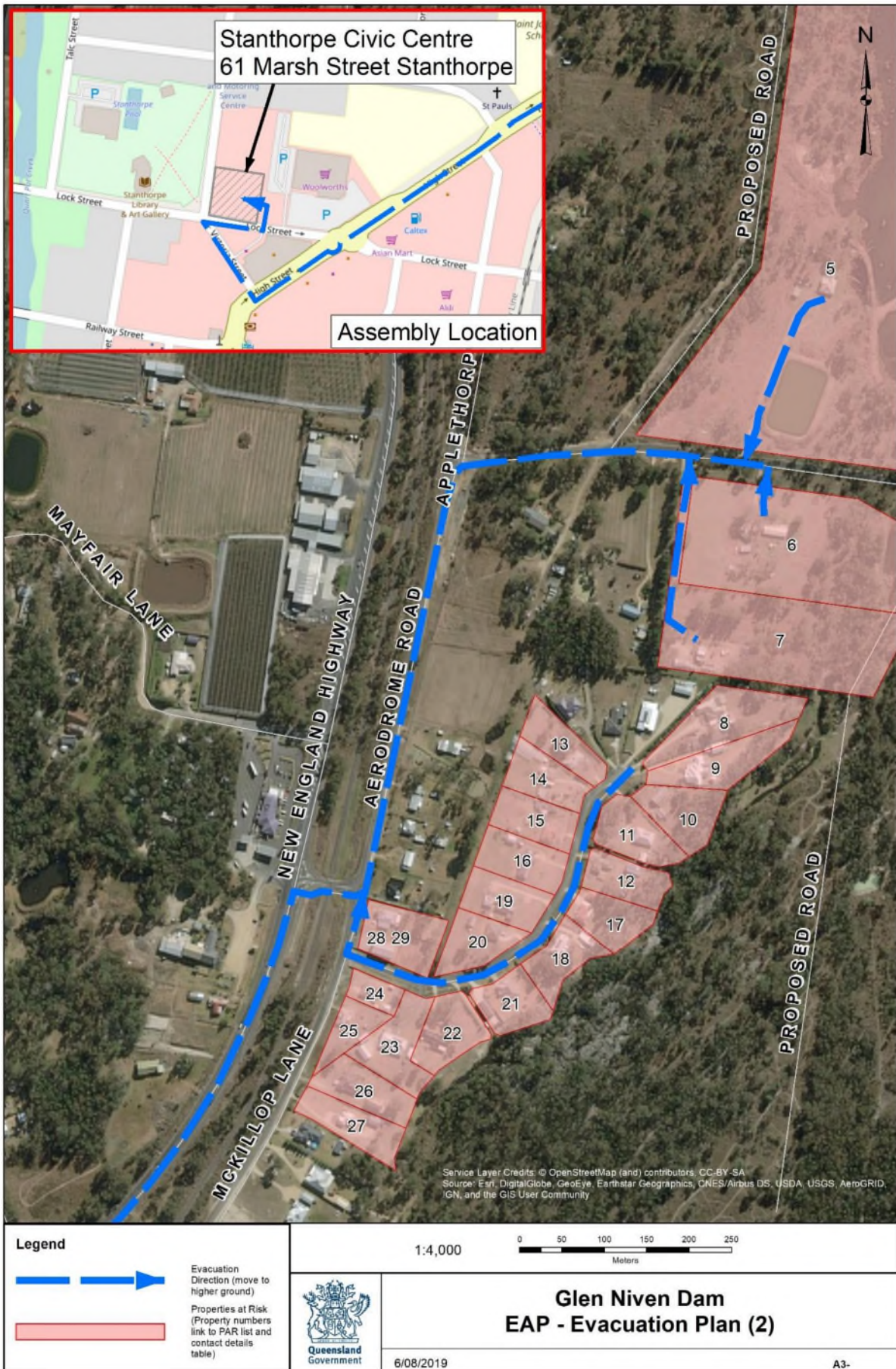
EAP Triggers, Critical Reservoir Water Levels and Impacted Features/Actions

Alert Status	Reservoir Water Level (m)	Dam Downstream Release (M3/s) (Approximate)	AEP Approx. (1 in x years) (Approximate)	Impacted Features/ actions
FSL	879.41	0	-	
Routine Spillway Flows	879.46 to 879.90	0 – 20	Frequent	May impact Border Road and Aerodrome Road
Alert	879.90 to 880.25	20 - 45	Frequent	May impact downstream property. RDSWU notified
Lean Forward	880.25 to 880.50	45 - 65	40	May impact downstream property PAR notified
Stand Up 1	880.50 – 881.60	65 - 235	100	PAR Evacuations
Stand Up 2	881.60 – 881.80	235 - 280	30,000	PAR Evacuations
Dam Crest EL	881.80	280	50,000	Overtopping imminent
PMP Design Flood	Above 881.80	>280	10,000,000	Embankment likely to have failed
Stand Down	Below 879.90	65	100	May impact downstream property

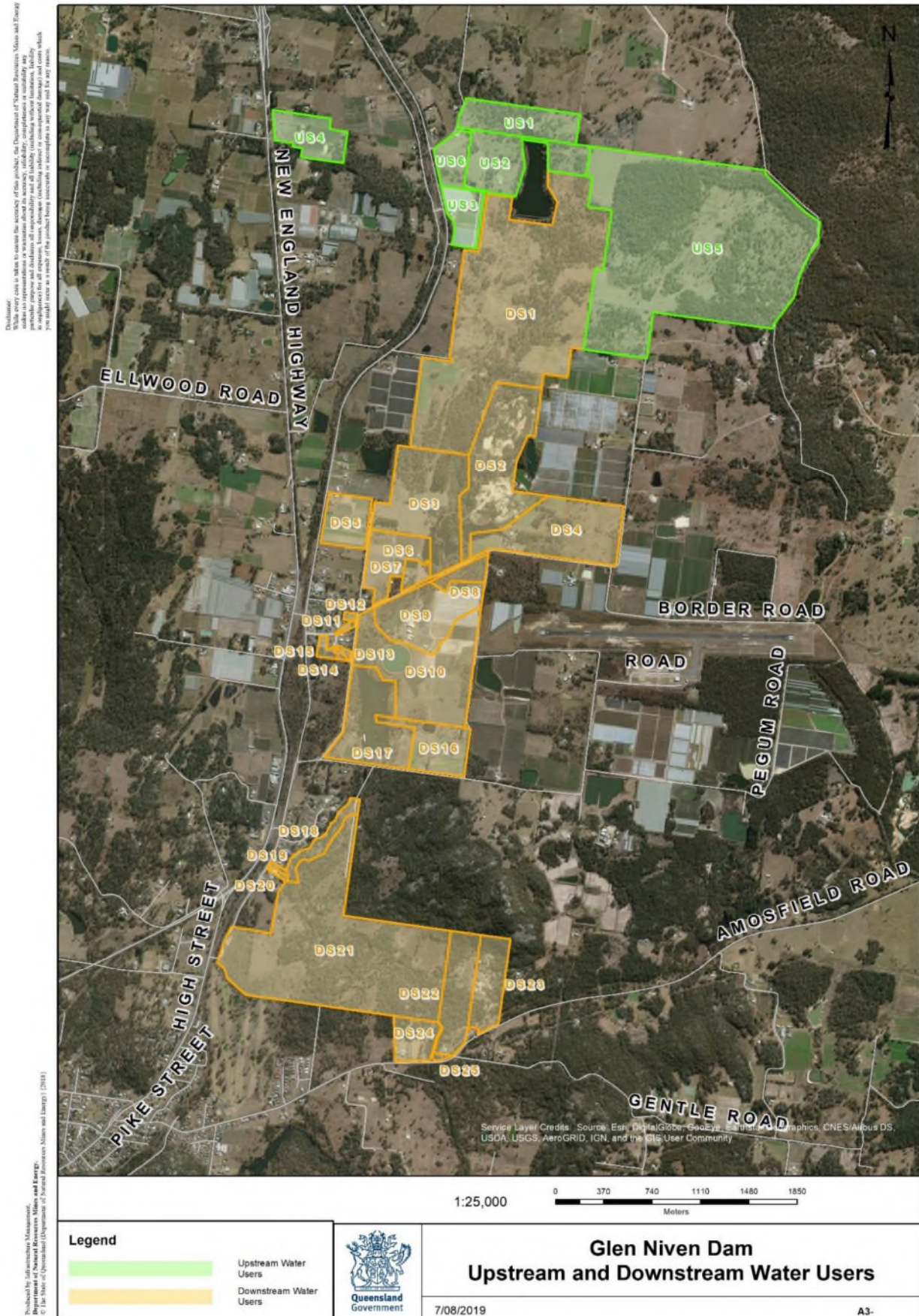
Appendix 11 – PAR Evacuation Plans



This document is a summary of the necessary information for the Department of Natural Resources and Mines and Energy. It is not intended to be used as a substitute for professional advice. The Department of Natural Resources and Mines and Energy makes no representation or warranty about its accuracy, reliability, completeness or timeliness. The user of this document is responsible for ensuring that all necessary information is obtained and that the user is aware of the limitations of the information provided. The Department of Natural Resources and Mines and Energy is not liable for any loss or damage, including consequential loss or damage, arising from the use of this document.



Appendix 12 – Riparian and Downstream Water Users (RDSWU) Locality Map



Appendix 13 – Burst SMS Sending messages

Purpose

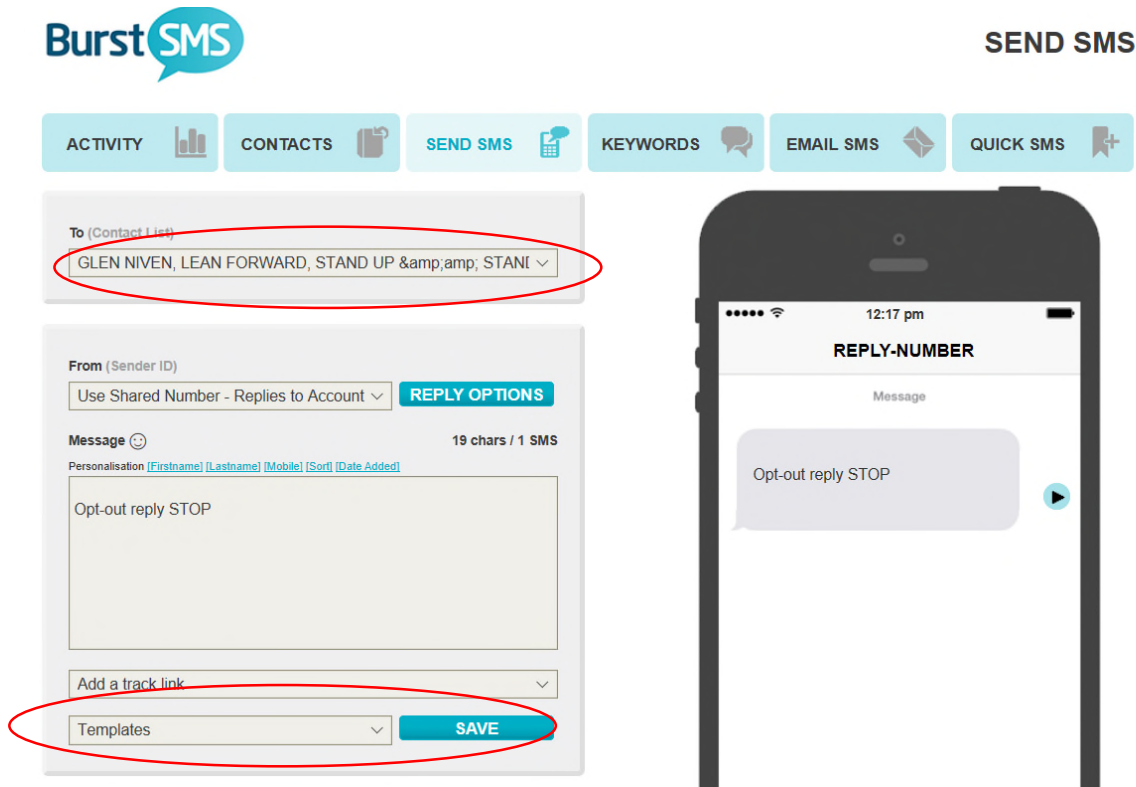
This document outlines the standard operating procedure required in order to send emergency messages using Burst SMS. The purpose of the messages is to send notification and warning texts messages to preloaded recipient groups.

Process

- 1) Log into Burst SMS, <https://kudosity.transmitsms.com/u/messaging>
 The Login button is in the top right hand side of home page
 In the login page enter your email address and password, then press login.
- 2) To send an SMS
 Select SEND SMS tab



Ensure the To **Contact List** is correct for the target Dam, in this case **Glen Niven** and the **Activation Status**



Left Click the Templates tab to display available preloaded messages (shown above). Select the appropriate message by left clicking from the field depending on the correct Event and Status, ensuring the prefix of the template starts with Glen Niven (shown below).

- Glen Niven Flooding LEAN FOWARD @ 879.75m
- Glen Niven Flooding Pre-Notification (Advice)
- Glen Niven Flooding STAND DOWN @ 879.75m
- Glen Niven Flooding STAND UP @ 880.0m
- Glen Niven Sunny Day ALERT
- Glen Niven Sunny Day ALERT CANCELLATION
- Glen Niven Sunny Day EVACUATE
- Glen Niven Sunny Day EVACUATION CANCELLATION
- Glen Niven System Test

Carefully review the content of the draft message in the simulated phone image on the right hand side.
Some messages have various options that require final editing
Ensure to edit UPDATE field, **time** for the next update and editing for **am/pm**

To (Contact List)
Glen Niven PAR (29)

From (Sender ID)
Use Shared Number - Replies to Account **REPLY OPTIONS**

Message 384 chars / 3 SMS
Personalisation [Firstname] [Lastname]
DEWS Emergency NOTIFICATION
DAM: Glen Niven
EVENT: Flooding
STATUS: LEAN FOWARD, Heavy rainfall has raised Dam level to 879.75m, and raising/steady, the critical level is 880.00m.
ACTION: PREPARE for evacuation now, refer to Glen Niven Evacuation Plan, await further notifications or self evacuate early at signs of increased flooding.
UPDATE: Next update due by ** am/pm.

Add a track link

Glen Niven Flooding LEAN FOWARD @ **DELETE**

Schedule
No send immediately on confirmation

Split Sending
No

Pending Message Expiry
Yes If message undeliverable stop trying after 4 hours

Total \$7.743 [Show Details](#) **SAVE DRAFT** **NEXT**

REPLY-NUMBER

Message

DEWS Emergency NOTIFICATION
DAM: Glen Niven
EVENT: Flooding
STATUS: LEAN FOWARD, Heavy rainfall has raised Dam level to 879.75m, and raising/steady, the critical level is 880.00m.
ACTION: PREPARE for evacuation now, refer to Glen Niven Evacuation Plan, await further notifications or self evacuate early at signs of increased flooding.
UPDATE: Next update due by ** am/pm.

AU+61 **TEST**

Click on the NEXT button on the bottom of the screen (shown above)
The next page is the final check and send. **The message content of any BurstSMS campaign must be checked by the EEM prior to sending.** Check the **To Target Group** and **simulated message**, if all correct press **SEND**.



- ACTIVITY
- CONTACTS
- SEND SMS
- KEYWORDS
- EMAIL SMS
- QUICK SMS

Confirm Send

To: **Glen Niven PAR**

From: **Shared Number**

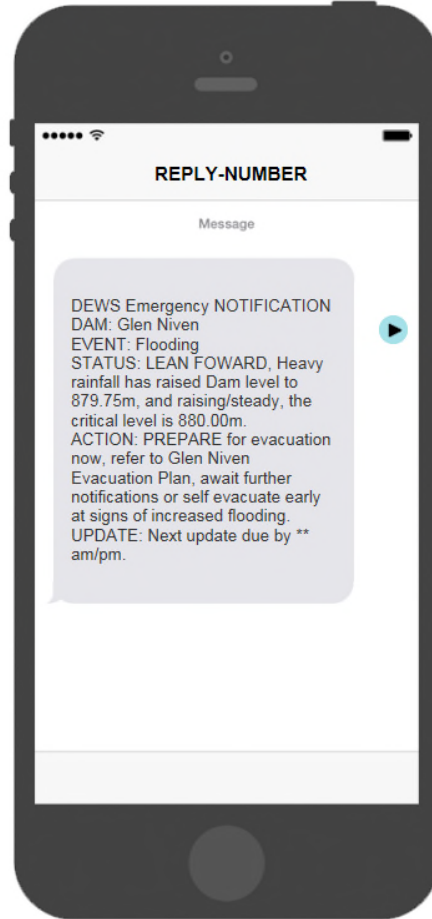
Scheduled: **immediately**

Total **\$7.743**

[Show Details](#)

Pre-Pay Balance \$18.44

SAVE DRAFT
SEND



Sent Message Reporting



MESSAGING ACTIVITY

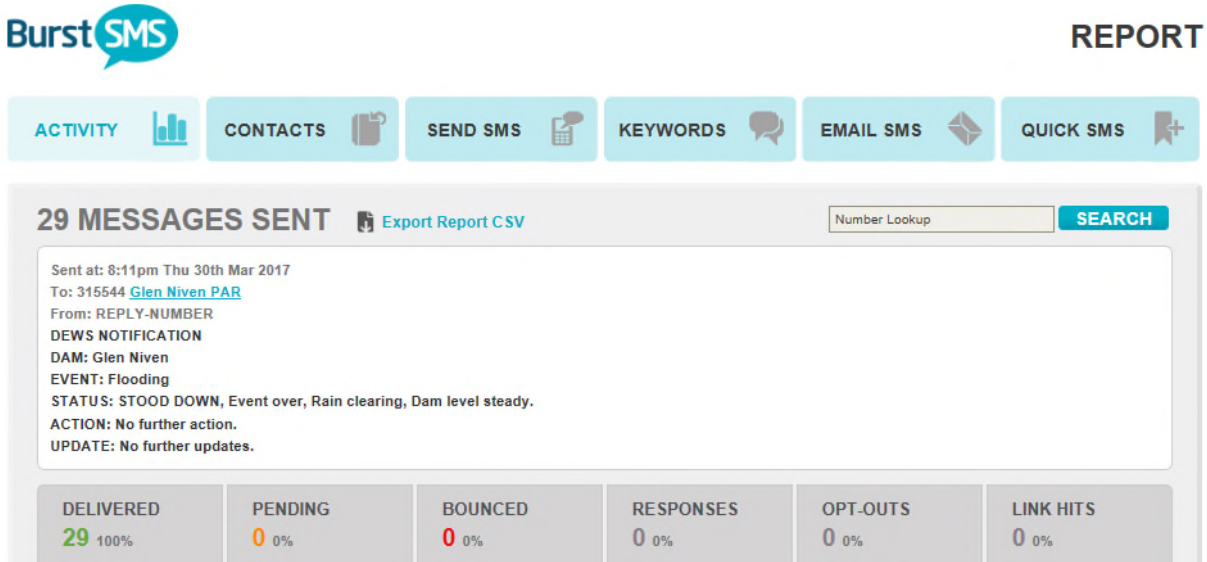
- ACTIVITY
- CONTACTS
- SEND SMS
- KEYWORDS
- EMAIL SMS
- QUICK SMS

Last 30 Days
All Types
Outbox
 Export
Number Lookup
SEARCH

Date / Time	From	To	Message Text	Type	Status	Resp.	Actions
13/04/2017 2:40pm	Shared Number	Glen Niven PAR	DEWS Emergency NOTIFICATI...	Campaign	Draft	0	Edit Delete
30/03/2017 8:11pm	Shared Number	Glen Niven PAR	DEWS NOTIFICATION	Campaign	29 Sent	0	Resend Report
30/03/2017 6:20pm	Shared Number	Glen Niven PAR	DEWS Emergency NOTIFICATI...	Campaign	29 Sent	0	Resend Report
30/03/2017 4:47pm	Shared Number	Glen Niven PAR	DEWS ADVICE DAM: G...	Campaign	29 Sent	0	Resend Report
30/03/2017 4:37pm	Shared Number	Glen Niven PAR	DEWS Emergency NOTIFICATI...	Campaign	Draft	0	Edit Delete
29/03/2017 3:24pm	Shared Number	My Test List	DEWS ADVICE DAM: G...	Campaign	Draft	0	Edit Delete
29/03/2017 3:22pm	Shared Number	[REDACTED]	DEWS ADVICE DAM: GI...	Test SMS	1 Sent	0	Report

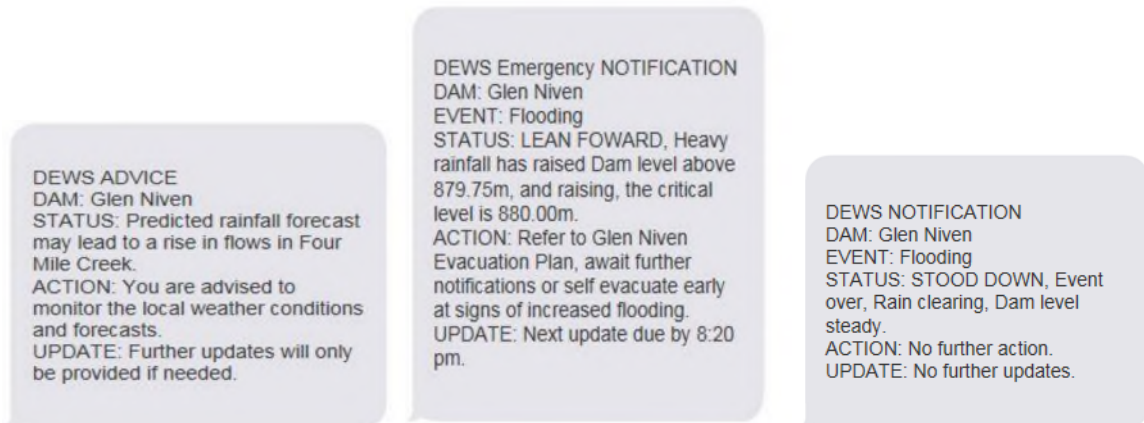
Displaying 1 to 7 of 7 - show items per page

In the main menu select **Activity** Tab
 Check the details on the required message, **time & date & target group**
 Check status to confirm the status of all the sent messages
 Check for any responses, if more than 0, left click to see who replied and the response.
 Left Click on the **Report**

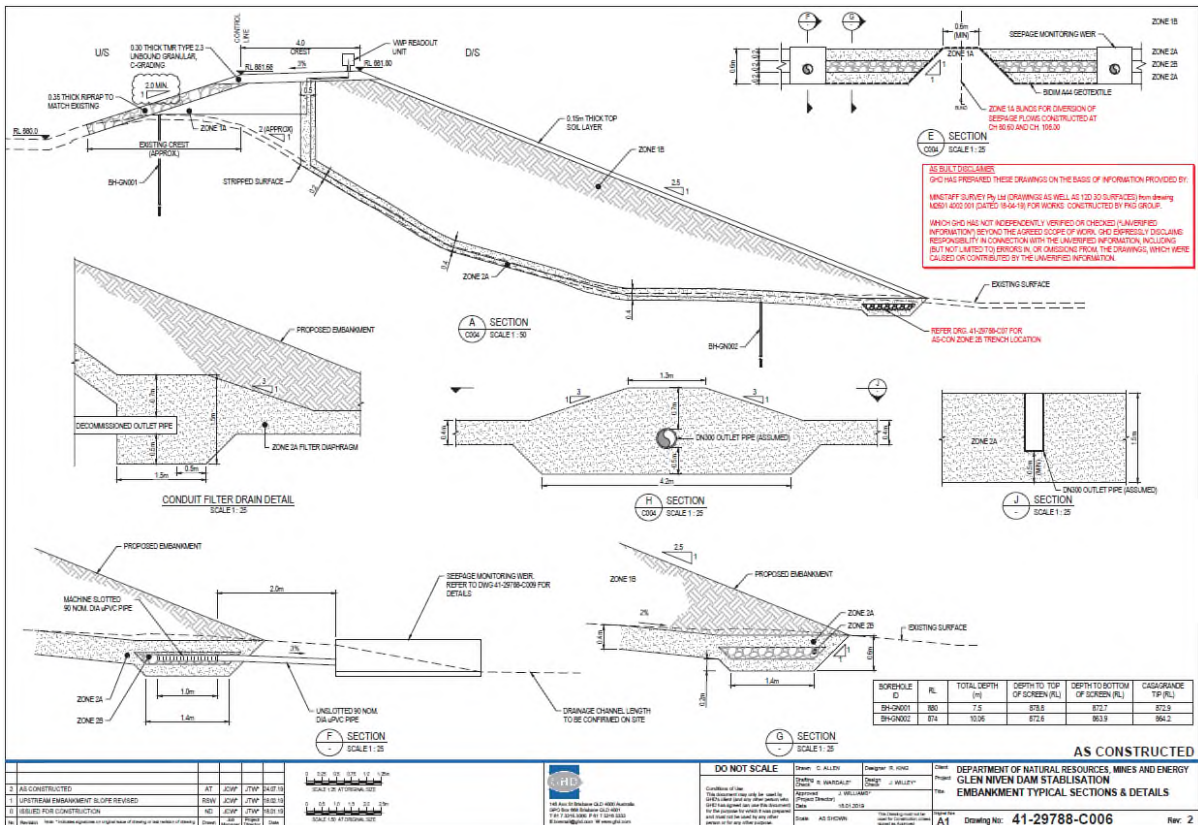
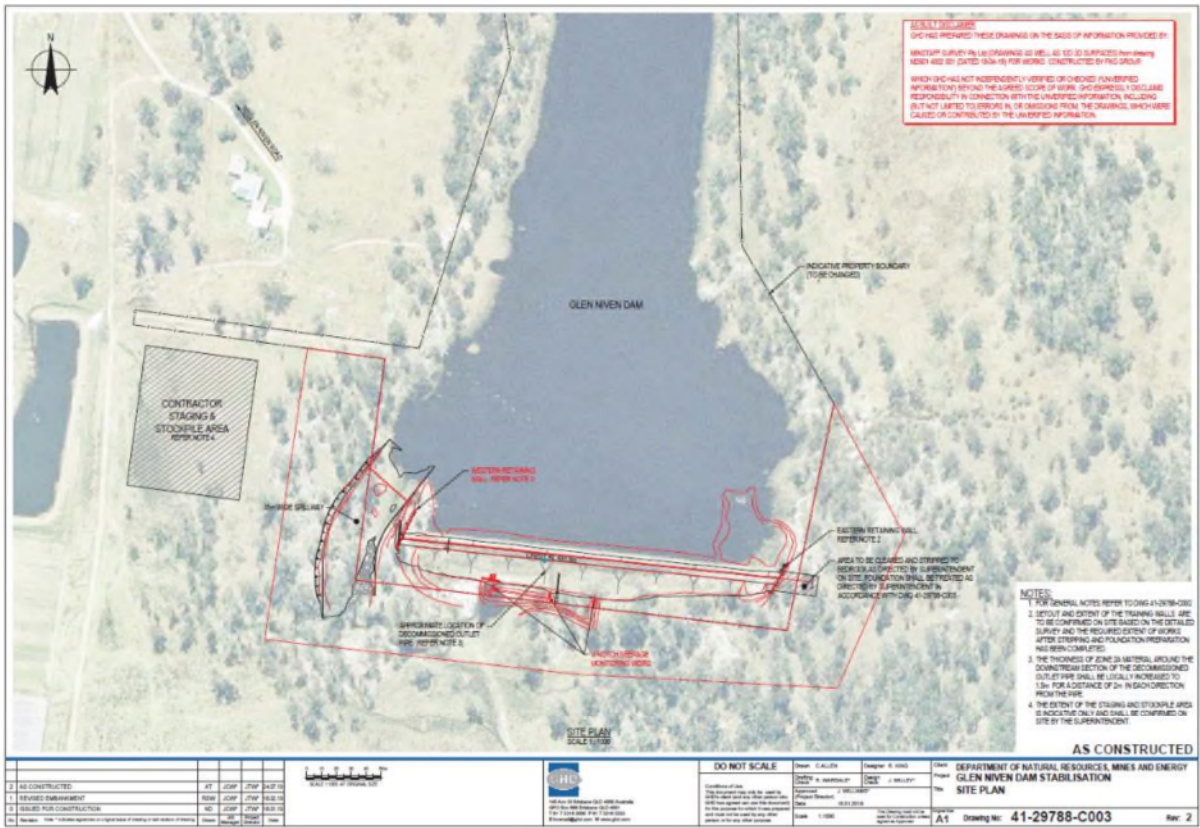


Delivered means the message has been delivered to the recipient’s handset
Pending The message has been delivered to the carrier and they are attempting to deliver it to the handset, no form of delivery receipt has been received. This could mean the phone is off or out of range. If unsuccessful for 72 hours it will be marked as soft bounced.
Soft Bounced The message has timed out after 72 hours, either the phone was turned off or out of range or the message was unable to be delivered due to a network outage or other connectivity issue.
Hard bounced the message failed due to the number being invalid or disconnected

Examples of previous messages sent



Appendix 14 – Glen Niven Dam Drawings



Appendix 15 – Training

EAP Training exercises shall be organised by the EEM. These shall include TS officers and where possible DIO Officers and the appropriate Disaster Management Group personnel.

A record is to be kept in the table below.

Officer	EAP Role	Dam Safety Training	EAP Scenario Training
[Redacted]	EEC	September 2022	TBC
[Redacted]	Backup EEC	September 2023	November 2024
[Redacted]	EEM	September 2023	November 2024
[Redacted]	EEM	September 2023	November 2024
[Redacted]	DM	Nil	November 2024

Appendix 16 – Emergency Event Coordination

Table 1 Acronyms

EEC	Emergency Event Coordinator
DM	Director, Asset Management
EEM	Emergency Event Manager, Technical Services

Procedure

The RSAS Alert System will send an automatic SMS Alert message instantaneously to the entire nominated TS, RSAS EAP On-Call Contact Distribution List as per the below table, detailing the dam name, date, time, activation status, and latest relevant instrumentation readings.

The nominated EEC for the particular dam should respond ASAP but has 5 minutes to respond via SMS text to the entire EAP On-call Group via the existing established NCA Iphone Circulation Message Group Text indicating to the EEM and rest of the group they have acknowledged the alert and are responding. Example, 'I've got this event'. All other officers are to stand by.

If the nominated EEC does not respond after the 5 minutes the EEM or DM will respond via SMS text to the entire EAP On-call Group via the existing established NCA Iphone Circulation Message Group Text that they have acknowledged the alert and will appoint an alternative EEC officer.

If neither the EEM nor DM respond soon after the 5 minutes any other nominated EEC officer can respond via SMS text that they will assume the EEC role and contact the EEM or DM directly by phone, after which other officers are to stand by.

The EAP EEC On-Call Contact Distribution List, is to be updated when officers go on leave, and distributed to the EEC's, EEM and DM.

Table 2 On-Call Contact List

Role	Name	Dam	Mobile Number
EEC	[REDACTED]	Crooks Dam	[REDACTED]
	[REDACTED]	Copperfield River Gorge Dam	[REDACTED]
	[REDACTED]	Corella Dam	[REDACTED]
	[REDACTED]	Glen Niven Dam	[REDACTED]
EEM	[REDACTED]	All	[REDACTED]
	[REDACTED]	All	[REDACTED]
DM	[REDACTED]	All	[REDACTED]
Backup EEC	[REDACTED]	As required	[REDACTED]
	[REDACTED]	As required	[REDACTED]

Appendix 17 – Glen Niven Dam Flood Emergency Alert Request

SDCC Emergency Alert Request Guidelines

An Emergency Alert Request form should be completed, if required (see Table 5 to Table 50 for actions) and sent to the SDCC Watch Desk in order to activate the Glen Niven Dam Emergency Polygon.

Instructions

This form is not to be used for Flood UNLESS a flood has triggered a dam failure hazard (STAND UP 2).

Open copy of the following SDCC Emergency Alert Request template.

Telephone the [REDACTED] and tell them your intention to use the Emergency Alert for a dam failure hazard for Glen Niven Dam. A KML Polygon for this dam is stored in the Disaster Management Portal in the Emergency Alert area. Ask the SDCC operative to locate the polygon. It will be a KML file called [REDACTED]

Give them your phone number, confirm their name, and end the call after advising the form will be sent shortly.

EEC, EEM & DM will use pre-populated message below or work together to craft a message relevant to the hazard and discuss with the LDMG, if there is time.

Fill in the form and send to [REDACTED] This form must come from the EEC, EEM or DM.

Phone back to check the message has been sent and ask for an email to confirm.

Use the following text to complete the emergency alert request:

Emergency Alert – Polygon text

FILE NAME

dportal/EA Library/Referable Dams/Glen Niven/ Glen Niven Dam_Polygon


VOICE MESSAGE (message should be less than 450 characters) 430

Emergency Emergency! This is an important message from Department of Natural Resources. Heavy rain has led to rapid rises in Glen Niven Dam. Population at risk must leave immediately and move to higher ground away from Four Mile Creek. Do not enter floodwaters. For further information please listen to local radio or visit www.disaster.qld.gov.au/warnings. If your life is in danger, contact Triple Zero.

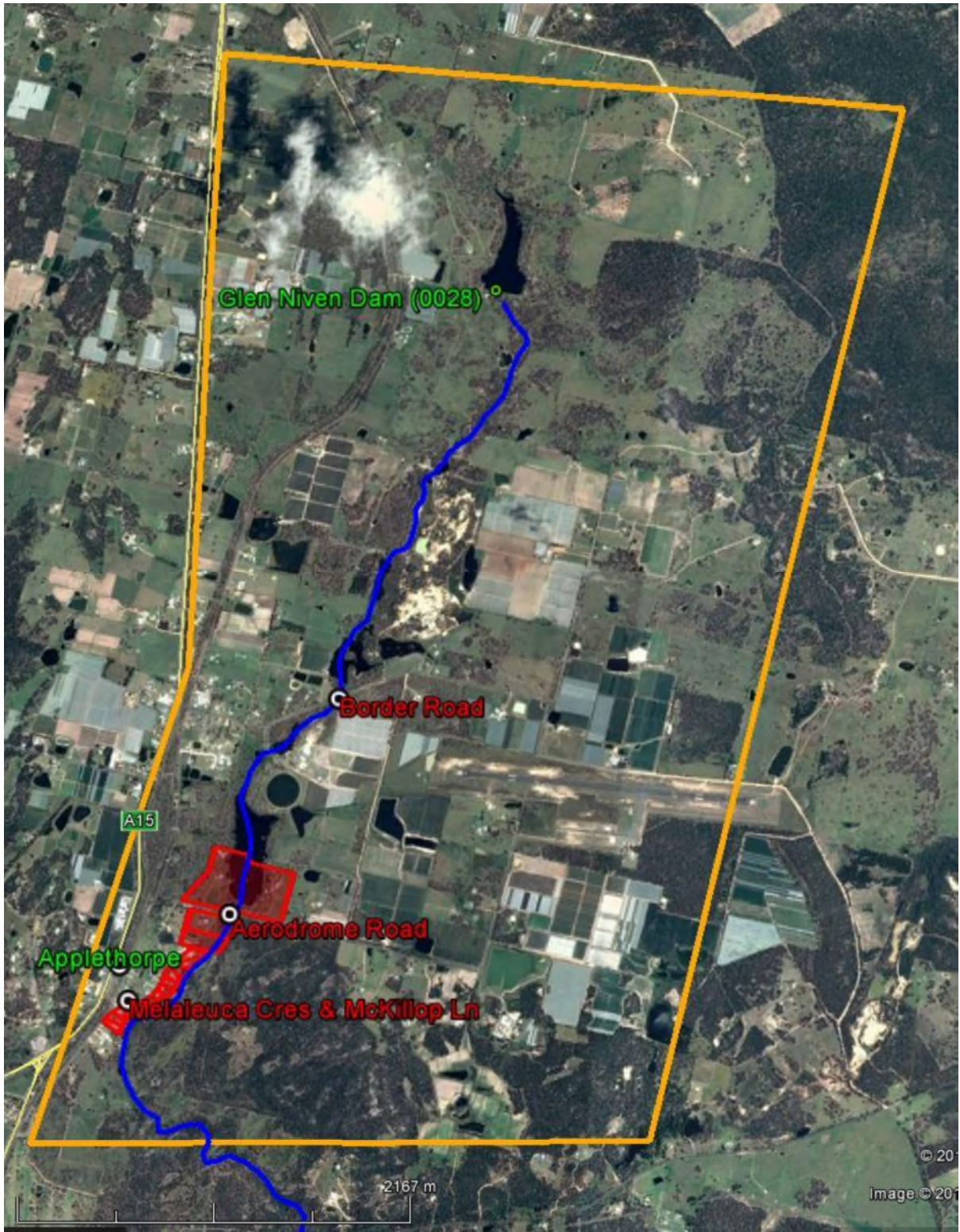
SMS MESSAGE (maximum of 160 characters including spaces) 146

EMERGENCY EMERGENCY! Department of Natural Resources advises rapid rises in Glen Niven Dam. LEAVE IMMEDIATELY and move to higher ground away from Four Mile Creek. For further information please listen to local radio or visit www.disaster.qld.gov.au/warnings. If your life is in danger, contact 000.

Emergency Alert Request Form

 <p>Queensland Government</p>	PHONE THE [REDACTED] – ADVISE EA IS BEING DEVELOPED	
	<h2 style="margin: 0;">EMERGENCY ALERT REQUEST</h2>	
	Location of Alert: Glen Niven Dam (Applethorpe) (e.g. Suburb, Town)	Date: TBC
LGA/Agency requesting: Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development (DNRMMRRD)		Time: TBC
Requesting Officer (e.g. Disaster Coordinator/Incident Controller) Name: [REDACTED] Agency/Position: Principal Engineer, DNRMMRRD		Telephone: [REDACTED] (SDCC Watch Desk may telephone you)
Email: [REDACTED]		
Advised LDC/LDMG: <input checked="" type="checkbox"/> YES	DDC/DDMG: <input checked="" type="checkbox"/> YES	Neighbouring LDMG/LGA: <input type="checkbox"/> YES <input checked="" type="checkbox"/> N/A
Send Alert	Immediately: <input checked="" type="checkbox"/> YES	Scheduled: <input type="checkbox"/> YES Date & Time / / : hrs
Event Type	<input type="checkbox"/> cyclone <input type="checkbox"/> Storm Tide <input checked="" type="checkbox"/> Flash Flood <input type="checkbox"/> Flood <input type="checkbox"/> Bushfire <input type="checkbox"/> Fire Incident <input type="checkbox"/> Smoke / Toxic Plume <input type="checkbox"/> Chemical Spill <input type="checkbox"/> Tsunami (Sent as Location Based Text Message ONLY) <input checked="" type="checkbox"/> Other (please specify): Glen Niven Dam Flood	
Distributed by: (Channel)	<input checked="" type="checkbox"/> Voice (Landline only) <input checked="" type="checkbox"/> SMS – Location Based (Location of phone at time of distribution) <input type="checkbox"/> SMS – Service Address Based (Registered billing address)	
Message Severity	<input checked="" type="checkbox"/> Emergency Warning (Activates SEWS) <input type="checkbox"/> Watch & Act <input type="checkbox"/> Advice	
Threat Direction Required? (e.g. Fire, Chemical Spill, Dam Spill)	<input type="checkbox"/> YES <input checked="" type="checkbox"/> N/A	Threat location indicated on map? Only For Emergency Warning Voice & Service Address SMS
EA Messaging Filename (Doc, Pdf): [REDACTED]	Polyvoon Filename. (Kml, Kmz, Gml, GeoJSON): [REDACTED] Number of polygons (if multiple, attach list in order of priority)	
Supplied via: <input type="checkbox"/> DM Portal <input checked="" type="checkbox"/> Email <input type="checkbox"/> Verbal <input type="checkbox"/> Other Other (please specify):	Supplied via: <input checked="" type="checkbox"/> DM Portal <input type="checkbox"/> Email <input type="checkbox"/> Verbal <input type="checkbox"/> Other Other (please specify):	
Voice: Type or handwrite, max 4000 characters incl spaces. (Ideally message should be < 450 characters)		
Emergency Emergency! This is an important message from Department of Natural Resources. Heavy rain has led to rapid rises in Glen Niven Dam. Population at risk must leave immediately and move to higher ground away from Four Mile Creek. Do not enter floodwaters. For further information please listen to local radio or visit www dot disaster dot qld dot gov dot au forward-slash warnings. If your life is in danger, contact Triple Zero.		
SMS: Type or handwrite, use capitals for clarity, max 612 characters incl spaces. (Ideally should be < 160 characters incl. spaces)		
EMERGENCY EMERGENCY! Department of Natural Resources advises rapid rises in Glen Niven Dam. LEAVE IMMEDIATELY and move to higher ground away from Four Mile Creek. For further information please listen to local radio or visit www.disaster.qld.gov.au/warnings . If your life is in danger, contact 000.		
Remove EA from websites:	<input type="checkbox"/> 12 hrs <input type="checkbox"/> 24 hrs <input type="checkbox"/> 48 hrs <input type="checkbox"/> Specify Date & Time: <input checked="" type="checkbox"/> Check back in 12 hrs: <input type="checkbox"/> Replace previous EA message / / : hrs Contact # [REDACTED]	
Requesting Officer: [REDACTED]	Signature: [REDACTED]	Date: / /
Send to [REDACTED]		to confirm receipt
FOR USE BY SDCC		
EA Request Form completed by: SDCC Watch Desk <input type="checkbox"/> Requesting Officer <input type="checkbox"/>		
Notification of any delays provided to Requestor: <input type="checkbox"/> YES <input type="checkbox"/> NO		
EA User Name:		Emergency Alert No:
Signature:	Date: / /	EMS EA Campaign Report ID:
Authorising Officer Name:	Date: / /	
Report provided to Requestor on EA outcomes: <input type="checkbox"/> YES <input type="checkbox"/> NO		
The EA Manual, EA Quick Reference Guide, EA Request Form Template are available at: www.disaster.qld.gov.au		

Glen Niven Dam Emergency Alert Polygon



Appendix 18 – SOP 14 – Normal Spillway Discharge

Department of Natural Resources and Mines,
Manufacturing and Regional and Rural Development

Glen Niven Dam

Standing Operating Procedures

For

Small to Medium Spillway Overflows

SOP – 14

Table of Contents

1 Purpose 127

2 Scope 127

3 Personnel Affected and Responsibilities 127

4 Procedures 127

5 References 128

Appendix A – Inspecting for Deficiencies: Summary 129

Purpose

This Procedure exists to manage small spillway overflow events that occur at Glen Niven Dam.

This Procedure applies when the dam water level is at or above EL 879.46 mAHD, and is below EL 879.90 mAHD.

Glen Niven Dam is operated and maintained by the Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development (DNRMMRRD) acting as the dam owner on behalf of the Queensland Government. Through an inspection contract with DNRMMRRD, SDRC is responsible for operation and maintenance activities at the dam, including the undertaking of weekly surveillance inspections and approved minor repairs.

Part of the dam safety management program is to inspect the dam immediately before the spillway starts to overflow.

Scope

This procedure applies to spillway overflow events that are greater than 0.05m over the spillway (EL 879.46m) but less than the Alert level trigger for flooding of the EAP (EL 879.90m). The personnel with responsibilities under this SOP are the Dam Inspection Officers (DIO) and Emergency Event Coordinator (EEC) as well as backup personnel for these positions listed in the EAP for Glen Niven Dam.

This SOP is intended to complement the EAP for Glen Niven Dam. The EAP is the primary document for managing a flood event and should always take precedence over any instructions contained within this SOP if a discrepancy is identified.

Personnel Affected and Responsibilities

Director, Asset Management (DM), DNRMMRRD	Authorises/Approves this procedure The person responsible for internal approval of the Emergency Action Plan
Local Disaster Coordinator (LDC), Southern Downs Local Disaster Management Group	The person responsible for management of disaster operations on behalf of the Local Disaster Management Group
Emergency Event Manager, Technical Services (EEM), DNRMMRRD	Manages the distribution, approval and revision control relating to this procedure. The person responsible for the persons undertaking the role of the DIOs and EECs and, for managing, receiving, sorting and checking data for the Glen Niven Dam, reviewing and authorising documentation on the dam produced by SDRC and the DE and initiating investigations into abnormal behaviour of the dam.
Emergency Event Coordinator (EEC), DNRMMRRD	The person responsible for monitoring the status of the dam and forecast conditions and informing the EEM.
Dam Inspection Officer (DIO), SDRC	The officer responsible for conducting the routine weekly inspections of Glen Niven Dam

Dam Inspection Engineer (DE), DNRMMRRD or Dams Consultant A Registered Professional Engineer Queensland (RPEQ), responsible for carrying out engineering inspections at the dam.

Procedures

The EEC is responsible for monitoring dam water levels, seepage flow, rainfall conditions and weather forecasts to assess the overall status of the dam, predict dam water level trends, and provide notifications as required by this Procedure. Dam information recorded by the Remote Sensing and Alert System (RSAS) is accessed via the Eagle.io platform at: https://app.eagle.io/ui/pros14/Department_of_Resources/?m=show

Escalation

When the dam water level reaches, or is predicted to reach, the SOP14 trigger level (EL 879.46 mAHD) the EEC is to notify the EEM by phone.

Following discussion with the EEM, the EEC is to notify the LDC by phone that a spillway discharge is likely and that the SOP14 trigger level has been reached. Advise SDRC to monitor Border and Aerodrome Roads downstream of the dam for flooding. Road Closed information should be displayed on the Southern Downs Regional Council (SDRC) website.

The EEC is to then notify the DIO and Riparian Downstream Water Users (RDSWU) by BurstSMS (adopting the below template) that minor spillway flows have commenced:

DEPARTMENT OF NATURAL RESOURCES ADVICE

DAM: Glen Niven Dam

EVENT: Spillway Discharge

STATUS: Minor flows from the dam are now occurring which may raise flows in Four Mile Creek. The water level in the dam is currently rising slowly.

WHAT YOU SHOULD DO: No action required. Avoid fast flowing or deep water near waterways and floodplains.

UPDATE: Further updates will only be provided as required

Following consultation between the EEM and ECC, DNRMMRRD may elect to modify the timing of SOP14 notifications if it can be established that the activation trigger level (EL 879.46 mAHD) is likely to be reached late at night or very early in the morning. This proactive approach allows a 'considered response strategy' for DNRMMRRD to be put in place and for messaging to be sent out during normal community waking hours.

When the dam water level reaches, or is predicted to reach, the EAP Alert trigger level (EL 879.90 mAHD) the EEC is to notify the EEM by phone and refer to Section 6.1 of the EAP

De-Escalation

Following a period of SOP14 activation, when the dam water level falls below the SOP14 trigger level (EL 879.46 mAHD) and the predicted trend is falling, the EEC is to notify the EEM by phone.

Once spillway flows are below the SOP14 trigger level the EEC advises the Local Disaster Coordinator, Southern Downs Local Disaster Management Group (LDMG) that spillway flows have reduced below SOP14 trigger levels. The EEC will then stand down.

The EEC is to then notify the DIO and Riparian Downstream Water Users (RDSWU) by BurstSMS (adopting the below template) that spillway flows have ceased:

DEPARTMENT OF NATURAL RESOURCES ADVICE

DAM: Glen Niven Dam

EVENT: Spillway Discharge

STATUS: Stand down – event over. Spillway flows from the dam have ceased.

WHAT YOU SHOULD DO: No action required. Avoid fast flowing or deep water near waterways and floodplains.

UPDATE: No further updates will be provided.

Following consultation between the EEM and ECC, DNRMMRRD may elect to modify the timing of stand down notifications if it can be established that the SOP14 activation trigger level (EL 879.46 mAHD) is likely to be exceeded again within the next 7 days. This Procedure would apply until stand down notifications are issued. The intent of this cautious approach is to minimise the number of notifications issued and mitigate the risk of 'alarm fatigue' developing within the community.

If RSAS is not Working/Unreliable

The EEC is to notify the EEM, the LDC and the DIO that the RSAS is not working/unreliable.

The EEC is to rely on intel from the local residents and BOM, such as the amount of rain that is falling/has fallen in the past 24 hours. Local residents are not to be requested to go to the dam site to obtain information on the state of the dam.

DIO or DE Special Inspections

The EEC is to notify the EEM and consider the need for a special inspection by either the DIO or DE. The EEC outlines the scope requirements and frequency for the special inspection.

A DIO special inspection may be considered when general observations of the dam, ancillary structures, or manual instrument reads are required. The EEC requests the special inspection through the DIS. The DIS is to assess the risk and coordinates the inspection if safe to do so.

A DE special inspection may be considered when specialist dams engineering advice is required to ascertain the condition of an observed feature or deficiency in the dam, or to identify appropriate remedial or risk mitigation measures. The EEC is to assess site/access risks and consider the mobilisation time required for the DE special inspection to occur. The EEC requests the special inspection through the DE following consultation with the EEM.

For any special inspection, dam instrumentation readings, including storage height gauge, rain gauge and V notch weirs, are to be recorded with time while on-site. Photographs are to be taken to accompany any observations.

The DIO/DE is required to provide the EEC a telephone call and brief report before leaving the dam. A written inspection report is required to be provided to the EEC (within an agreed timeframe relative to the severity of the concern).

References

Queensland Dam Safety Management Guidelines; and
Emergency Action Plan, Glen Niven Dam.

Appendix A

Inspecting for Deficiencies: Summary

Type of Deficiency	Look For
Seepage	<p>A water flow or sand boil on the lower portion of the downstream slope or toe area, especially at the groins.</p> <p>Leakage around conveyance structure such as outlet works.</p> <p>Wet Area or areas where the vegetation appears greener or lusher on the embankment slope or toe are.</p> <p>Blocked toe drains.</p> <p>An increase in the amount of water being released from the toe drains. (Remember to take into account changes in the reservoir level.)</p> <p>Turbidity or cloudiness of the seepage.</p>
Cracking	<p>Desiccation Cracking; A random honeycomb pattern of crack usually found on the crest and the downstream slope.</p> <p>Transverse Cracking; crack that are perpendicular to the length of the dam usually found on the crest.</p> <p>Longitudinal Cracking: Cracks that are parallel to the length of the dam. Longitudinal crack maybe associated with stability problems in the slopes.</p>
Instability	<p>Slides on the upstream or downslopes.</p> <p>Bulging, especially at the toe of the dam.</p>
Depressions	<p>Misalignment in the crest and embankment slopes found by sighting along fixed points.</p> <p>Sinkholes found by checking and probing each depressions</p> <p>Remember, sinkholes have steep, bucket like sides while minor depressions have gently sloping, bowl like sides.</p>
Maintenance Concerns	<p>Inadequate Slope Protection: Check for bald areas or areas where the protection is sparse or damaged.</p> <p>Surface Runoff Erosion: Check for gullies or other signs of erosion. Make sure to check the low points along the upstream and downstream shoulder and groin since surface runoff can collect in these areas.</p> <p>Inappropriate Vegetative Growth: Check for excessive and deep rooted vegetative growth.</p> <p>Debris: check for debris on and around the dam, especially near the outlet work or spillway inlets.</p> <p>Animal Burrows: Check for damage caused by burrowing animals.</p>

Note: This tabulation is taken from the Dam Safety Surveillance Field Manual – August 2005.

When to get further assistance

Several of the deficiencies covered above are very serious. If you observe any of the following deficiencies, you should consult with the EEM:

Sand boils or turbid seepage;

Seepage that has increased since the last inspection (taking the reservoir level into consideration);

Cracking that extends below the reservoir level or potential reservoir level;

Transverse and longitudinal cracking;

Deep seated slides or bulging associated with slides;

Sinkhole or other large depressions;

Deep rooted vegetation that might need to be removed.

If you are unsure whether or not a condition poses a threat to the safety of the dam, you should discuss your findings with the EEM.