CROOKS and WYNDHAM DAMs Emergency Action Plan

Technical Services

Revision 22, November 2022

Prepared by:
Technical Services
Department of Resources
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PREPARATION AND AUTHORISATION

Queensland Government

Approved by the delegate of the Chief Executive, Department of Regional Development, Manufacturing and Water until

Emergency Event - Activation Quick Guide

The Emergency Action Plan (EAP) for Crooks and Wyndham Dams 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 Status	Normal Spillway Discharges SOP 14	Alert	Lean Forward	Stand Up	Stand Down
Decision Authority	EEC	EEC	COM & DM	COM & DM	COM & DM
Activation triggers for emergency conditions relating to uncontrolled dam release hazards (Flooding)					
Flooding (Section 6.1)	Crooks Dam Reservoir water level above EL 691.3m (FSL) and below EL 692.0m, SOP14 Brownville Road may be flooded.	Crooks Dam Reservoir water level above EL 692.0m and below EL 693.00m, notification of potential downstream hazards to persons and/or property.	Crooks Dam Reservoir water level above EL 693.00m and below EL 695.0m, additional potential downstream hazards to persons and/or property.	Crooks Dam Reservoir water level above EL 695.0m (0.3m below fuse plug, 1.3m below the crest) and additional potential downstream hazards to persons and/or property.	Crooks Dam Reservoir water level below EL 692.0m and falling and no more risk of damage from downstream hazards to persons or property.
Chemical/Toxic Spill (Section 6.3)	Not applicable	Reports of contamination or potential contamination in either reservoir and/or catchment area and potential hazards to RDSWU, persons and/or property	Not applicable	Confirmation of or high probability of significant contamination in either reservoir or catchment area and potential hazards to RDSWU persons and/or property	• Risk assessment indicates that risk has reduced • Confirmation that significant contamination has **not** occurred • All clear WQ test result
Activation triggers for emergency conditions relating to dam failure hazards					
Structural (Section 6.2)	Not applicable	• Increasing seepage through either embankment, the foundations or abutments	• Increasing seepage through either embankment, the foundations or abutments with cloudy water	• Structural damage has been established at either embankment and failure in progress or possible due to structural damage	Risk Assessment has determined that structural risk has reduced

Terrorist Threat/Activity or High Energy Impact (Section 6.4)	Not applicable	Not applicable	Not applicable		• Possible terrorist activity/suspicions noticed at either dam or threat received • Large explosion heard/observed at either dam (e.g. bomb explosion, aircraft hit) • Failure at either dam in progress or possible due to impact or explosion	Risk assessment has determined that failure risk has reduced
Activation Status	**Normal Spillway Discharges SOP 14**	**Alert**	**Lean Forward**	**Stand Up 1**	**Stand Up 2**	**Stand Down**
Earthquake (Section 6.5)	Not applicable	Earthquake reported or felt in the area **AND** Intensity less than or equal to 5MM **AND** Change detected during surveillance	Earthquake reported or felt in the area **AND** Intensity greater than or equal to 5MM **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 at either dam has been identified	**Stand Up 2** Failure possible at either dam or in progress due to earthquake	Risk assessment has determined that failure risk has reduced

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EAP Distribution List

No.	Position
1	Dam Inspection Supervisor (DIS) TRC
2	Dam Inspection Officer (DIO) TRC
3	Dam Inspection Officer Backup 1 TRC
4	Crooks Dam EEC, Technical Services, DoR
5	Central Operations Manager, Technical Services, DoR
6	Director Asset Management, DoR
7	Executive Director, Technical Services, DoR
8	Deputy Director-General, Georesources Division, DoR
9	Director-General, DoR
10	Director, Dam Safety, DoR
11	Local Disaster Coordinator, Tablelands LDMG
12	Two (2) Deputy Local Disaster Coordinators, LDMG and CEO, TRC
13	Local Controller, State Emergency Service (SES)
14	A/Assistant Commissioner, QFES, Far Northern Region.
15	State Disaster Coordination Centre Watch Desk Officer, QFES
16	Police Mt Garnet Officer in Charge
17	Far Northern District, Communications Centre
18	Deputy Chair District Disaster Management Group
19	District Disaster Coordinator Mareeba DDMG
20	EEC Back-up, Senior Project Officer, Technical Services, DoR
21	EEC Back-up, Executive Engineer, Technical Services, DoR

Endorsement Sheet

ENDORSEMENT SHEET

This Emergency Action Plan was prepared by Technical Services in liaison with key stakeholders.

Reviewed:

Name (Print Name)

[redacted]

Signed

[redacted] Date: 20/2/2022

Central Operations Manager, Technical Services

Endorsed:

Name (Print Name)

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Sign[redacted] Date: 20/12/2022

Director, Asset Management, DoR

Document Revision History

Revision No.	Date	Revision Description
0	November 2005	Interim Issue
1	April 2007	Notification List and documentation updated
2	September 2007	Notification List and documentation updated
3	March 2008	Notification List and documentation updated
4	October 2009	Updated after 2009 dam safety upgrade works
5	December 2009	Notification List and documentation updated
6	June 2010	Notification List and documentation updated
7	September 2010	Notification List and documentation updated
8	October 2010	Plan update based on FIA by GHD, Oct 2010
9	October 2011	Documentation review and update
10	October 2012	Documentation review and update incorporating Flood Commission Recommendations, name change to DNRME and Qld Police request that they implement evacuation process.
11	October 2013	Notification list and documentation review and update including new Dam Safety guidelines.
11.1	March 2015	Notification List, documentation updated and change of Departmental personnel.
12	October 2015	Notification list, PAR, A/D to D, Change Dam Inspection Officers from RoadTek to Tablelands Shire Council.
13	December 2015	Review and update by SMEC including outcomes of scenario training exercise at Mt Garnet and telemetry integration, not distributed.
14	September 2016	Review by DNRME including IGEM Recommendations
15	December 2016	Incorporation of feedback from the Regulator
16	September 2017	Contact list update and documentation revision
17	August 2018	Review and update
18	October 2018	Substantive full consultative review with LDMG, DDMG and TRC, and update
19	September 2019	Annual non substantive review and update
20	September 2020	Annual non substantive review and update
21	September 2021	Annual non substantive review and update
22	September 2021	Annual non substantive review and update
23	November 2022	Substantive full consultative review with LDMG, DDMG and TRC, and update

List of Acronyms and Definitions

Acronym	Full Title	Description
AEP	Annual Exceedance Probability	Likelihood of an event occurring i.e. 1 in x years
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
BGA	Blue Green Algae (Sign)	Interpretative sign installed at the dam to indicate the varying hazard of Blue Green Algae
BOM	Bureau of Meteorology	Government department providing weather data and weather warnings
Burst SMS	Burst SMS	SMS broadcast service managed by DoR capable of broadcasting previously prepared messages to previously prepared target groups simultaneously via mobile telephones, with reporting. (Appendix 13)
CEO	Chief Executive Officer	Chief Executive Officer of Tablelands Regional Council (TRC)
COM	Central Operations Manager, Technical Services	Operations Manager, for DoR responsible for management of the dam
DCFF	Dam Crest Flood Failure	Failure of the dam as a result of high flood water overtopping and eroding the main embankment.
DCL	Dam Crest Level	Elevated Reservoir Water Level during a flooding event, being equal to the dam crest elevation.
DDGGD	Deputy Director-General, Georesources Division DoR	Deputy Director-General, Georesources Division for DoR
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 RDMW
DGDoR	Director-General, DoR	Director-General for DoR
DIS	Dam Inspection Supervisor	TRC person appointed to coordinate dam inspections and minor works.
DE	Dam Engineer	Engineer appointed to undertake inspections
DIO	Dam Inspection Officer	TRC person appointed to undertake inspections
DM	Director Asset Management	Director for DoR responsible for Technical Services

• Acronym	• Full Title	• Description
• DoR	• Department of Resources	• Queensland Government Department who own Crooks and Wyndham Dams
• DoREM	• DoR Emergency Management	• Emergency Management section of DoR
• DoRM	• DoR Media	• DoR Media section responsible for media releases etc.
Downstream release	• Downstream release	• Any downstream release, for these two dams limited to uncontrolled releases only including spillway, fuse plug triggering or embankment failures
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. This is a mandatory system.
EAP	• Emergency Action Plan	• The Emergency Action Plan for Crooks and Wyndham Dams
• Earthquake Intensity	• Modified Mercali (MM) 5 • or • Magnitude Scale 5	• Earthquake which is felt outdoors. Sleepers awakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing. Pictures on wall move. Pendulum clocks stop
• EDTS	• Executive Director, Technical Services	• Executive Director of the Technical Services unit of DoR
• EEC	• Emergency Event Coordinator	• Person responsible for activating the EAP and coordinates emergency actions
• EER	• Emergency Event Report	• Document prepared by DIO or COM and forwarded to DM and, once approved, sent to DDS
• EL	• Elevation	• Elevation above Mean Sea Level in AHD
• EMT	• Emergency Management Team	• Internal and external teams that manage the response to the emergency
• 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 pre-prepared messages to target groups simultaneously via mobile telephones, landline telephones and email, with reporting. This is an opt-in system.

Acronym	Full Title	Description
FIA	Failure Impact Assessment	Independent assessment to determine the number of people, population at risk (PAR) should a dam fail.
FSL	Full Supply Level	Reservoir Water Level reached for reservoir to start spilling
Fuse Plug		Refer to Section 1.2 Outline of dam(s)
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 Disaster Management Act 2003
LDCC	Local Disaster Coordination Centre	Centre established to manage the multi-agency response to the emergency
LDMG	Local Disaster Management Group	Local group established under s.29 of the Disaster Management Act 2003 to manage the multi-agency response to and recovery from an emergency event
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
PAR -Nominal	Nominal PAR	Nominal calculation of total PAR based on assumption of 2.9 persons per house
PMF	Probable Maximum Flood	The largest flood that could conceivably occur at a particular location.
PMP	Probable Maximum Precipitation	The greatest conceivable depth of precipitation for a given duration, particular location and time of the year.
PMPDF	Probable Maximum Precipitation Dam Failure	Dam Overtopping Failure as a result of the estimated largest possible event.
QFES	Queensland Fire and Emergency Services	Queensland Fire & Emergency Services which includes Fire and Rescue, Rural Fire Service, State Emergency Service and Emergency Management.
QPS	Queensland Police Service	Queensland Police Service
DRDMW	Department of Regional Development Manufacturing and Water	Dam Safety Regulation is included within this Department

Acronym	Full Title	Description
RDSWU	Riparian and Down Stream Water Users	Persons or property impacted as a result of the event other than PAR.
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 Crooks Dam Reservoir
SDCC	State Disaster Coordination Centre	Coordinates the communications and actions at a State Level during an event if required
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	A method of communication on mobile phones for sending messages
SOP	Standard Operating Procedure	Documented procedure for undertaking a defined activity
SPO	Senior Project Officer	DoR officer responsible for operations at the dam
SDF/ Sunny Day	Sunny Day Embankment Failure	Embankment failure and uncontrolled downstream release during a period of nil or low inflow to the reservoir
TS	Technical Services	Staff of the Technical Services business unit of DoR primarily responsible for managing Crooks and Wyndham Dams
TRC	Tablelands Regional Council	Crooks Dam located in TRC electorate and contracted provider of Dam Inspections to undertake routine dam safety inspections.

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 relevant emergency management entities, are required to respond to the event; • the event may arise because of a disaster situation declared under the Disaster Management Act; • 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 group's or local government's disaster management plan under the Disaster Management Act.
District group (District Disaster Management Group)	For an emergency action plan (EAP), means a district group established under the Disaster Management Act, 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) Act, 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

	• the chief executive has not, under section 349 of the Act, accepted a failure impact assessment of the dam.
Relevant entity	Means each of the following under the EAP for the dam: • 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	The four levels of EAP activation are: • **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. • **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. • **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. • **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. 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.
Bureau of Meteorology flood level classifications	The three levels of flooding are: • **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	The contamination of water in the storage of the dam that could create a dam hazard.
Dam Crest Failure	Dam crest flood 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 to 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 Introduction

This Emergency Action Plan (EAP) has been prepared to guide Department of Resources (DoR) and relevant entities in the event of an event or flood flows being released from Crooks and Wyndham Dams that compromises the safety of persons and/or property downstream of the dam. Both Crooks and Wyndham Dams are located approximately 10 kilometers upstream (north east) of the township of Mt Garnet in close session on Return Creek. Crooks Dams is the lower of the two dams with the embankments located approximately 1.2 kilometers apart. Both dams are of similar capacity when full being just over 1000ML.

Minor release events (1:5 to 1:50 AEP) from Crooks Dam will have direct impact on persons and/or property including the upstream water users (access only), downstream property owners/mining and local roads. Moderate sized release events (1:50 to 1:1000) are expected to have minimal increased impacts, more local roads access including the Kennedy Highway will be closed and inundation of the first dwellings occurring. Major sized release events (1:2,000 to 1:20,000 AEP) are expected to develop a continuing increase of inundation impacts on dwellings. Extreme flooding events in excess of 1:20,000 AEP to the PMP, have been used to identify the impacted residents in the downstream township of Mt Garnet requiring evacuation from houses.

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 Activity Tables and Communication Activity 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 population at risk (PAR); and event and review reporting.

1.1 Dam Owner

Both Crooks and Wyndham Dams are ungated dams owned by the State and managed by DoR.

Tablelands Regional Council (TRC) is contracted to carry out routine dam safety inspections and approved minor repairs. A memorandum of understanding (MOU) between DoR and RoadTek Works Manager, Asset Services North, Cairns exists for more major requested repairs and maintenance of Crooks Dam.

1.2 Outline of the Dam(s)

Crooks Dam has a homogeneous earth fill embankment built in the mid to late 1960s for the purpose of mining which has now ceased. There is no current use of the dam other than stock watering. During a dam refurbishment and spillway upgrade in 2009, a filter blanket and weighting berm were added to the downstream face of the dam embankment and an auxiliary spillway with a single bay fuse plug was added to the left bank dam abutment.

Wyndham Dam is also a homogeneous earth fill embankment dam also built in the mid 1960's for the purpose of mining which has now ceased. There is no current use of the dam other than stock watering. Wyndham Dam is located approximately 2 kilometers upstream of the Crooks Dam embankment. The headwater of Crooks Dam, when near full supply, inundates an area close to the downstream toe of Wyndham Dam. During a dam refurbishment and spillway upgrade in 2008, a filter blanket and weighting berm were added to the downstream face of Wyndham Dam along with a single bay fuse plug on the left abutment and a second fuse plug in the right end of the dam embankment, immediately adjacent to the service spillway.

Neither Crooks Dam nor Wyndham Dam have a gated structure or are fitted with a large outlet structure, allowing upstream water levels to be lowered quickly if required. Downstream

releases are limited to spillway, fuse plug triggering or embankment failures.
A fuse plug is a specialized engineered and constructed lower section of embankment, designed to trigger (erode quickly) when overtopped at a designed reservoir flood height during a high flood event. This increases the dams overall spillway capacity and reduces the likelihood of the main embankment overtopping and failing. The pilot channel is a lower section of the fuse plug crest where erosion is initiated.

The Wyndham Dam has two fuse plugs and have been designed to trigger during flooding events. The fuse plugs are designed to trigger at a 1:50 Annual Exceedance Probability (AEP) event on the left bank and at a 1:1000 AEP event on the right bank respectively. A concrete training wall has been constructed in the main spillway to minimize erosion of the left bed of the spillway.

The single fuse-plug in Crooks Dam is designed to trigger at a 1:1,000 AEP event. This fuse plug has been designed to accommodate the combined inflows from the failure of the upstream Wyndham Dam Embankment plus its own catchment. The critical dam in this system therefore is Crooks Dam.

The combined capacity of the existing spillways and secondary fuse plug spillways (when triggered) at both Wyndham and Crooks Dams is compliant with the current Acceptable Flood Capacity inflow (AFC). Further assessments are proposed here in the near future.

The catchment area above Crooks dam is considered as medium sized circular shaped catchment at 94km^2. The catchment is also described as relatively steep, with a medium timber cover, generally in a natural poor land use condition. Therefore in most average rainfall events the catchment is likely to respond relatively quickly producing runoff and inflows to the dam within approximately 1.0 hour and similarly significant inflows will cease just as quickly at the cessation of heavy rain. Due to the higher elevation and rocky streambeds lower stream base flows persist for considerable time after medium rainfall events.

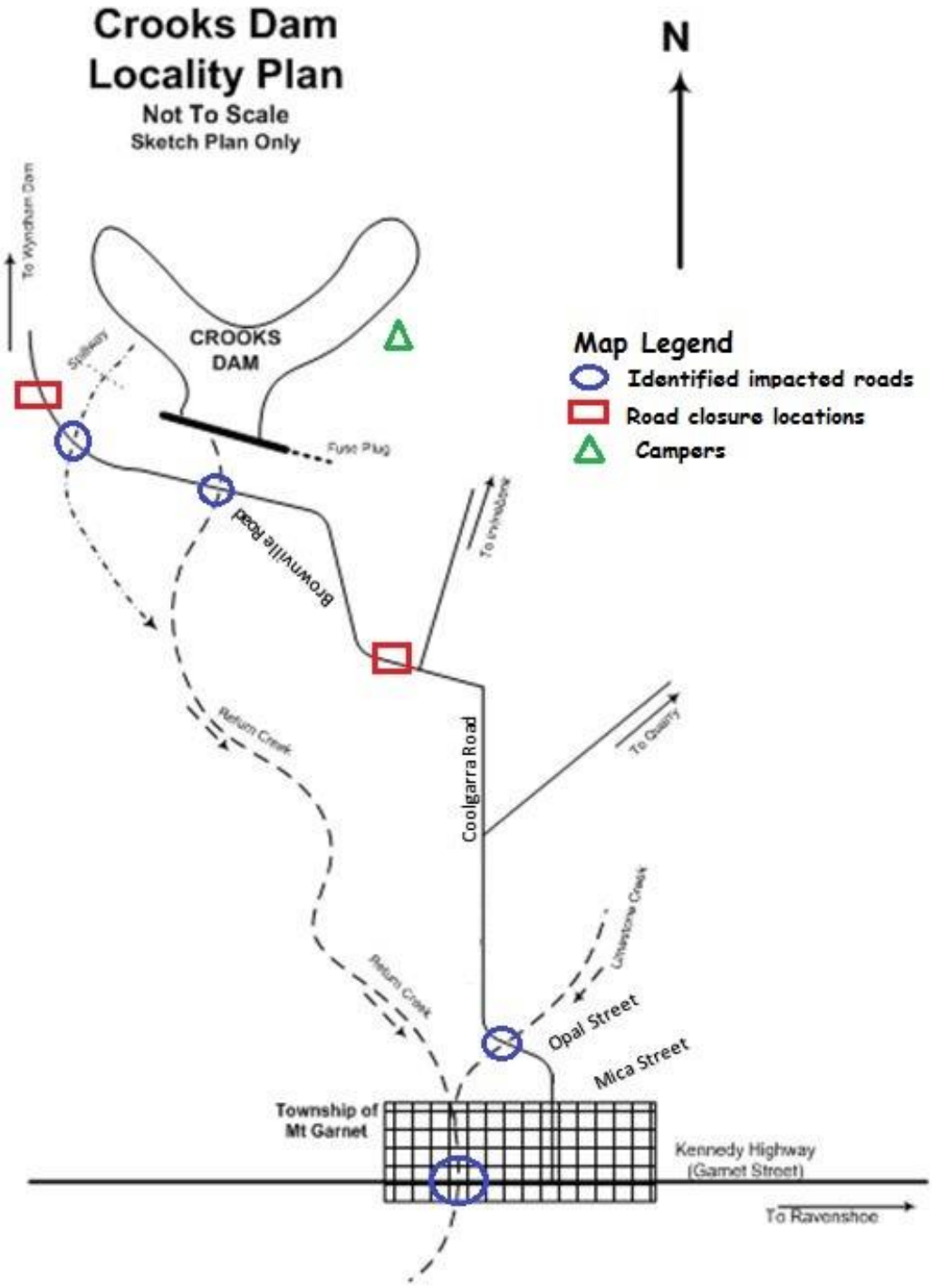


Figure 1 - Crooks Dam Locality Plan

1.3 Travel Directions and Vehicle Access to Crooks Dam

Only one access route exists to both dams. Turn-off the Kennedy Highway into Mica Street, then travel 10kms north. This road initially has 2km of sealed road before becoming unsealed. The sealed section crosses Limestone Creek which may become flooded due to local runoff or backwater from Return Creek during frequent events. The unsealed section is likely to be slippery and/or flood effected during heavy rain. (Figure 1 and Appendix 2 for Locality Plan and Access Route map). In exceptional cases if required access to the dam may be gained by helicopter and will be requested and coordinated through the LDMG in the first instance and escalated to the DDMG (by the LDMG) if a helicopter cannot be sourced locally.

1.4 Flood Releases and agreed coordinated response

The Crooks Dam Failure Impact Assessment (FIA) (May 2022) undertaken by Royal Haskonig DHV determined that:

- Crooks Dam should be assigned a Category 1 failure impact rating and be considered a Referable Dam as a result of failure in isolation or in a cascade scenario.
- Wyndham dam should be assigned a Category 1 failure impact rating and be considered a Referable Dam as a result of failure in isolation or in a cascade scenario.
- There is no identified downstream Population at Risk (PAR) in all flooding events up to the major 1:1,000 AEP event including all Sunny Day Embankment Failure scenarios.
- For flooding events of 1:1000 AEP and greater up to the PMP event there is an increasing impact of inundation impacts to dwellings, up to a total of seventy two (72) houses surrounding and downstream of the township of Mt Garnet that are likely to be effected by above ground flooding and surrounding inundation. These houses have been identified as PAR. Refer to event inundation flood mapping (Appendix 9) and PAR list (Appendix 1) and evacuation mapping (Appendices 11 and 12). The nominal total PAR based on 2.9 persons per house is approximately 208 persons.
- The travel time for a flood or change in flow conditions at Crooks Dam to impact on the township of Mt Garnet is calculated at less than 1.0 hour.

Other identified downstream risks in smaller flooding events include Brownville road inundation as soon as Crooks dam is full and the uncontrolled spillway release begins impacting on Riparian and Downstream Water Users (RDSWU).

- DoR and LDC agreed response to flooding events are:
- EEC will commence Burst SMS notifications (Appendix 13) to LDC, DIO and RDSWU at SOP 14 status (Appendix 8), EL 691.3m when Crooks Dam starts spilling. LDC will assess the need to close Brownville Road, LDC will direct road closure by TRC road crew if required and update the TRC Emergency Management Dashboard;
- EEC will update PAR, LDC, DIO and RDSWU by Burst SMS at the Alert status, EL 692.0m;
- EEC will distribute notification messaging updates by Burst SMS to LDC, DIO, RDSWU and notification messaging to PAR at the Lean Forward Status, EL 693.0m. LDC will consider distributing EWN and/or ‘Heavy Rainfall’ Emergency Alert;
- As a precaution evacuation of the PAR will be recommended to commence at an earlier stage during a flooding event consistent with the very rare 1:1000 AEP event, trigger reservoir water level EL 695.00m;
- EEC will liaise by phone with LDC prior to distributing warning messaging updates by Burst SMS to LDC, DIO, RDSWU and PAR at the Stand Up Status, EL 695.0m, recommending evacuation. LDC will distribute ‘Possible Failure’ Emergency Alert
- EEC will distribute messaging warning updates by Burst SMS to LDC, DIO, RDSWU and PAR in the event of a main embankment failure event. LDC will distribute ‘Failure’ Emergency Alert.
- EEC will liaise by phone with LDC prior to distributing update message by Burst SMS recommending Stand Down to LDC, DIO, RDSWU and PAR when a receding trend is observed, no additional rain in the catchment and reservoir water level less than EL 692.0m. 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 QPS and coordinated through the LDMG. This aligns with the Local Disaster Management Plan and/or sub plan. Therefore, DoR must communicate effectively with the LDC at all times, from start to finish of the event.
- Other dam hazards exist for Crooks and Wyndham Dams before the flooding event reaches, Stand Up status (and evacuation) in priority order which include:
- Brownville Road inundation and required closure;
- Fencing, pumps and stock;

- Internal property access roads may be cut (grazing/mining);
- Limestone Creek crossing inundation and required closure; and
- Kennedy Highway inundation and required closure.
- Colour coding has been used in this EAP to correspond to each status/level of EAP activation. Explanation of the colour coding can be found in Table 2 – Alert Status Colour Coding Table 2.
-

1.5 EAP requirements under the Water Supply (Safety & 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.

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.

The local government whose area may be affected by a dam hazard for Crooks Dam has been assessed as Tablelands Regional Council (TRC). TRC has been provided with a copy of the draft EAP for assessment.

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 Crooks Dam is the Far North Disaster

Management Group (DDMG). Technical Services has provided the DDMG with a copy of the draft EAP for review.

1.6 Objective of the Crooks and Wyndham Dams 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 Crooks and Wyndham Dams 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 TRC LDMG, relevant DMGs and the broader community during the activation of this EAP.

1.7 Development of the Crooks and Wyndham Dams EAP and continuous improvement

This EAP has been prepared in accordance with Chapter 4 of the Act, and has involved continuous collaboration over several 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, TRC and LDMG representatives to discuss any proposed changes to the EAP.
- Are involved in the Far North DDMG as liaison officers, to ensure that the Far North DDMG is well informed on the dam safety issues surrounding Crooks 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.

1.7.1 Training

Technical Services (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 internally coordinated workshops and scenarios to test the effectiveness of the EAP. Depending on availabilities, external agencies and/or Local Government are 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.

1.8 EAP event decision making process

This EAP can be activated by the EEC, COM or DM (refer to section 5.1.1). The EAP is activated 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), under the Director Asset Management (DM), 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
- Recorded rainfall by nearby pluviometers
- The BOM radar for Cairns and the intensity of rainfall over the dam catchment
- The 1-7 day forecasts for Atherton, the nearest location on the Tablelands area
- 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.

1.8.1 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 its circumstances 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 'considered response strategy' 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 by approval of the DM to reflect the unique circumstances of the dam hazard event or dam emergency event.

1.9 Dam hazard identification

The emergency action planning for Crooks and Wyndham Dams 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, DCFF and PMPDF scenarios; therefore covering the areas likely to be impacted in 'worst case' scenarios.

Dam hazard	May become a dam hazard event or emergency event when;
Flood event	Spillway outflows from the dams 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	Either 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.

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 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 which corresponds to each level of alert or status:-

Table 2 – Alert Status Colour Coding

Status	Description / Situation
NORMAL SPILLWAY DISCHARGES (SOP 14)	Conditions identified that impact on Crooks Dam and may include: • Observed or monitored rainfall resulting in inflows and Reservoir Water Level (RWL) rising above full supply level (discharge through the main spillway above EL 691.3m) • Normal spillway discharge up to EL 692.0m
ALERT	Conditions identified or developing that could escalate and impact on Crooks Dam include: • Development of conditions (or received information) that warrants more frequent or continuous monitoring of weather forecasts, rainfall, RWL or seepage • Reservoir Level (RWL) is above EL 692.0m • Other situations or issues that compromises the structural integrity of Crooks or Wyndham Dams resulting in possible failure of the dam.

Status	Description / Situation
LEAN FORWARD	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 693.0m • Potential for the Wyndham Dam fuse plug to trigger • 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.
STAND UP	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: • Observed, monitored or forecast rainfall resulting in inflows and RWL rising above full supply level (discharge through the main spillway above EL 695.0m) • Discharges taking place or forecast to take place through both the main spillway and fuse plug spillway • Wyndham Dam reaches, exceeds dam crest level or begins to fail. • Crooks Dam fuse plug triggers. • Forecast for Reservoir Levels to reach or exceed Crooks dam crest level if the fuse plug has triggered • Major flooding downstream of Crooks Dam requiring evacuations to take place. • Reports of significant damage to the dam
STAND DOWN	Conditions exist or are developing where rainfall and inflows to Crooks Dam are reducing and discharges from Crooks Dam is reducing. Conditions may include: • Reduction in RWL and spillway discharges to EL 693.0m and falling with no rain forecast in the catchment. • Downstream flooding has reduced and is no longer a threat to the public and PAR. • Risks are reassessed as being low.

1.10 Communications

1.10.1 Notifications and warnings

Flooding in Return Creek (and discharges from Crooks Dam) is expected as a result of heavy localised rainfall, possibly as a result a low pressure or cyclonic rain system over the area. 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 TRC).

In consideration of the short calculated flood travel time being less than 1.0 hour from Crooks Dam to Mt Garnet early warning will be given to PAR on being aware of a potential dam break event or flooding issues from the dam. A proactive response and early notification, warning and/or evacuation may occur, rather than waiting for dam RWL 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.

Message content may be changed by approval of the DM 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 Chapter 6 of this EAP. It is important to note that priority order is implied by the order in which persons/entities are listed within the communication Activity Tables in Chapter 6. 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 COM to the DM via email.

- External SitReps are escalated by the DM or COM and are sent to the ERT, which include a summary of the dam/s status and the required actions. External SitReps are distributed to all recipients listed in the DM Communication Activity Tables.

SitRep and Event Log templates are stored on DoR SharePoint. A copy of the SitRep template is provided below. The content of SitReps may be altered to suit the circumstances of individual dam hazard events or dam emergency events as required.

Template SitRep

Crooks Dam (situated 11km north of Mt Garnet in North Queensland)

- Nil Concerns
- Reservoir water level trend is steady
- Current level is XXX.XXm (XXX.XXm over spillway) (current at DATE/TIME)
- EAP activation status: xxxx
- Current actions:
    - Frequency of monitoring xxxxx
    - BOM forecast rainfall, river conditions and radar Xxxxx
    - Inspections Xxxxx
    - Notifications to xxxxx

<u>Significant Reservoir Water Levels</u>

- Full Supply Level 691.30m
- Moderate Flood Level (Alert) occur at 692.0m – Provide notifications
- Moderate/Major Flood Level (Lean Forward) occurs at 693.0m – Prepare for evacuations

Major Flood Level (Stand Up) occurs at 695.0 m – Advise evacuations

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 may include:

- Burst SMS Text
- Face to face door knock – QPS/SES notification to PAR
- Landline Telephone
- Mobile Telephone (Limited coverage in the Crooks Dam area)
- Satellite Telephone
- Email
- SMS/Text
- TRC socials for broader community messaging
- Emergency Management Dashboard, http://dashboard.trc.qld.gov.au/
- Media outlets.

1.11 References and Associated Documents

The following list of references, including relevant legislation and key documentation but not limited to applicable to this EAP is as follows.

- *Water Supply (Safety and Reliability) Act 2008.*
- *Disaster Management Act 2003.*
- Queensland Dam Safety Management Guidelines February 2002.
- ANCOLD Guidelines.
- Report for Crooks Dam, Failure Impact Assessment (FIA), November 2011.
- DRDMW Emergency Emergency Action Plan for Referable Dam Guideline
- IGEM Review of SEQWater and SunWater Warnings Communications Report 1: 2015-16
- Report for Crooks Dam, Failure Impact Assessment (FIA), May 2022.
- IGEM South East Queensland Rainfall and Flooding Feb to Mar 2022 Review

1.12 Other Risks and Issues

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

- Roads to and from Mt Garnet, including the Kennedy Highway, may be impassable due to localized flooding, slippery road conditions, downed power lines and trees or vegetation across the roads;
- the road leading from Mt Garnet to Crooks Dam is a gravel road and it may become impassable due to:
- localised flooding or
  - muddy or slippery road conditions
  - washouts
  - high winds making road travel difficult or unsafe;
  - DIO’s unable to travel to dam site due to road closures;
  - emergency services already occupied with other storm event related issues;
  - limited number of resources available within Mt Garnet to assist with implementation of the EAP.

- Irrespective of the weather conditions, road conditions may also have the following risks:
- uneven surfaces including rutting and corrugations
  - native wildlife (kangaroos etc.) or farm animals on or beside the road
  - large vehicles (road trains) and extensive dust trails left by these and other vehicles.

In the event of the Crooks Dam Fuse Plug being triggered (fuse plug eroded away with discharges taking place through the fuse plug channel), there will be no access to the Crooks Dam embankment as the discharge through the fuse plug will inundate the access road. If personnel are present at Crooks Dam, they may become isolated until such time as the flow through the fuse plug ceases.

Similarly access to Wyndham Dam may be impossible. The access road to Wyndham Dam is the same as that for Crooks Dam, it passes downstream of both the main spillway and fuse plug for Crooks Dam. Both of these road crossings are regarded as being low level and will quickly become inundated with any discharges from Crooks Dam.

The RSAS has been installed at Crooks Dam 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 Crooks Dam relies on a telemetry system that utilises the mobile phone network. Storm damage to the mobile phone network or damage to the onsite equipment (such as from a lightning strike) may make the system inoperable. Similarly, adverse weather conditions may impact on the site being able to connect to the mobile phone system.

Any dam operators or other persons located at the dams during a flooding event may be isolated until such time as the flood waters recede or alternative arrangements are made to recover them. This will be dependent on weather conditions prevailing or the access roads being passable and safe to travel on.

DIO's are to cease all routine weekly inspections of the dams once the flooding activation status reaches or exceeds (or is likely to exceed) the Alert status and the EAP is activated, unless requested by the EEC, and if it is safe to do so.

1.13 Technical Data

The following technical data is provided for Crooks Dam and Wyndham Dams.

Crooks Dam Technical Data

• Name and location	•
• Council	• Tablelands Regional Council
• Nearest Town	• Mt Garnet
• Stream and AMTD	• Return Creek, AMTD 40.6km
• Licence No	• 45853K
• Referable Dam Number	• Dam ID 401
• Embankment Coordinates	• 17^0 35' 58"S 145^0 08' 18"E
• Current Owner	• Queensland Government (managed by Department of l Resources)
• Designer (Date) • Designer of Upgrade (2009)	• Owner, Tableland Tin Dredging Company (Mid-Late 1960's) GHD
• Construction Contractor of Upgrade	• RoadTek
• Construction Period • Construction of Upgrade	• Mid-Late 1960's • 2009
• Dam Safety review dates	• January 2007, 2020 (as part of the Portfolio Risk Assessment),
• Technical data	•
• Dam Type	• Homogenous earth fill embankment with filter blanket and weighting berm added to the downstream face.
• Purpose	• Water supply for stock and recreation at present.
• Main Dam Height (above lowest toe)	• 12m
• Main Dam Length	• 382m
• Primary Spillway Type	• Nib weir (Right Bank), open channel with natural rock-bed foundation, Spillway Crest 691.3m.

• Primary Spillway Description	• Service – Spillway width of 72 m
• Auxiliary Spillway Type	• Excavated Rock
• Auxiliary Spillway Fuse Plug Type	• Single-bay fuse plug
• Auxiliary Spillway Width	• 25m
• Invert level of pilot channel	• EL 695.3m
• Crest level and trigger level for initiation of erosion	• EL 695.6m
• AEP of fuse plug trigger	• 1 in 2,500
• Invert of spillway channel	• EL 688.8m
• Outlet Description (main spillway drain)	• Small diameter mild steel pipe through primary spillway weir. Pipe is un-coated and corroded, both pipe and flange have been denso-wrapped. Currently inoperable, capped with mild steel blank flange (4 holes, 2 bolts).
• Reservoir characteristics	•
• Full supply level (FSL)	• EL 691.3 m
• Reservoir capacity	• 1045 ML
• Surface area	• 37.6ha at FSL
• Length of shoreline	• 5.4 km
• Main Spillway capacity	• 1,249 m^3/s at Dam Crest level
• Auxiliary Spillway capacity (at dam crest level)	• 813 m^3/s
• Dam crest level (DCL)	• 696.3m (AHD)
• Catchment area	• 94km^2
• Estimated time of concentration	• 1.0 hour
• Catchment description	• Dry, moderately timbered eucalypt stands with medium length native grass coverage.
• Design Rainfall Review	•
• Methods	• Design rainfall derived using the Department of Natural Resources Mines and Energy CRC Forge data for Queensland for floods up to the 1 in 1000 AEP event and GSDM for less frequent events up to PMP
• Dam characteristics	•
• Wall Description (Dimensions and zone arrangements)	• 5.3 m wide crest with 2.9:1 upstream slope and 2.8:1 downstream slope. The wall is a homogenous earth-fill with cobbles and grasses for slope protection.
• Slope Protection	• Rock cobbles and grass coverage
• Erosion Protection Works	• Loose cobbles on the DS face • Loose rock rip-rap on the US face

Wyndham Dam Technical Data

Location	
Shire	Tablelands Regional
Nearest Town	Mt Garnet
Property Description	Lot 2 on SP189919
Referable Dam Number	Dam ID 883
Stream and AMTD	Wyndham Creek, AMTD 1.0km
Catchment Area	43km2
Embankment Coordinates	17^0 35’ 15” S 145^0 08’ 26” E
Catchment Description	Undulating rocky hills with emerging eucalypt forest
Designer (Date)	Owner, Tableland Tin Dredging Company (Mid-Late 1960’s)
Structural Upgrade Contractor	RoadTek, Queensland Main Roads

Structural Upgrade Designer	GHD Pty ltd
Structural Upgrade Date	April – November 2008
Safety Review Dates	January 2007, 2020 (as part of the Portfolio Risk Assessment),
Dam Characteristics	
Dam Type	Homogenous earth fill embankment with concrete cut-off wall in lower section of embankment. A seepage control berm constructed of filter sand and compacted fill was added to the DS face of the embankment as part of the 2008 upgrade.
Purpose	Current use – water supply for stock and recreation.
Dam Height (above lowest toe)	13.8m
Dam Length	286m (approx)
Storage at FSL	1,142ML
Full Supply Level	701.7(AHD) After spillway upgrade.
Dam Crest Level (DCL)	703.8m (AHD)
Embankment Crest Width	4m
Surface Area	32.5ha at FSL
Length of shoreline	Unknown
Upstream Slope	3H:1V (GHD Safety Review)
Downstream Slope	2H:1V (GHD Safety Review)
Volume RCC Main Dam	N/A
Volume of Concrete Main Dam	N/A
Slope Protection	Sown native grasses
Outlet works	A controlled 200mm diameter DICL pipe at RL 692.3m AHD
Erosion Protection Works	Sown native grasses and rock lined groin and toe drains
Corrosion Protection System	None
Erodible embankment section	
Location	Western end of embankment
Trigger level for initiation of erosion	RL 704.1m
AEP of initiating event	1 in 3500
Section width	15m
Peak breach section outflow	1,117 m3/s
Peak water level in Crooks Reservoir immediately prior to breach	RL 694.58m
Peak water level in Crooks reservoir after breach	RL 695.49m
Description of Primary Spillway	
Spillway Type	Broad crested weir (Right Bank)
Spillway Crest Length	56m
Spillway Maximum Height	RL 701.7m AHD
Spillway Capacity	243 m3/s at Dam Crest Level AEP of dam crest flood 1 in1,000
Spillway Chute	Excavated rock
Description of Auxiliary Spillway	
Spillway Type	Broad crested weir (Left Bank)
Spillway Crest Length	23.9m total length
Spillway Maximum Height	699.8m AHD
Spillway Discharge Capacity	187 m3/s at Dam Crest Level AEP of dam crest flood 1 in1,000
Spillway Chute	Excavated rock
Auxiliary Spillway Fuse Plug	
Trigger level for initiation of erosion	RL 703.7m
Invert level of pilot channel	RL 703.4m
Width of pilot channel	3m

Adopted flow depth for initiation of erosion	0.3m
AEP of fuse plug trigger	1 in 50
Invert of spillway channel	699.7m
Description of outlet works	
Reservoir Outlet Description	Refurbished outlet works are now operational and can release water to Crooks Dam through a controlled 200mm diameter DICL pipe at RL 692.3m AHD. The flow is controlled by two (2) AVK resilient seat gate valves.
Conduit Description	300mm Mild Steel Pipe, reduced to 200mm DICL pipe.
Regulator Description	Downstream gate valve
Outlet – Off take Description	200mm diameter DICL pipe controlled by two (2) AVK resilient seat gate valves

Critical Reservoir Water Level Triggers

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

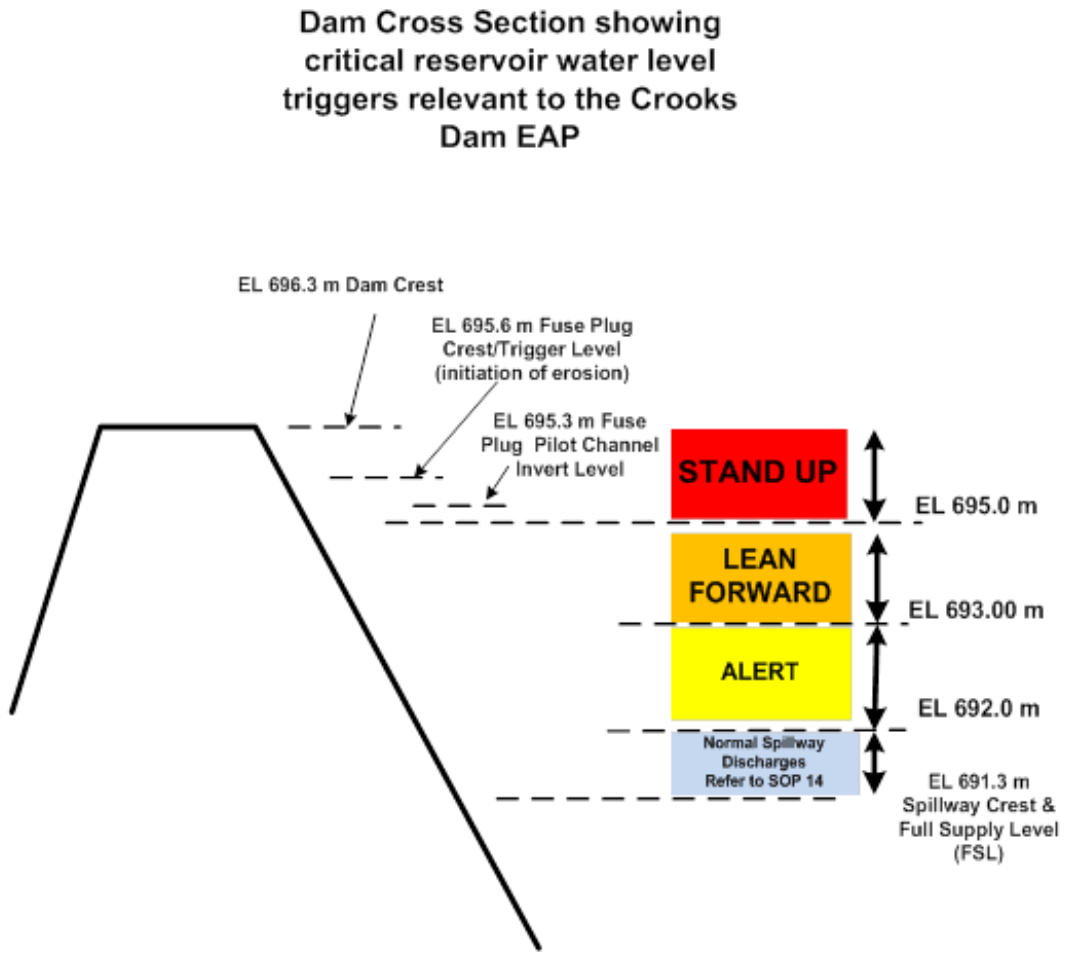
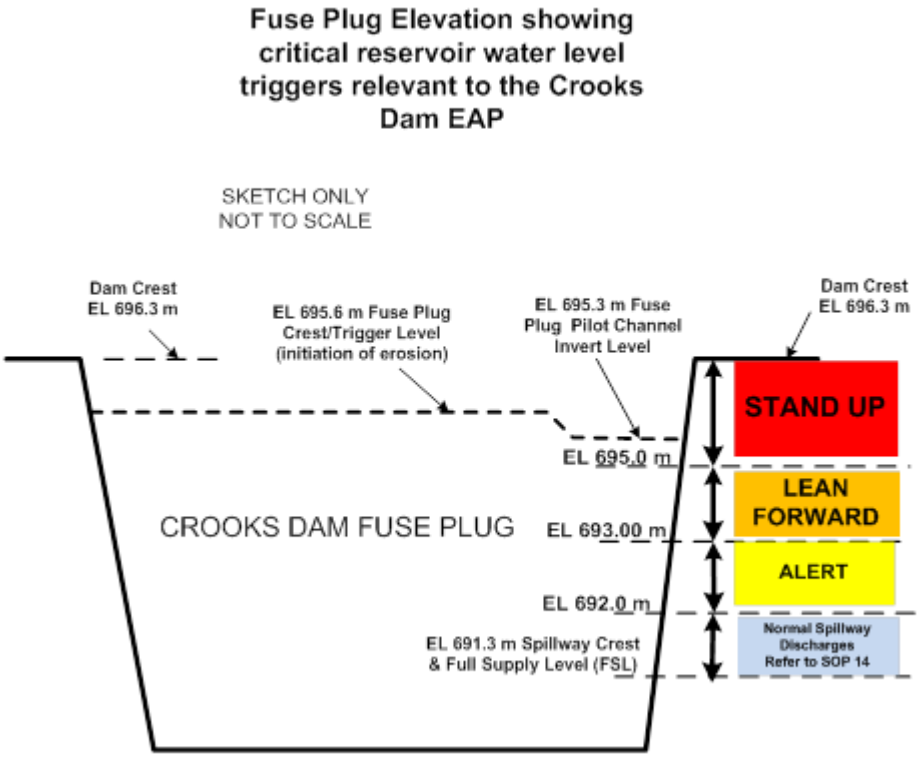


Figure 3 –Fuse Plug Elevation View showing Critical Reservoir Water Level Triggers



2.15 Crooks Dam - Remote Sensing and Alert System (RSAS)

A telemetric Remote Sensing and Alert System (RSAS) has been installed at Crooks Dam to provide two primary functions

1) Constantly monitor, recorded and display in real time the following storage attributes
   - upstream dam reservoir water level (RWL)
   - cumulative rainfall
   - three V-Notch weirs at the downstream toe monitoring dam seepage
   - a float toggle switch in the downstream fuse plug channel to indicate that the fuse plug has been triggered
   - voltage of the batteries powering the system
2) Automatically send SMS alerts to a preselected DoR RSAS Notification List at predetermined and set instrumentation trigger levels or events.

- The RSAS system installed at Crooks Dam has two independent loggers and communications systems to communicate the site data to QTec. The primary communications system operates on the 3G mobile network whilst the secondary system operates via a satellite communications network. Both communication systems have independent batteries and solar panels for backup power supply.
- The RSAS loggers records and stores the input from a number of site instruments and forwards the details either on a regular basis (pre-set time interval) or in the event of an alarm level being reached an immediate update of site conditions.
- The accuracy of the RSAS readings are benchmarked weekly, monthly and biannually against manual instrumentation readings for consistency. The RSAS instruments are serviced and calibrated biannually by qualified contractors.

Both loggers and communication systems are powered by independent batteries which are

electrically maintained by independent solar panels located on the top of each cabinet. Both independent systems are capable of operating for several days of heavy cloud cover. However, cloudy conditions and wet weather may create poor satellite phone reception at the site and result in communication failure with the RSAS system.

Access to RSAS is limited to DoR, further details on the RSAS including use of the portal website, preset triggers for automatic SMS alerts and SMS notification distribution list can be found in Appendix 6.

The RSAS has an external data transfer share agreement with BOM in order to provide an increased external situational awareness to relevant entities including the general public.

The direct link to BOM, Latest River Heights Table for the Herbert, Johnstone, Mulgrave/Russell, Barron, Daintree catchments is listed directly below http://www.bom.gov.au/cgi-bin/wrap_fwo.pl?IDQ60291.html. This information is also available from the TRC Emergency Management Dashboard (BoM River Heights).

The relative station is located within in the Herbert catchment section, and named, Return Ck at Crooks Dam HW (Head Water)

Additional graphed and tabulated recent data is available for this station, on the right hand side on the table, indicating the latest water level height (m) which correlates directly with the Reservoir Water Levels (RWL) in the EAP and EAP trigger levels and trend. This graph also indicates the latest depth of flow above the spillway. Direct links to the graph and table are listed directly below.

Crooks Dam HW TM Plot - http://www.bom.gov.au/fwo/IDQ65394/IDQ65394.531111.plt.shtml
This plot also indicates the spillway level as a straight horizontal line

Crooks Dam HW TM Table - http://www.bom.gov.au/fwo/IDQ65394/IDQ65394.531111.tbl.shtml

A remote controlled Tilt, Pan, Zoom and Inferred closed circuit camera is installed on the left abutment to compliment and increase situational awareness at the dam during emergency events.

1.14 RSAS Redundancy Plan

If the RSAS including CCTV cameras are not operating, the receipt of local intelligence and monitoring of the Bureau of Meteorology website (www.BOM.gov.au) on predicted rainfall and weather conditions will provide updates to any situation until telemetry and communications resume. See Crooks Dam Rainfall Duration Curves graph, Appendix 7.

1.15 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 Crooks and Wyndham Dams . The information includes “weather radar” images from the Cairns Weather Watch Radar and localized surrounding rainfall weather stations.

Details of the use of BOM site to assist in assessing impacts to the dams can be found in Appendix 6.

1.16 Maintenance and Inspections

Both dams are maintained and inspected in accordance with the safety conditions relevant to

the dam and the Queensland Dam Safety Management Guidelines.

The dams are inspected regularly including:

- Regular periodic inspections by experienced operators on a weekly basis.
- Quarterly inspections certified by a qualified dams engineer (RPEQ).
- Bi-annual inspections by Technical Services Officers.
- Comprehensive inspections on a 5 yearly basis.
- Dam safety reviews at 20 year intervals (last one undertaken in 2005).

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.

2. Uncontrolled Downstream Releases

Neither Crooks or Wyndham Dams have ability for controled high-capacity releases (for example outlet pipes or gated structures), all releases pass through the spillways only and are therefore uncontrolled. The triggering of any of the three fuse plugs will create significant increased pulses in downstream releases. The current Failure Impact Assessment (FIA) May 2022, indicates the first of the downstream houses are likely to be impacted by increased flows soon after Wyndham Dam reaches DCF and Crooks Dam fuse plug triggering at AEP 1:1,000.

3. Downstream Release Hazards

3.1 Persons

Public access on State controlled land surrounding Crooks and Wyndham Dams is not permitted.

Flooding downstream of Crooks Dam does not impact on residential properties and residents in Mount Garnet until discharges are in the order of a 1:1,000 AEP event.

Flooding events in excess of 1:1,000 AEP will directly impact on downstream properties and residents around and downstream the township of Mt Garnet. These impacted persons 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 just prior to the 1:1,000 AEP, providing sufficient lee time before Wyndham Dam reaches DCL and Crooks Dam fuse plug triggers.

The identified and notifiable PAR has been divided into three separate evacuation groups, being **In Town** (Blue), **Coolgarra Road** (Green) impacted by Limestone Creek and other **Surrounding Areas** (Orange). These designated colours are consistent in both the Notification List Appendix 1 and Evacuation Plans Appendix 11. Each evacuation group have defined evacuation directions to reach higher ground, due to expected isolation from flooded streams at the Stand UP activation status of the critical Flooding Event. (Refer to Appendix 1, PAR within Inundation area as identified in PMP Flood Event and Appendix 11, PAR Evacuation Groups and Evacuation Routes.)

All other downstream release events including flooding events less than 1:1,000 AEP, and "Sunny Day" failure event including structural concerns, terrorism or high impact or earthquake will have no major impact on PAR residents around township of Mt Garnet as the resulting downstream release flood flows are fully contained within the banks of Return Creek. The Kennedy Highway Bridge and Limestone Creek crossings will be effected by flows at a 1:50 AEP. (Refer section 3.3)

3.2 Property

Events may impact properties surrounding and downstream of the dam other than the identified PAR at Mount Garnet. 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, mining/grazing activities, fences, stock and pumps. The RDSWU are therefore included in all simulcast broadcast messaging.

3.3 Road Inundation / Road Closure

Immediate road closure of the two culvert road crossings on Brownville Road located just downstream Crooks dam will need to be considered by TRC whenever there is any release or possible failure from Crooks Dam. TRC, LDC will be notified of the uncontrolled release and advised the road may require closing. Large and/or long duration releases or the triggering of the Crooks Dam fuse plug is likely to cause damage to Brownville Road which should be assessed by TRC after each event.

Roads in Mt Garnet are unlikely to be inundated for uncontrolled releases from the dam for flooding events of less than 1:50 AEP or sunny day failures, however this does not include localized flooding in the Mt Garnet area. The following crossings or bridges may be significantly impacted by events at a 1:50 AEP:

- Limestone Creek crossing, between Opal Street and Coolgarra Road, residents on Copper Street and Coolgarra Road on the northern side of Limestone Creek are likely to be

impacted

- Kennedy Highway (Garnet Street) at the Return Creek Bridge (including the footpath on the upstream side of the bridge)
  A proactive approach is encouraged in respect to road closures, and 'do not drive, walk or ride into flood waters' approach should be used.
  Warning signs should be erected ahead of any adverse weather systems approaching the area were possible to do so.

The Tablelands Regional Council (TRC) should liaise with the relevant entities to assist with road closures, the placement of signage/barricades and relevant TRC website updates.

Refer to Appendix 10 Critical Water Levels and Trigger Justification, Figure 1 - Crooks Dam Locality Plan, Appendix 12 for RDSWU locality map and Appendix 1 for RDSWU contact list.

4. Communications

4.1 Notifications and warnings

Flooding in Return Creek and discharges from Crooks Dam are expected as a result heavy localised rain in the area. The Emergency Action Activity Tables provided in this EAP provide an indication of identifying triggers and indicate when notifications and warnings from the Communication Activity 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 TRC) 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 level triggers to be reached.
With advice from the BoM and DoR, the Tablelands Local Disaster Management Group (LDMG) may recommend pre-emptive evacuation of the population at risk prior to flood event trigger levels being reached in the event of a cyclone that is predicted to impact Mt Garnet and increase storage levels in the dam.

4.2 Communication Systems

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

The listed order in the Emergency Action Activity Tables and Communication Activity Tables is the intended priority order. However the primary communication mode "Burst SMS" 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 (DoR) messaging, primary communication mode (Appendix 13);
- EWN (TRC LDC) messaging, primary communication mode;
- Face to face, door knock (QPS or SES)
- Landline Telephone, secondary communication mode;
- Mobile Telephone, secondary communication mode;
- TRC socials;
- Emergency Management Dashboard, http://dashboard.trc.qld.gov.au/;
- Media outlets.

5. EAP Roles and Responsibilities

5.1 DoR as the Dam Owner

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

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

The EEC is the Technical Services officer who is responsible for coordinating an emergency event and activating the EAP.

During an event the EEC shall:-

- Activate the EAP in consultation with COM as per Section 1.8 when the situation reaches ALERT except in the event of a terrorist threat or event which goes straight to STANDUP.
- Advise Central Operations Manager (COM) that the EEC is coordinating the response to the event and confirm that the EAP is activated in response to an event.
- Monitor conditions at the dam using a combination of reports from the RSAS and BOM websites.
- Monitor all emergency events.
- When an event at Crooks Dam has reached or is likely to reach a dam safety trigger level, make notifications as per Activity Tables 3, 11, 19, 27 and 35 in consultation with the COM.
- Refer high risk activities to the COM, as appropriate and/or as per Departmental policy.
- Evaluate inspection reports from the DIO/DE and provide directions where required in this plan, forward inspection reports to COM.
- Provide regular updates during emergency events to the Local Disaster Coordinator in consultation with the COM.
- Maintain an event log of all communications received, communications sent, actions taken and observations.

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

5.1.2 Dam Inspection Officer (DIO), TRC

The nominated or duty DIO shall undertake the following:

- Monitor the dams for any potential emergency events (high rainfall or storm events forecasted, dam safety issues, earthquakes, sabotage or vandalism).
- Follow the EAP relevant for the specific emergency condition outlined in this document. Immediately notify the EEC when an emergency event or potential emergency condition has been identified;
- In the event of determining that a Structural/Sunny Day Failure, Terrorist Threat, or Earthquake is developing or has occurred, immediately advise the EEC.
- In an emergency event, take steps to ensure personal safety and the safety of other DIOs and the public.
- When an event at Crooks Dam has reached or is likely to reach a dam safety trigger level, make notifications as per Activity Tables 7, 15, 23, 31 and 39 in consultation with EEC.
- If safe to do so, attend the site, monitor and report site conditions / situation if requested by EEC. If unable to attend site or site attendance is to be greater than 2 hours after

receipt of request, advise EEC of delay and likely time to arrive at site.
- Record details of the emergency event in the Event Log if requested by EEC. This shall include details of all communications received and sent, observations and actions taken;
- Take relevant photographs, water tests (dam safety issues, water levels etc.) if requested by EEC and forward them to the EEC.;
- Provide regular reports / updates / changes to the EEC if requested by the EEC for evaluation during the emergency. Updates are to be provided in the first instance verbally and followed up where possible by email;
- During an emergency event, the DIO should refer all requests from the media for comments to the Executive Officer, LDMG;
- In the event that the DIO is unable to fulfil the duties, advise the DIO Backup of any intended absence from the area and leave a point of contact;
- Keep the Emergency Action Plan (EAP) in a clean, secure location that can be readily accessed at short notice;
- After an emergency event, send copy of the Event Log to the C O M , within 15 working days if requested by the EEC;

5.1.3 Dam Inspection Officer (DIO) Backup, TRC

The nominated DIO Backup shall undertake the following:
- Assist the DIO in times of emergency;
- Follow the Emergency Action Plan relevant for the specific emergency event outlined in this EAP;
- Undertake the role and responsibilities of the DIO should that person be unavailable;
- During adverse weather conditions or dam safety emergency, DIO Backup shall attempt to establish communications with the DIO;
- Record details of the emergency event in the Event Log. This shall include details of all communications received and sent, observations and actions taken;
- Keep the Emergency Action Plan (EAP) in a clean, secure location that can be readily accessed at short notice;

5.1.4 Dam Engineer (DE),

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

5.1.5 Central Operations Manager, Technical Services, DoR (COM)

- The Central Operations Manager, Technical Services, DoR shall undertake the following:
- **Annually:-**
  - Review the EAP by 1st September each year.
  - Undertake the annual EAP door knock with the LDMG to distribute updated evacuation plans.
  - Check that the DIO, DIO Backup(s) and disaster management entities are conversant with the EAP.
  - Distribute the EAP and any amendments / updates according to the EAP distribution list.

During an event:-

- Monitor conditions at the dam using a combination of reports from the EEC, RSAS web site and BOM web site and any inspection reports from the DIO/DE.
- Confirm that this EAP is implemented in response to an event at the 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 Activity Tables 8, 16, 24, 32, and 40.
- Refer high risk activities to the DM, as appropriate and/or as per Departmental policy.
- Maintain an event log of all communications received, communications sent, actions taken and observations.
- Within thirty (30) days of an event, present an EER (if required) to the DDS.

5.1.6 Director Asset Management, DoR

- The DM, DoR shall undertake the following:

- Annually:-
  - Review the EAP in consultation with the COM by 1st September each year.
  - Authorises/approves this EAP.
  - Initiate a review as and when there are changes to the operating environment or assessed risk.

During an Event:-

- Review SitReps and notify as per Activity Tables 9, 17, 25, 33 & 41.
- Advises the Director Dam Safety, RDMW when the EAP is activated.
- Provide advice and/or assistance to the EEC and COM as required.
- Direct the 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.
- 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.

5.1.7 Executive Director, Technical Services, DoR

- The Executive Director of Technical Services shall undertake the following:
- Review event reports and notify the Deputy Director-General, Georesources Division, DoR of the event.

5.1.8 Deputy Director-General, Georesources Division, DoR

The Deputy Director-General, Georesources Division, DoR shall undertake the following:

- Notify the Director-General, DoR of the event.

5.1.9 Director-General, DoR

The Director-General, DoR shall undertake the following:

- Monitor the event reports and keep the Minister informed.

5.2 Tablelands Local Disaster Management Group (LDMG)

The Tablelands LDMG is responsible for:

(a) to ensure that disaster management and disaster operations in the area are consistent with the State group's strategic policy framework for disaster management for the State;
(b) to develop effective disaster management, and regularly review and assess the disaster management;
(c) to help the local government for its area to prepare a local disaster management plan;

(d) to identify, and provide advice to the relevant district group about, support services required by the local group to facilitate disaster management and disaster operations in the area;
(e) to ensure the community is aware of ways of mitigating the adverse effects of an event, and preparing for, responding to and recovering from a disaster;
(f) to manage disaster operations in the area under policies and procedures decided by the State group;
(g) to provide reports and make recommendations to the relevant district group about matters relating to disaster operations;
(h) to identify, and coordinate the use of, resources that may be used for disaster operations in the area;
(i) to establish and review communications systems in the group, and with the relevant district group and other local groups in the disaster district of the relevant district group, for use when a disaster happens;
(j) to ensure information about a disaster in the area is promptly given to the relevant district group;
(k) to perform other functions given to the group under this Act; *Local Government Act 2009* and the *Disaster Management Act 2003*.

5.2.1 LDMG Chairperson

The Chairperson of the LDMG (or nominated Deputy), is responsible for:

(a) to manage and coordinate the business of the group;
(b) to ensure, as far as practicable, that the group performs its functions;
(c) to report regularly to the relevant district group, and the chief executive of the department, about the performance by the local group of its functions.

5.2.2 Local Disaster Coordinator,

The Local Disaster Coordinator (LDC) or nominated Deputy is responsible for:

(a) to coordinate disaster operations for the local group;
(b) to report regularly to the local group about disaster operations;
(c) to ensure, as far as practicable, that any strategic decisions of the local group about disaster operations are implemented.

5.2.3 Queensland Police Service

The QPS has responsibilities related to this EAP under the *Disaster Management Act 2003*.

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 TRC 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 have responsibilities with regards to facilitating required evacuations as advised from the Queensland Police Communication Centre or QPS membership from the Tablelands LDMG. Mt Garnett QPS have a Station Instruction relating to Crooks and Wyndham Dams EAP, this document should be reviewed annually following the EAP annual review to ensure consistency the current EAP.

With many smaller communities, the capacity of a specific volunteer group/organisation to fulfil a task like door knocking will be dependent on their member capacity and responsibilities already undertaken.

When a Request for Assistance (RFA) is received for a door knock, it may be that the fulfilment of this tasking could potentially be performed by other strains of emergency/community services.

6. Emergency Events and Action Activity Tables

In a flood and dam safety emergency situation, 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 events at Crooks and Wyndham Dams and Mt Garnet may be limited due to these resources being previously 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 Crooks and Wyndham Dams :-

- Flood Events – Section 6.1
- Chemical/Toxic Spill – Section 6.2
- Structural Issues – Section 6.3
- Earthquake/Sunny day Failure – Section 6.4
- Terrorist or High Energy Impact – Section 6.5

6.1 Flood Events

6.1.1 Estimate of Population at Risk (PAR)

The following table summarises the PAR as a guide to the possible number of persons at risk in the township of Mount Garnet. It also includes estimates of travel time for water discharging from Crooks Dam to reach the township of Mount Garnet and the duration of the peak inundation.

It should be noted that the events for this EAP are modelled on occurrences in Return Creek only and does not include any concurrent flooding from the catchment downstream of Crooks Dam. The catchment area downstream of Crooks Dam is about the same as that above the dam and the concurrent flooding may be in the same order as that for the dam. Table 3 - Summary of Population at Risk (PAR)

Flood Event	Event Description	Potential Failure PAR Dwellings	Flood Travel time to Mt Garnet	Minimum Duration of Inundation
Sunny Day Failure		Crooks - 0 Wyndham - 0	1.5 hour	0
1:50 AEP	Wyndham Fuse Plug triggers	No Data (ND)	Less than1.0 hour	4 hours
1:1,000 AEP	Wyndham DCF and	Crooks – ND Wyndham - 2	Less than1.0 hour	4 hours

	Crooks Fuse Plug triggers First PAR			
1:2,000 AEP		Crooks – 30 Wyndham - 8	Less than1.0 hour	4 hours
1:5,000 AEP	Wyndham CFF and Crooks CFF	Crooks – 38 Wyndham - 18	Less than1.0 hour	4 hours
1:20,000	Cascade failure Wyndham into Crooks	Crooks and Wyndham - 39	Less than1.0 hour	4 hours
1:100,000 AEP	Crooks DCF	Crooks – 32 Wyndham - ND	Less than 1.0 hour	4 hours
1:10,000,000 PMP Design Flood		Crooks - 35 Wyndham - 35	Less than 1.0 hour	4 hours

Crooks Dam does not have any controlled outlet works other than the spillways. There are no facilities available to lower the water level in Crooks Dam other than by providing temporary pumps.

Both Wyndham Dam and Crooks Dam have been provided with “fuse plug” spillways that provide additional spillway capacity for high rainfall / reservoir inflow events. The fuse plugs on each dam are triggered in response to water inflows to the reservoirs reaching the respective fuse plug trigger levels. The event triggers provided in Table 4 are an estimate of the probability of the event which would trigger the fuse plug being exceeded in any given year.

Table 4 - Dam Fuse Plug Trigger Inflow Events

Dam	Fuse Plug	Event Trigger
Wyndham Dam	Main Spillway Concrete Blocks	1:50 AEP
Crooks Dam	Left Abutment Fuse Plug	1:1,000 AEP
Wyndham Dam	Left Abutment Fuse Plug	1:1,000 AEP

It is important to note, that once the fuse plugs are triggered, the following can be expected:

- A rapid increase in stream flows and rise in water levels downstream of Crooks Dam;
- The dams will continue to release water until the water level reduces to below FSL; and
- There will be potential for damage downstream of the fuse plug.

6.1.2 Flood Durations

The travel time for a flood or change in flow conditions at Crooks Dam to impact on the township of Mt Garnet has been calculated to be less than 1.0 hour. A minimum duration of 4.0 hours high level inundation exceeding a minimum depth of 300mm can be expected in Mt Garnet.

6.1.3 Flood Depths

The FIA indicates there is no above ground flooding of houses in a sunny day event and all flooding events up to the 1:2,000 AEP event.
The evacuation trigger for of all impacted houses is at a conservative earlier stage equivalent

to the 1:1,000 AEP event before Wyndham reaches DCL, Crooks fuse plug triggers and the first houses are impacted.

Refer to Appendix 9 for Event Inundation Flood Mapping for various modelled flood events. The shaded flood extent areas (yellow, orange and red) outline areas likely to experience flooding depths in excess of 300mm.

Activity Table 1 – Flood Events - Summary of Crooks Dam Trigger Points and Actions

Crooks Dam Reservoir Water Level (RWL) and Trigger Points	Action at Trigger Point	Action if RWL is rising or RWL is steady and further heavy rainfall[1] is likely	Action if no further heavy rainfall is likely and RWL is falling
691.3m Water at spillway level			
691.3m – 692.0m	Notify TRC that water is likely to be flooding the downstream road causeway.	SOP 14 for minor flows applies (refer Appendix 8 – SOP 14 – Small to medium Spillway Overflows)	
692.0m End of SOP 14	Alert Status EEC notifies PAR, LDC that the EAP is activated		Stand Down when a receding trend is established, no additional rain in the catchment and RWL is less than 692.0m
692.0m – 693.0m		Monitor and report Update COM and LDC	
693.0m	Lean Forward Status Notify PAR Warning to LDC		
693.0m – 695.0m		Monitor and report Update COM, LDC and PAR	
695.0m	Stand Up Status WARNING TO PAR TO EVACUATE EVACUATE PAR WARNING TO LDC		Stand Down when a receding trend is established, no additional rain in the catchment and RWL is less than 692.0m
695.3m Fuse Plug Pilot Channel Invert Level 695.6m Fuse Plug Crest/Trigger Level		Monitor and report Update PAR Update LDC	Water receding. Continue to monitor and report. Update PAR and LDC until event is concluded. Notify PAR and LDC that the event is over. Conduct event reporting and review as required.

[1] **Heavy rainfall is considered to be in the order of 50mm/hr.**

Activity Table 2 – Flood Events - DIO Emergency Actions

Activation Status	**Normal Spillway Discharges SOP 14**	**Alert**	**Lean Forward**	**Stand Up**	**Stand Down**
Activation Trigger	Reservoir water level above EL 691.30m	Reservoir water level above EL 692.00m	Reservoir water level above EL 693.00m	Reservoir water level above EL 695.00m	Reservoir water level below EL 692.00m and falling
Actions	• Notify EEC • Continue weekly inspections (or as advised by DoR) • Log Book entry	• Notify EEC • Cease inspections when RWL is greater than EL 692.0m • Record data of the event and maintain an event log EER of all actions and communications if requested by EEC	• As per previous status,	• As per previous status	• Return to SOP 14 activation status in consultation with EEC, plus • Provide EER to EEC if requested • Identify any damage or irregularities when safe to do so and forward to EEC • Log Book entry • Inspections to recommence in consultation with EEC when RWL EL is less than 692.0m and falling and considered safe to do so.
Notifications	• EEC	• Notify EEC to activate EAP	• Provides updates as required if requested by EEC.	• Provides updates as required if requested by EEC	• Notify EEC before inspections recommence • Provide EER to EEC if requested

Activity Table 3 – Flood Events - EEC Emergency Action

Activation Status	**Normal Spillway Discharges SOP 14**	**Alert**	**Lean Forward**	**Stand Up**	**Stand Down**
Activation Trigger	Reservoir water level above (FSL) EL 691.30m	Reservoir water level above EL 692.00m	Reservoir water level above EL 693.00m	Reservoir water level above EL 695.00m	Reservoir water level below EL 692.00m and falling
Actions	• Notify LDC, Crooks Dam is spilling and the downstream causeway may be flooded • Follow SOP 14 • Notify that SOP 14 is in place, send Burst SMS Flooding SOP 14 • Notify COM • Notify LDC • Notify RDSWU • Notify DIO • Notify SES • Monitor RSAS and BOM as per Appendix 6	• As per previous status, plus • Activate EAP in consultation with COM • Notify of EAP Activation, send Burst SMS Flooding ALERT • Notify LDC • Notify PAR • Record data of the event and maintain an event log of all actions and communications • Provide updates to COM • Liaise with LDC as required	• As per previous status, plus • Escalate EAP in consultation with COM • Phone LDC, consider sending EWN and/or 'Dam Rainfall' Emergency Alert • Notify of status Escalation, send Burst SMS Flooding Lean Forward • Notify LDC • Notify PAR • Notify RSDWU • Notify DIO • Provide updates to COM • Liaise with LDC as required	• As per previous status, plus • Escalate EAP in consultation with COM • Phone LDC, consider sending Dam Failure Possible' Emergency Alert • Notify of status Escalation, send Burst SMS Flooding Stand Up • Notify LDC • Notify PAR • Notify RDSWU • Notify DIO • Provide updates to COM • Liaise with LDC as required	• De-activate EAP in consultation with COM • Phone LDC • Notify of status De-escalation and that the event is over • Recommend to DIO to recommence inspections once RWL EL is less than 692and falling and considered safe to do so. • Debrief with COM and other DoR staff as appropriate
Notifications and Warnings	• COM • LDC • RDSWU • DIO	• COM • LDC • PAR • RDSWU • DIO	• COM • LDC • PAR • RDSWU • DIO	• COM • LDC • PAR • RDSWU • DIO	• COM • LDC • PAR • RDSWU • DIO

Activity Table 4 - Flood Events - COM Emergency Actions

Activation Status	**Normal Spillway Discharges SOP 14**	**Alert**	**Lean Forward**	**Stand Up**	**Stand Down**
Activation Trigger	Reservoir water level above (FSL) EL 691.30m	Reservoir water level above EL 692.00m	Reservoir water level above EL 693.00m	Reservoir water level above EL 695.00m (Historical Maximum)	Reservoir water level below EL 692.00m and falling
Actions	• None	• Notify DM • Provide SitRep to DM	• Notify DM • Provide SitRep to DM	• Notify DM • Provide SitRep to DM	• Notify DM that the event is over with SitRep • Prepare and forward EER, if required to DM
Notifications and Warnings	• None	• DM • SitRep	• DM • SitRep	• DM • SitRep	• DM • SitRep • EER, if required

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Activity Table 5 - Flood Events - DM Emergency Actions

Activation Status	**Normal Spillway Discharges SOP 14**	**Alert**	**Lean Forward**	**Stand Up**	**Stand Down**
Activation Trigger	Reservoir water level above (FSL) EL 691.30m	Reservoir water level above EL 692.00m	Reservoir water level above EL 693.00m	Reservoir water level above EL 695.00m (Historical Maximum)	Reservoir water level below EL 692.00m and falling
Actions	• None	• Provide SitRep to stakeholders • Notify EDTS, DDS[1], DoREM, DDGGD and external stakeholders (including Police, LDMG, SDCC)	• Provide SitRep to stakeholders • Update EDTS, DDS[1], • DoREM, DDGGD and external stakeholders (including Police, LDMG, SDCC)	• Provide SitRep to stakeholders • Update EDTS, DDS[1], • DoREM, DDGGD and external stakeholders (including Police, LDMG, SDCC)	• Notify EDTS, DDS[1], DoREM, DDGGD and external stakeholders (including Police, LDMG, SDCC) that the event is over with SitRep • Review EER[2], if required and forward to DDS
Notifications and Warnings	• COM	• EDTS • DDS • DoREM • DDGGD • External stakeholders	• EDTS • DDS • DoREM • DDGGD • External stakeholders	• EDTS • DDS • DoREM • DDGGD • External stakeholders	• EDTS • DDS • DoREM • DDGGD • 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*

Activity Table 5 - Flood Events - DIO Communications

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Message Text
N/A	Request from EEC for special inspection	EEC	Phone	N/A

Activity Table 6 - Flood Events - EEC Communications

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Distribution List & Message Template	Message Text (subject to minor change by approval of DM) and (Subject to risk assessment and on ground situation, Refer to Section 1.8)
Normal Spillway Discharges SOP 14	Reservoir water level above (FSL) EL 691.30m Updates from RSAS and BoM	COM	Burst SMS	'Crooks, SOP 14 & Alert List' 'Crooks - Flooding SOP 14, EL 691.3m' Template	Department of Resources NOTIFICATION DAM: Crooks Dam EVENT: Flooding - SOP 14 STATUS: Dam Water level is above EL 691.3m with a slow/moderate/quick rate of rise. Low Spillway release will raise flows in Return Creek. Click on this link to track dam levels ACTION: Brownville Road may be closed UPDATE: Further updates will only be provided as required. (subject to minor change by approval of DM)
		LDC/TRC	SMS/Email		
		RDSWU	Burst SMS		
		DIO	Burst SMS		
Alert	Reservoir water level above EL 692.00m Updates from RSAS and BoM	COM	Burst SMS	'Crooks SOP 14 & Alert List' 'Crooks - Flooding ALERT, EL 692.0m' Template	Department of Resources NOTIFICATION DAM: Crooks Dam EVENT : Flooding – ALERT STATUS : – An increased release from the dam is happening now raising flows in Return Creek. The Dam Water Level is approaching/reached EL 692.0m and /raising/steady/falling slowly/moderately quickly/. Brownville Road will be closed. Click on this link to track dam levels ACTION: Monitor local weather conditions and forecasts. UPDATE: Further updates will only be provided as required. (subject to minor change by approval of DM)
		LDC	Burst SMS		
		PAR	Burst SMS		
		RDSWU	Burst SMS		
		DIO	Burst SMS		
Lean Forward		COM	Burst SMS		Department of Resources

	Reservoir water level above EL 693.00m Updates from RSAS and BoM	LDC	Phone first then Burst SMS	'Crooks Lean Forward & Stand Up List' 'Crooks - Flooding LEAN FORWARD EL 693.0m' Template	EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT : Flooding - LEAN FORWARD STATUS :– Moderate release from the dam is happening now rising flows in Return Creek The Dam Water Level is approaching/above EL 693.0m and rising/steady/slowly/quickly. The Dam Water Level that requires evacuation is 695.00m. Brownville road is closed. Click here to track dam levels ACTION: Click here to view Evacuation Plans, await further notifications, consider your evacuation preparedness. UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
		PAR	Burst SMS		
		RDSWU	Burst SMS		
		DIO	Burst SMS		
Stand Up	Reservoir water level above EL 695.00m (Historical Maximum) Updates from RSAS and BoM	COM	Burst SMS	'Crooks Lean Forward & Stand Up List' 'Crooks - Flooding STAND UP, EL 695.0m' Template	Department of Resources EMERGENCY WARNING DAM: Crooks Dam EVENT : Flooding - STAND UP STATUS : – Large flows from the dam are now occurring and downstream houses may be impacted. The Dam Water Level is approaching/reached the required evacuation level: EL 695.00m and rising/steady slowly/quickly. Brownville Road and Kennedy Highway Bridge will be closed. Click here to track dam levels ACTION: Click here to Follow your Evacuation Plan now, move to higher ground if safe to do so. More info TRC [redacted] www.dashboard.trc.qld.gov.au UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
		LDC	Phone first then Burst SMS		
		PAR	Burst SMS		
		RDSWU	Burst SMS		
		DIO	Burst SMS		
Stand Down		COM	Burst SMS	Either	Department of Resources

	Reservoir water level below EL 692.00m and falling Updates from RSAS and BoM	LDC	Phone first then Burst SMS	'Crooks SOP 14 & Alert List' or 'Crooks Lean Forward & Stand Up List' depending on highest activation level reached Crooks - Flooding STAND DOWN, EL 692.0m' Template	NOTIFICATION DAM: Crooks Dam EVENT : Flooding - STAND DOWN STATUS :– Event over, Dam Water Level below EL 692.00m and steady/falling. Click here to track dam levels ACTION: If needed contact SDRC TRC Call Centre [redacted] for more details or www.dashboard.trc.qld.gov.au, Brownville Road access will remain flooded check local conditions. UPDATE: No further updates. (subject to minor change by approval of DM)
		PAR	Burst SMS		
		RDSWU	Burst SMS		
		DIO	Burst SMS		

Activity Table 7 - Flood Events - COM Communications

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Message Text
Normal Spillway Discharges SOP 14	Reservoir water level above (FSL) EL 691.3.0m Updates from RSAS and BoM			
Alert	Reservoir water level above EL 692.00m Updates from RSAS and BoM	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Lean Forward	Reservoir water level above EL 693.00m Updates from RSAS and BoM	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Stand Up	Reservoir water level above EL 695.00m (Historical Maximum) Updates from RSAS and BoM	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Stand Down	Reservoir water level below EL 692.00m and falling Updates from RSAS and BoM	DM	SitRep Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.

Activity Table 9 - Flood Events - DM Communications

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Message Text
Normal Spillway Discharges SOP 14	Reservoir water level above (FSL) EL 691.3.0m Updates from RSAS and BoM	N/A		
Alert	Reservoir water level above EL 692.00m Updates from RSAS and BoM	EDTS DDS DoREM DDGGD External Stakeholders (including Police, LDMG, SDCC)	SitRep 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Lean Forward	Reservoir water level above EL 693.00m Updates from RSAS and BoM	EDTS DDS DoREM DDGGD External Stakeholders (including Police, LDMG, SDCC)	SitRep 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Stand Up	Reservoir water level above EL 695.00m (Historical Maximum) Updates from RSAS and BoM	EDTS DDS DoREM DDGGD External Stakeholders (including Police, LDMG, SDCC)	SitRep 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Stand Down	Reservoir water level below EL 692.00m and falling Updates from RSAS and BoM	EDTS DDS DoREM DDGGD External Stakeholders (including Police, LDMG, SDCC)	SitRep 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 DoR Senior Management. Refer to SitRep template in Section 1.1.

6.2 Structural/Sunny Day Failure Issues

Structural failure of the dams can occur when the storage level is at or below FSL, and 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 foundations.

The identification of structural concerns can be identified during any of the routine inspections carried out at the dam as described in Section 1.16.

6.2.1 Structural Concerns

Dam safety issues may include:

- Increasing rates of seepage or development of new seepage areas
- Embankment instability
- Displacement of the embankment
- Cracking of the embankment (either transverse cracking or longitudinal cracks)
- Development of seepage at the dam's downstream toe or through the dam abutments.

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 dam water level drains down.

It is unlikely that if a serious and developing dam safety issue is identified at the dam that it will be possible to undertake any repairs or mitigation during the event to arrest the issue from developing or to slow its development.

6.2.2 Sunny Day Failure

A "Sunny Day" failure is defined as failure of the dam and the release of water downstream, when there is low or no inflow to the dam from rainfall events. This type of dam failure is unexpected and can occur with little or no warning.

A "Sunny Day" failure may be as a result of any or a combination of the following:

- distress in the embankment including cracking or deformation
- abnormal instrument readings (piezometers indicating higher hydrostatic pressures)
- differential movement or settlement
- increasing rates of seepage or development of new seepage paths
- piping of the embankment

A sunny day failure 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.

Activity Table 10 - Structural/Sunny Day Failure - DIO Emergency Actions

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

Activity Table 11 - Structural/Sunny Day Failure - EEC Emergency Actions

Activation Level	Alert	Lean Forward	Stand Up	Stand Down
Activation Trigger	A structural concern has been identified **AND** • No change detected during inspection	A structural concern has been identified **AND** • Change detected during inspection **OR** • A possible failure seepage path has been identified	Failure in progress or possible, seepage increasing and/or cloudy.	Risk Assessment has determined that structural risk has reduced
Actions	• Activate EAP in consultation with COM • Notify of EAP Activation • Notify LDC downstream causeway may be at risk • Notify DIO • Notify , PAR and RDSWU that EAP is activated • Provide Updates to COM	• Escalate EAP in consultation with COM • Notify LDC, PAR, DIO, RDSWU • Make preparations for mobilisation of remedial work materials and machinery if required • Provide Updates to COM	• Escalate EAP in consultation with COM • As per previous activation level plus • WARNING to LDC • WARNING to PAR • Notify RDSWU, DIO • Provide Updates to COM	• De-activate EAP in consultation with COM • Notify LDC, PAR, DIO and RDSWU that the event is over • Prepare and forward EER[2], if required to COM
Notifications and Warnings	• COM • LDC • DIO	• COM • LDC • PAR • DIO • RDSWU	• COM • LDC • PAR • RDSWU • DIO	• COM • LDC • PAR • RDSWU • DIO

[2]Forward Emergency Event Report (EER) to COM within 30 days of the event as specified in the *Water Supply (Safety and Reliability) Act 2008*

Activity Table 12 - Structural/Sunny Day Failure - COM Emergency Actions

Activation Level	**Alert**	**Lean Forward**	**Stand Up**	**Stand Down**
Activation Trigger	A structural concern has been identified **AND** • No change detected during inspection	A structural concern has been identified **AND** • Change detected during inspection **OR** • A possible failure seepage path has been identified	Failure in progress or possible, seepage increasing and/or cloudy	Risk Assessment has determined that structural risk has reduced
Actions	• Notify DM • Provide SitRep to DM	• Update DM • Provide SitRep to DM	• As per previous activation level • Provide SitRep to DM	• Notify DM that the event is over with SitRep • Prepare and forward EER, if required to DM
Notifications and Warnings	• DM • SitRep	• DM • SitRep	• DM • SitRep	• DM

Activity Table 13 - Structural/Sunny Day Failure - DM Emergency Actions

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

[1] Notify DDS within 48 hours of event, [2]Forward Emergency Event Report (EER) to DDS within 30 working days of the event as specified in the *Water Supply (Safety and Reliability) Act 2008*

Activity Table 84 – Structural/Sunny Day Failure - DIO Communications

Activation Level	Trigger for Communications	Contact Priority Order	Methods	Message Text
N/A	Request from EEC for special inspection	EEC	Phone	N/A

Activity Table 15 - Structural/Sunny Day Failure - EEC Communications

Activation Level	Trigger for Communications	Contact Priority Order	Methods	Distribution List and Message Template	Message Text (subject to minor change by approval of DM) and (Subject to risk assessment and on ground situation, Refer to Section 1.8)
Alert	A structural concern has been identified **AND** • No change detected during inspection	COM	Burst SMS	'Crooks, SOP 14 & Alert List' Crooks - Structural ALERT customized 'Blank Template'	Department of Resources NOTIFICATION DAM: Crooks Dam EVENT :Structural Concerns STATUS : ALERT - EAP ACTIVATED, Investigation underway Action: Houses are not at risk UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
		LDC	Phone first then Burst SMS		
		DIO	Burst SMS		
Lean Forward	A structural concern has been identified **AND** • Change detected during inspection **OR** • A possible failure seepage path has been identified	COM	Burst SMS	'Crooks Lean Forward & Stand Up List' Crooks - Structural LEAN FORWARD customized 'Blank Template'	Department of Resources EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT : Structural Concerns STATUS : LEAN FORWARD, Dam affected, surveillance continuing Action: Houses are not at risk UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
		LDC	Phone first then Burst SMS		
		PAR	Burst SMS		
		DIO	Burst SMS		
		RDSWU	Burst SMS		
Stand Up	Failure in progress or possible, seepage increasing and/or cloudy	COM	Burst SMS	'Crooks Lean Forward & Stand Up List' Crooks -	Department of Resources EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT : Structural Concerns STATUS : STAND UP – Dam failure in progress
		LDC	Phone then Burst SMS		
		PAR	Burst SMS		

Activation Level	Trigger for Communications	Contact Priority Order	Methods	Distribution List and Message Template	Message Text (subject to minor change by approval of DM) and (Subject to risk assessment and on ground situation, Refer to Section 1.8)
		DIO	Burst SMS	Structural STAND UP customized 'Blank Template'	ACTION: Flood water will be contained in waterways, houses are not at risk. Follow emergency services instructions. More info TRC www.dashboard.trc.qld.gov.au UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
		RDSWU	Burst SMS		
Stand Down	Risk Assessment has determined that structural risk has reduced	COM	Burst SMS	Either 'Crooks SOP 14 & Alert List' or 'Crooks Lean Forward & Stand Up List' depending on highest activation level reached Crooks Structural STAND DOWN customized 'Blank Template'	Department of Resources NOTIFICATION DAM: Crooks Dam EVENT : Structural Concerns STATUS : STAND DOWN, Event over ACTION : More info TRC www.dashboard.trc.qld.gov.au UPDATE: No further updates (subject to minor change by approval of DM)
		LDC	Phone then Burst SMS		
		PAR	Burst SMS		
		DIO	Burst SMS		
		RDSWU	Burst SMS		

Activity Table 16 - Structural/Sunny Day Failure - COM Communications

Activation Level	Trigger for Communications	Contact Priority Order	Methods	Message Text
Alert	A structural concern has been identified **AND** • No change detected during inspection	DM	SitRep Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Lean Forward	A structural concern has been identified **AND** • Change detected during inspection **OR** • A possible failure seepage path has been identified	DM	SitRep Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Stand Up	Failure in progress or possible, seepage increasing and/or cloudy	DM	SitRep Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Stand Down	Risk Assessment has determined that structural risk has reduced	DM	SitRep Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.

Activity Table 17- Structural/Sunny Day Failure - DM Communications

Activation Level	Trigger for Communications	Contact Priority Order	Methods	Message Text
Alert	A structural concern has been identified **AND** • No change detected during inspection	EDTS DDS DoREM DDGGD External Stakeholders (including Police, LDMG, SDCC)	SitRep 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Lean Forward	A structural concern has been identified **AND** • Change detected during inspection **OR** • A possible failure seepage path has been identified	EDTS DDS DoREM DDGGD External Stakeholders (including Police, LDMG, SDCC)	SitRep 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Stand Up	Structural damage Failure in progress or possible, seepage increasing and/or cloudy	EDTS DDS DoREM DDGGD External Stakeholders (including Police, LDMG, SDCC)	SitRep 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Stand Down	Risk Assessment has determined that structural risk has reduced	EDTS DDS DoREM DDGGD External Stakeholders	SitRep 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 DoR Senior Management. Refer to SitRep template in Section 1.1.

Activation Level	Trigger for Communications	Contact Priority Order	Methods	Message Text
		(including Police, LDMG, SDCC)		

6.3 Chemical/Toxic Spill Event

6.3.1 Contamination in the Reservoir or Catchment

The discharge of a toxic spill into the dam or its catchment may have an impact on the upstream and downstream riparian water users.

During periods of dry weather (no discharges from the dam) any contamination will be fully contained within the impounded water of the dam.

Contamination may occur by either biological processes in the water reservoir itself or by chemical pollution from incidents/activities in the dam catchment.

In the event that contamination occurs prior to or during a period when water is discharging through the spillway, the contamination and impacted area may be transferred further downstream.

6.3.2 Biological Contamination

Biological events within the dam water storage itself can result in its contamination. These events 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.

6.3.3 Toxic Inflows into the Storage

Contamination from toxic inflows could be from spill incidents or on-going leachate seepage from current or past activities in the dam catchment**.**

Activity Table 18 - Chemical/Toxic Spill Event - DIO Emergency Action

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 indicates that risk has reduced • Confirmation that significant contamination has not occurred • All clear WQ test result
Actions	• Notify EEC • Undertake investigations EER to confirm any reports if requested by EEC • Sketch, measure, photograph and locate its position in the reservoir/catchment • Collect samples if requested by EEC • Log Book entry	• Not Applicable	• Notify EEC • Update BGA warning sign indicator if directed • Log Book entry	• Prepare and forward EER including water test results, photos and sketches to EEC • Log Book entry • Return to routine activities and weekly inspections in consultation with EEC
Notifications	EEC	• Not Applicable	EEC	• EEC

Activity Table 19 - Chemical/Toxic Spill Event - EEC Emergency Action

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 indicates that risk has reduced • Confirmation that significant contamination has not occurred • All clear WQ test result
Actions	• Activate EAP in consultation with COM • Notify of EAP Activation • Notify LDC • Liaise with DIO • Seek advice for sampling and testing, Appendix 1,toxic spill contacts • Notify RDSWU • Record data of the event and maintain an event log of all actions and communications	• Not Applicable	• Escalate EAP in consultation with COM • Phone LDC • Notify of status Escalation • WARNING to LDC • Notify DIO • WARNING to RDSWU not to use the water until further notice •	• De-activate EAP in consultation with COM • Phone LDC • Notify of EAP Stand Down • Notify LDC • Notify DIO • Notify RDSWU • Prepare and forward EER [2] to COM (if required)
Notifications and Warnings	• LDC • DIO • RDSWU • COM	• Not Applicable	• LDC • DIO • RDSWU • COM	• LDC • DIO • RDSWU • COM

[2]Forward Emergency Event Report (EER) to COM within 30 days of the event as specified in the *Water Supply (Safety and Reliability) Act 2008*

Activity Table 9 - Chemical/Toxic Spill Event - COM Emergency Action

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 indicates that risk has reduced • Confirmation that significant contamination has not occurred • All clear WQ test result
Actions	• Notify DM of EAP Activation with SitReps • Notify DDS[1] of EAP Activation	• Not Applicable	• Notify DM of EAP status escalation with SitReps • Notify DDS of EAP status escalation	• Notify DM that the event is over with SitRep • Notify DDS that the event is over • Prepare and forward EER to DM (if required)
Notifications and Warnings	• DM	• Not Applicable	• DM	• DM

Activity Table 21 - Chemical/Toxic Spill Event - DM Emergency Action

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 indicates that risk has reduced • Confirmation that significant contamination has not occurred • All clear WQ test result
Actions	• Notify of EAP Activation with SitReps • EDTS • DDS • DoREM • DDGGD • External Stakeholders	• Not Applicable	• Notify of status Escalation with SitReps and incident report • EDTS • DDS • DoREM • DDGGD • External Stakeholders	• Notify of EAP Stand Down with SitRep • EDTS • DoREM • DDGGD • External Stakeholders • Submit EER to DDS (if required)
Notifications and Warnings	• EDTS • DDS • DoREM • DDGGD • External Stakeholders	• None	• EDTS • DDS • DoREM • DDGGD • External Stakeholders	• EDTS • DDS • DoREM • DDGGD • External Stakeholders

Activity Table 22 - Chemical/Toxic Spill Event - DIO Communication

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Message Code	Message Text
Alert	Reports of contamination or potential contamination in the reservoir or catchment area	EEC	Phone		DIO NOTIFICATION DAM: Crooks Dam EVENT: Water Quality Contamination STATUS : ALERT – Investigation underway ACTION: STAND BY UPDATE: Next update due by XX am/pm
Lean Forward	Not Applicable				
Stand Up	Confirmation of or high probability of contamination found in the reservoir/catchment	EEC	Phone SMS		DIO EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT: Water Quality Contamination STATUS: STAND UP – Contamination Confirmed UPDATE: Next update due by XX am/pm
Stand Down	Risk Assessment indicates that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result	EEC	Phone SMS		DIO NOTIFICATION DAM: Crooks Dam EVENT: Water Quality Contamination STATUS : STAND DOWN – Event over ACTION: WATER SAFE TO USE

Activity Table 23 - Chemical/Toxic Spill Event - EEC Communication

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Distribution List and Message Template	Message Text (subject to minor change by approval of DM) and (Subject to risk assessment and on ground situation, Refer to Section 1.8)
Alert	Reports of contamination or potential contamination in the reservoir or catchment area	LDC	Burst SMS	'Crooks, SOP 14 & Alert List' Crooks - Quality ALERT customized 'Blank Template'	Department of Resources NOTIFICATION DAM: Crooks Dam EVENT : Water Quality Contamination STATUS : ALERT – EAP Activated, Investigation underway ACTION: AVOID ALL USE OR CONTACT WITH WATER UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
		DIO	Burst SMS		
		RDSWU	Burst SMS		
		COM	Burst SMS		
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 SMS	'Crooks Lean Forward & Stand Up List' Crooks - Quality STAND UP customized 'Blank Template'	Department of Resources EMERGENCY WARNING DAM: Crooks Dam EVENT : Water Quality Contamination STATUS : STAND UP – Contamination Confirmed ACTION: AVOID ALL USE OR CONTACT WITH WATER UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
		DIO	Burst SMS		
		RDSWU	Burst SMS		
		COM	Burst SMS		
Stand Down	Risk Assessment indicates that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result	LDC	Phone first then Burst SMS	Either 'Crooks SOP 14 & Alert List' or 'Crooks Lean Forward & Stand Up List' depending on highest activation level reached	Department of Resources NOTIFICATION DAM: Crooks Dam EVENT : Water Quality Contamination STATUS : STAND DOWN –Event over ACTION: WATER SAFE TO USE UPDATE: No further updates. (subject to minor change by approval of DM)
		DIO	Burst SMS		
		RDSWU	Burst SMS		
		COM	Burst SMS		

				Crooks - Quality STAND DOWN customized 'Blank Template'	

Activity Table 24 - Chemical/Toxic Spill Event - COM Communication

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Message Text
Alert	Reports of contamination or potential contamination in the reservoir or catchment area	DM	SitRep Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Lean Forward	Not Applicable			
Stand Up	Confirmation of or high probability of a large amount of contamination found in the reservoir/catchment	DM	SitRep Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Stand Down	Risk Assessment indicates that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result	DM	SitRep Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.

Activity Table 25 - Chemical/Toxic Spill Event - DM Communication

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Message Text
Alert	Reports of contamination or potential contamination in the reservoir or catchment area	EDTS DDS DoREM DDGGD External Stakeholders	SitRep 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Lean Forward	Not Applicable			
Stand Up	Confirmation of or high probability of a large amount of contamination found in the reservoir/catchment	EDTS DDS DoREM DDGGD External Stakeholders	SitRep 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Stand Down	Risk Assessment that risk has reduced Confirmation that significant contamination has not occurred All clear WQ test result	EDTS DDS DoREM DDGGD External Stakeholders	SitRep 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 DoR Senior Management. Refer to SitRep template in Section 1.1.

6.4 Terrorist or High Energy Impact

6.4.1 Sabotage or Vandalism

There is infrastructure located at Crooks and Wyndham Dams that may be the target of sabotage or vandalism. However there is no critical infrastructure that if interfered with is could to lead to a dam failure occurring or significant downstream release.

This infrastructure includes but is not limited to:

- Wyndham Dam through embankment outlet pipe
- Crooks Dam spillway weir sill
- RSAS
- Security fencing and safety signs
-

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

- Immediately report the incident to EEC,
- 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, and
- If possible and safe to do so, conduct a dam safety inspection to confirm if the incident has caused other damage to the dam.

Activity Table 26 - Terrorist or High Energy Impact - DIO Emergency Actions

Activation Status	Alert / Lean Forward	Stand Up 1	Stand Up 2	Stand Up 3	Stand Down
Activation Trigger	• Not Applicable	THREAT • Possible terrorist activity/suspicions noticed at the dam • Threat received	EVENT • Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit) **OR** • Threat confirmed	• Failure in progress or possible due to impact or explosion	Risk Assessment has determined that failure risk has reduced
Actions	• Not Applicable	• Notify Police on 000 • Notify EEC • Inspect dam with police and in consultation with EEC (if safe to do so) and ensure all security measures in place • Maintain photo record • Log Book entry • If police appoint incident manager, follow instructions	• As per previous activation level, plus • Inspect dam with police and in consultation with EEC (if safe to do so) • Undertake surveillance if requested by EEC • Log Book entry	• As per previous activation level, plus • Vacate the immediate vicinity of the embankment and downstream areas in consultation with EEC • Log Book entry	• Prepare and forward EER including photos and sketches to EEC • Dam Log Book is to be updated after every Emergency Event • Return to routine activities and weekly inspections in consultation with EEC (if safe to do so) • Log Book entry
Notifications	• Not Applicable	• Police on 000 • EEC	• Police on 000 • EEC	• Police on 000 • EEC	• Nil

Activity Table 27 - Terrorist or High Energy Impact - EEC Emergency Actions

Activation Status	**Alert**	**Lean Forward**	**Stand Up 1**	**Stand Up 2**	**Stand Up 3**	**Stand Down**
Activation Trigger	• Not Applicable		THREAT • Possible terrorist activity/suspicions noticed at the dam • Threat received	EVENT • Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit) **OR** • Threat confirmed	• Failure in progress or possible due to impact or explosion	Risk Assessment has determined that failure risk has reduced
Actions	• Not Applicable		• Activate EAP in consultation with COM • Notify LDC, DIO, RDSWU, PAR of EAP Activation • If police appoint incident manager support and follow instructions • Monitor situation and assess risks	• As per previous activation level	• As per previous activation level	• De-activation EAP in consultation with COM • Notify LDC, DIO, RDSWU, PAR of EAP • Prepare and forward EER[2] to COM if Stand UP 2 is reached and the dam requires remedial work
Notifications and Warnings	• Not Applicable		• LDC • DIO • RDSWU • PAR • COM	• LDC • DIO • RDSWU • PAR • COM	• LDC • DIO • RDSWU • PAR • COM	• LDC • DIO • RDSWU • PAR • COM

[2]Forward Emergency Event Report (EER) to COM within 30 days of the event as specified in the *Water Supply (Safety and Reliability) Act 2008*

Activity Table 28 - Terrorist or High Energy Impact - COM Emergency Actions

Activation Status	**Alert** / **Lean Forward**	**Stand Up 1**	**Stand Up 2**	**Stand Up 3**	**Stand Down**
Activation Trigger	• Not Applicable	THREAT • Possible terrorist activity/suspicions noticed at the dam • Threat received	EVENT • Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit) **OR** • Threat confirmed	• Failure in progress or possible due to impact or explosion	Risk Assessment has determined that failure risk has reduced
Actions	• None	• Notify DM • Provide SitRep to DM • 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[2] to DM (if required)
Notifications and Warnings	• None	• DM	• DM	• DM	• DM

Activity Table 29 - Terrorist or High Energy Impact - DM Emergency Actions

Activation Status	Alert / Lean Forward	Stand Up 1	Stand Up 2	Stand Up 3	Stand Down
Activation Trigger	• Not Applicable	THREAT • Possible terrorist activity/suspicions noticed at the dam • Threat received	EVENT • Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit) **OR** • Threat confirmed	• Failure in progress or possible due to impact or explosion	Risk Assessment has determined that failure risk has reduced
Actions	• None	• Provide SitRep EDTS, DDS[1], DoREM, DDGGD and external stakeholders (Police, LDMG, SDCC)	• Provide SitRep EDTS, DDS[1], DoREM, DDGGD and external stakeholders (Police, LDMG, SDCC)	• Provide SitRep EDTS, DDS[1], DoREM, DDGGD and external stakeholders (Police, LDMG, SDCC)	• Provide SitRep EDTS, DDS[1], DoREM, DDGGD and external stakeholders (Police, LDMG, SDCC) • Review EER[2], if required and forward to DDS
Notifications and Warnings	• None	• EDTS • DDS • DoREM • DDGGD • External Stakeholders (including Police, LDMG, SDCC)	• EDTS • DDS • DoREM • DDGGD • External Stakeholders (including Police, LDMG, SDCC)	• EDTS • DDS • DoREM • DDGGD • External Stakeholders (including Police, LDMG, SDCC)	• EDTS • DDS • DoREM • DDGGD • External Stakeholders (including Police, LDMG, SDCC)

Activity Table 30 - Terrorist or High Energy Impact - DIO Communications

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Message Text
Alert	Not Applicable			
Lean Forward	Not Applicable			
Stand Up1	THREAT • Possible terrorist activity/suspicions noticed at the dam • Threat received	Police on 000	Phone	DIO EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT: Terrorist or High Energy Impact STATUS: STAND UP – Received/Noted Terrorist Threat UPDATE: Further updates will be provided as required.
		EEC	Phone	
Stand Up 2	EVENT • Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit) **OR** • Threat confirmed	Police on 000	Phone	DIO EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT: Terrorist or High Energy Impact STATUS: STAND UP – Large Explosion reported at dam UPDATE: Further updates will be provided as required.
		EEC	Phone	
Stand Up 3	• Failure in progress or possible due to impact or explosion	Police on 000	Phone	DIO EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT: Terrorist or High Energy Impact STATUS: STAND UP – Dam failure in progress UPDATE: Further updates will be provided as required.
		EEC	Phone	
Stand Down	Risk Assessment has determined that failure risk has reduced	EEC	Phone	DIO NOTIFICATION DAM: Crooks Dam EVENT: Terrorist or High Energy Impact. STATUS: STAND DOWN- Event over. UPDATE: No further updates.

Activity Table 31 - Terrorist or High Energy Impact - EEC Communications

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Distribution List and Message Template	Message Text (subject to minor change by approval of DM) and (Subject to risk assessment and on ground situation, Refer to Section 1.8)
Alert	Not Applicable				
Lean Forward	Not Applicable				
Stand Up1	THREAT • Possible terrorist activity/suspicions noticed at the dam • Threat received	Police on 000	Phone	Crooks Emergency Stand Up 1 'Crooks Lean Forward & Stand Up List' Crooks - Emergency STAND UP 1 customized 'Blank Template'	Department of Resources EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT : Terrorist or High Energy Impact STATUS : STAND UP- EAP Activated, Received/Noted Terrorist Threat ACTION: Emergency response activated, PAR notified, houses are not at risk. UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
		LDC	Phone first then Burst SMS		
		DIO	Phone first then Burst SMS		
		COM	Burst SMS		
Stand Up 2	EVENT • Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit) **OR** • Threat confirmed	Police on 000	Phone	Crooks Emergency Stand Up 2 'Crooks Lean Forward & Stand Up List' Crooks - Emergency STAND UP 2 customized 'Blank Template'	Department of Resources EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT : Terrorist or High Energy Impact STATUS : STAND UP – EAP Activated, Large Explosion reported at dam ACTION: Emergency response activated, PAR notified, houses are not at risk. UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
		LDC	Phone first then Burst SMS		
		DIO	Phone first then Burst SMS		
		COM	Burst SMS		
Stand Up 3	• Failure in progress or possible due to impact or explosion	Police on 000	Phone	Crooks Emergency Stand Up 3 'Crooks Lean Forward & Stand Up List' Crooks - Emergency	Department of Resources EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT : Terrorist or High Energy Impact DAM FAILURE IN PROGRESS STATUS : STAND UP – EAP Activated, Dam failure in progress
		LDC	Phone first then Burst SMS		
		DIO	Phone first then Burst SMS		
		RDSWU	Burst SMS		

		PAR	Burst SMS	STAND UP 3 customized 'Blank Template'	ACTION: Flood water will be contained in waterways, houses are not at risk. More info TRC www.dashboard.trc.qld.gov.au, UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
		COM	Burst SMS		
Stand Down	Risk Assessment has determined that failure risk has reduced	Police on 000	Phone	Crooks Emergency Stand Down	Department of Resources NOTIFICATION DAM: Crooks Dam EVENT : Terrorist or High Energy Impact STATUS: STAND DOWN – Event over ACTION: Stand Down, More info TRC www.dashboard.trc.qld.gov.au, UPDATE: No further updates (subject to minor change by approval of DM)
		LDC	Phone first then Burst SMS		
		DIO	Phone first then Burst SMS		
		RDSWU	Burst SMS		
		PAR	Burst SMS		
		COM	Burst SMS		

Activity Table 32 - Terrorist or High Energy Impact - COM Communications

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Message Text
Alert	Not Applicable			
Lean Forward	Not Applicable			
Stand Up1	THREAT • Possible terrorist activity/suspicions noticed at the dam • Threat received	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Stand Up 2	EVENT • Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit) **OR** • Threat confirmed	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Stand Up 3	• Failure in progress or possible due to impact or explosion	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Stand Down	Risk Assessment has determined that failure risk has reduced	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.

Activity Table 33 - Terrorist or High Energy Impact - DM Communications

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Message Text
Alert	Not Applicable			
Lean Forward	Not Applicable			
Stand Up1	THREAT • Possible terrorist activity/suspicions noticed at the dam • Threat received	EDTS DDS DoREM DDGGD 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Stand Up 2	EVENT • Large explosion heard/observed at dam (e.g. bomb explosion, aircraft hit) **OR** • Threat confirmed	EDTS DDS DoREM DDGGD 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Stand Up 3	• Failure in progress or possible due to impact or explosion	EDTS DDS DoREM DDGGD 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Stand Down	Risk Assessment has determined that failure risk has reduced	EDTS DDS DoREM DDGGD 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 DoR Senior Management. Refer to SitRep template in Section 1.1.

6.5 Earthquake

The embankment slopes are considered low and not highly prone to slipping however an Earthquake event in close proximity to Crooks Dam and Wyndham could to lead to the following issues:

- Cracking of the embankment;
- Slipping or slumping of the embankment and fuse plug;
- Increased rate of seepage;
- Damage to the concrete spillway nib wall;
- Slumping of the sides of the fuse plug channel.

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;
- 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

Activity Table 34 - Earthquake - DIO Emergency Actions

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Down
Activation Trigger	Earthquake reported or felt in the area **AND** Intensity less than or equal to 5MM **AND** Change detected during surveillance •	Earthquake reported or felt in the area **AND** Intensity greater than 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 and DIO Backup Officer • Inspect the Dam Wall, Spillway, Abutments and Fuse Plug (if safe to do so) and report to EEC for leaks • Check for leaks, deformation, erosion and concrete damage • Maintain photographic record • Record data of the event and maintain an event log of all actions and communications • Log Book entry	• As per previous activation level; plus • Repeat the inspection as directed by EEC • Provide inspection report to EEC	• As per previous activation level • Support/ supervise remedial works as required • Maintain surveillance of the area immediately downstream • Log Book entry	• As per previous activation level	• Prepare and forward EER including photos to COM • Dam Log Book is to be updated after every Emergency Event • Return to routine activities and weekly inspections if it is safe to do so, in consultation with EEC
Notifications	• EEC and DIO Backup Officer • Campers	• As per previous activation level • EEC	• As per previous activation level	• As per previous activation level	• COM • EEC

Activity Table 35 - Earthquake - EEC Emergency Actions

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Down
Activation Trigger	Earthquake reported or felt in the area **AND** Intensity less than or equal to 5MM **AND** Change detected during surveillance •	Earthquake reported or felt in the area **AND** Intensity greater than 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 the EAP in consultation with COM • Notify COM, LDC, DDMG DIO, RDSWU •	• Escalate EAP in consultation with COM • Notify DIO, COM, LDC, DDMG, PAR • Investigate availability of machinery and materials (if sufficient stockpiles available) • Place machinery operators on stand by • Provide SitRep to COM	• As per previous activation level • Provide SitRep to COM	• As per previous activation level • WARNING to LDC • WARNING to PAR • Provide SitRep to COM	• Notify COM, LDC, DDMG, PAR DIO, RDSWU that the event is over •
Notifications and Warnings	• COM • LDC • DDMG • DIO • RDSWU	• COM • LDC • DDMG • PAR • DIO SitRep	• COM • LDC • DDMG • PAR • DIO SitRep	• COM • LDC, DDMG • PAR • DIO • SitRep	• COM • LDC, DDMG • PAR • RDSWU DIO

[2]Forward Emergency Event Report (EER) to COM within 30 days of the event as specified in the *Water Supply (Safety and Reliability) Act 2008*

Activity Table 36 - Earthquake - COM Emergency Actions

Activation Status	**Alert**	**Lean Forward**	**Stand Up 1**	**Stand Up 2**	**Stand Down**
Activation Trigger	Earthquake reported or felt in the area **AND** Intensity less than or equal to 5MM **AND** Change detected during surveillance •	Earthquake reported or felt in the area **AND** Intensity greater than 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	• Update DM • Provide SitRep to DM	• Update DM • Provide SitRep to DM	•	• Notify DM of EAP Stand Down with SitRep • Prepare and forward EER if required, to DM
Notifications and Warnings	• DM	• DM	• DM	•	• DM

Activity Table 37 - Earthquake - DM Emergency Actions

Activation Status	Alert	Lean Forward	Stand Up 1	Stand Up 2	Stand Down
Activation Trigger	Earthquake reported or felt in the area **AND** Intensity less than or equal to 5MM **AND** Change detected during surveillance •	Earthquake reported or felt in the area **AND** Intensity greater than 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 of EAP Activation • EDTS • DDS • DoREM • DDGGD External Stakeholders (including Police, LDMG, SDCC)	• Notify of EAP Activation • EDTS • DDS • DoREM • DDGGD • External Stakeholders (including Police, LDMG, SDCC)	• Provide SitRep EDTS, DDS[1], DoREM, DDGGEO and external stakeholders (Police, LDMG, SDCC) •	• Provide SitRep EDTS, DDS[1], DoREM, DDGGEO and external stakeholders (Police, LDMG, SDCC)	• Provide SitRep EDTS, DDS[1], DoREM, DDGGEO and external stakeholders (Police, LDMG, SDCC) • Review EER[2] if required, and forward to DDS •
Notifications and Warnings	• None	• EDTS • DDS • DoREM • DDGGD • External Stakeholders (including Police, LDMG, SDCC)	• EDTS • DDS • DoREM • DDGGD • External Stakeholders (including Police, LDMG, SDCC)	• EDTS • DDS • DoREM • DDGGD • External Stakeholders (including Police, LDMG, SDCC)	• EDTS • DDS • DoREM • DDGGD • External Stakeholders (including Police, LDMG, SDCC)

Activity Table 38 - Earthquake - DIO Communications

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Message Text
Alert	Earthquake reported or felt in the area **AND** Intensity less than or equal to 5MM **AND** Change detected during surveillance	EEC	Phone	DIO NOTIFICATION DAM: Crooks Dam EVENT: Earthquake STATUS: ALERT - Earthquake reported or felt in the area, Investigation underway UPDATE: Further updates will be provided as required.
Lean Forward	Earthquake reported or felt in the area **AND** Intensity greater than or equal to 5MM **AND** Change detected during surveillance	EEC	Phone	DIO EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT: Earthquake STATUS: LEAN FORWARD – Earthquake confirmed, dam affected, surveillance continuing Reservoir Water level: XXX.XXm AHD UPDATE: Further updates will be provided as required.
Stand Up1	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: Crooks Dam EVENT: Earthquake STATUS: STAND UP – Dam failure in progress Reservoir Water level: XXX.XXm AHD UPDATE: Further updates will be provided as required.
Stand Up 2	Failure possible or in progress due to earthquake	EEC, LDC	Phone	Crooks Quake Stand Up 2

Stand Down	Risk Assessment has determined that failure risk has reduced	LDC	Phone first then Burst SMS	Crooks Quake Stand Down

Activity Table 39 - Earthquake - EEC Communications

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Distribution List and Message Template	Message Text (subject to minor change by approval of DM) and (Subject to risk assessment and on ground situation, Refer to Section 1.8)
Alert	Earthquake reported or felt in the area Intensity less than 5 M/MM **AND** No change detected during surveillance inspection	COM LDC DIO	Burst SMS Burst SMS Burst SMS	Crooks Quake Alert	Department of Resources NOTIFICATION DAM: Crooks Dam EVENT: Earthquake STATUS : ALERT – EAP Activated, Unconfirmed ACTION: PAR notified, houses are not at risk. UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
Lean Forward	Earthquake reported or felt in the area **AND** Intensity <u>greater than</u> or equal to 5MM **AND** Change detected during surveillance •	LDC DIO RDSWU PAR COM	Phone first then Burst SMS Burst SMS Burst SMS Burst SMS Burst SMS	Crooks Quake Lean Forward	Department of Resources EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT: Earthquake STATUS: LEAN FORWARD – EAP Activated, Earthquake confirmed, dam affected, surveillance continuing ACTION: PAR notified, houses are not at risk. UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)

Stand Up 1	Earthquake reported or felt in the area **AND** Change detected during surveillance **AND** A possible failure path has been identified	LDC DIO RDSWU PAR COM	Phone first then Burst SMS Burst SMS Burst SMS Burst SMS Burst SMS	Crooks Quake Stand Up 1	Department of Resources EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT: Earthquake STATUS : STAND UP – Potential Dam failure ACTION: Flood water will be contained in waterways, houses are not at risk. More info TRC [redacted] www.dashboard.trc.qld.gov.au, UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
Stand Up 2	Failure possible or in progress due to earthquake	LDC DIO RDSWU PAR COM	Phone first then Burst SMS Burst SMS Burst SMS Burst SMS Burst SMS	Crooks Quake Stand Up 2	Department of Resources EMERGENCY NOTIFICATION DAM: Crooks Dam EVENT: Earthquake STATUS : STAND UP – Dam failure in progress ACTION: Flood water will be contained in waterways, houses are not at risk. More info TRC [redacted] www.dashboard.trc.qld.gov.au, UPDATE: Further updates will be provided as required. (subject to minor change by approval of DM)
Stand Down	Risk Assessment has determined that failure risk has reduced	LDC DIO RDSWU PAR COM	Phone first then Burst SMS Burst SMS Burst SMS Burst SMS Burst SMS	Crooks Quake Stand Down	Department of Resources NOTIFICATION DAM: Crooks Dam EVENT: Earthquake STATUS : STAND DOWN – Event over ACTION: Stand Down, More info TRC [redacted] www.dashboard.trc.qld.gov.au,. UPDATE: No further updates (subject to minor change by approval of DM)

+

Activity Table 40 - Earthquake - COM Communications

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Message Text
Alert	Earthquake reported or felt in the area **AND** Intensity less than or equal to 5MM **AND** Change detected during surveillance	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Lean Forward	Earthquake reported or felt in the area **AND** Intensity greater than or equal to 5MM **AND** Change detected during surveillance •	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.
Stand Up 1	Earthquake reported or felt in the area **AND** Intensity greater than or equal to 5MM **AND** Change detected during surveillance **EAP activated**	DM	SitReps Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.

Stand Up 2	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	Internal SitReps are prepared by the COM 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 1.1.
Stand Down	Risk Assessment has determined that failure risk has reduced	DM	SitRep Phone SMS Email	Internal SitReps are prepared by the COM 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 1.1.

Activity Table 41 - Earthquake - DM Communications

Activation Status	Trigger for Communications	Contact Groups (in Priority Order)	Methods	Message Text
Alert	Earthquake reported or felt in the area **AND** Intensity less than or equal to 5MM **AND** Change detected during surveillance	EDTS DDS DoREM DDGGD External stakeholders (Police, LDMG, SDCC)	SitReps SMS 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Lean Forward	Earthquake reported or felt in the area **AND** Intensity greater than or equal to 5MM **AND** Change detected during surveillance •	EDTS DDS DoREM DDGGD External stakeholders (Police, LDMG, SDCC)	SitReps SMS 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 DoR Senior Management. Refer to SitRep template in Section 1.1.
Stand Up 1	Earthquake reported or felt in the area **AND** Intensity greater than or equal to 5MM **AND** Change detected during surveillance	EDTS DDS DoREM DDGGD External stakeholders (Police, LDMG, SDCC)	SitReps SMS 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 DoR Senior Management. Refer to SitRep template in Section 1.1.

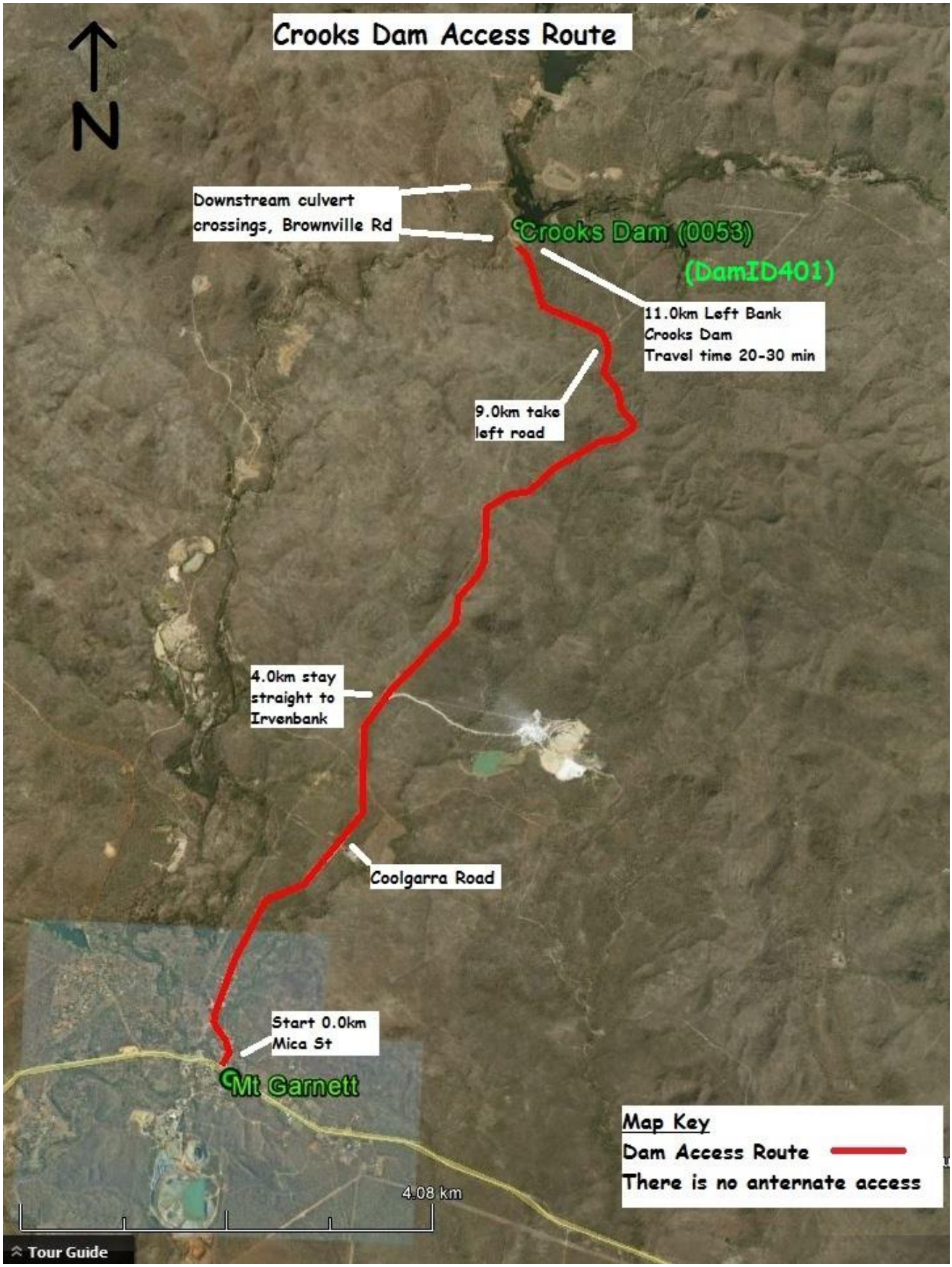
Stand Up 2	Earthquake reported or felt in the area **AND** Change detected during surveillance **AND** A possible failure path has been identified	EDTS DDS DoREM DDGGD External stakeholders (Police, LDMG, SDCC)	SitReps SMS Phone SMS Email	External SitReps are escalated by the DM as required to suit the circumstances including a summary dam(s) event status, hazards and required actions. These SitReps will be distributed by Email to the EMT and DoR Senior Management. Refer to SitRep template in Section 1.1.
Stand Down	Risk Assessment has determined that failure risk has reduced	EDTS DDS DoREM DDGGD External stakeholders (Police, LDMG, SDCC)	SitReps SMS 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 DoR Senior Management. Refer to SitRep template in Section 1.1.

APPENDIX 1
NOTIFICATION LISTS AND CONTACT DETAILS

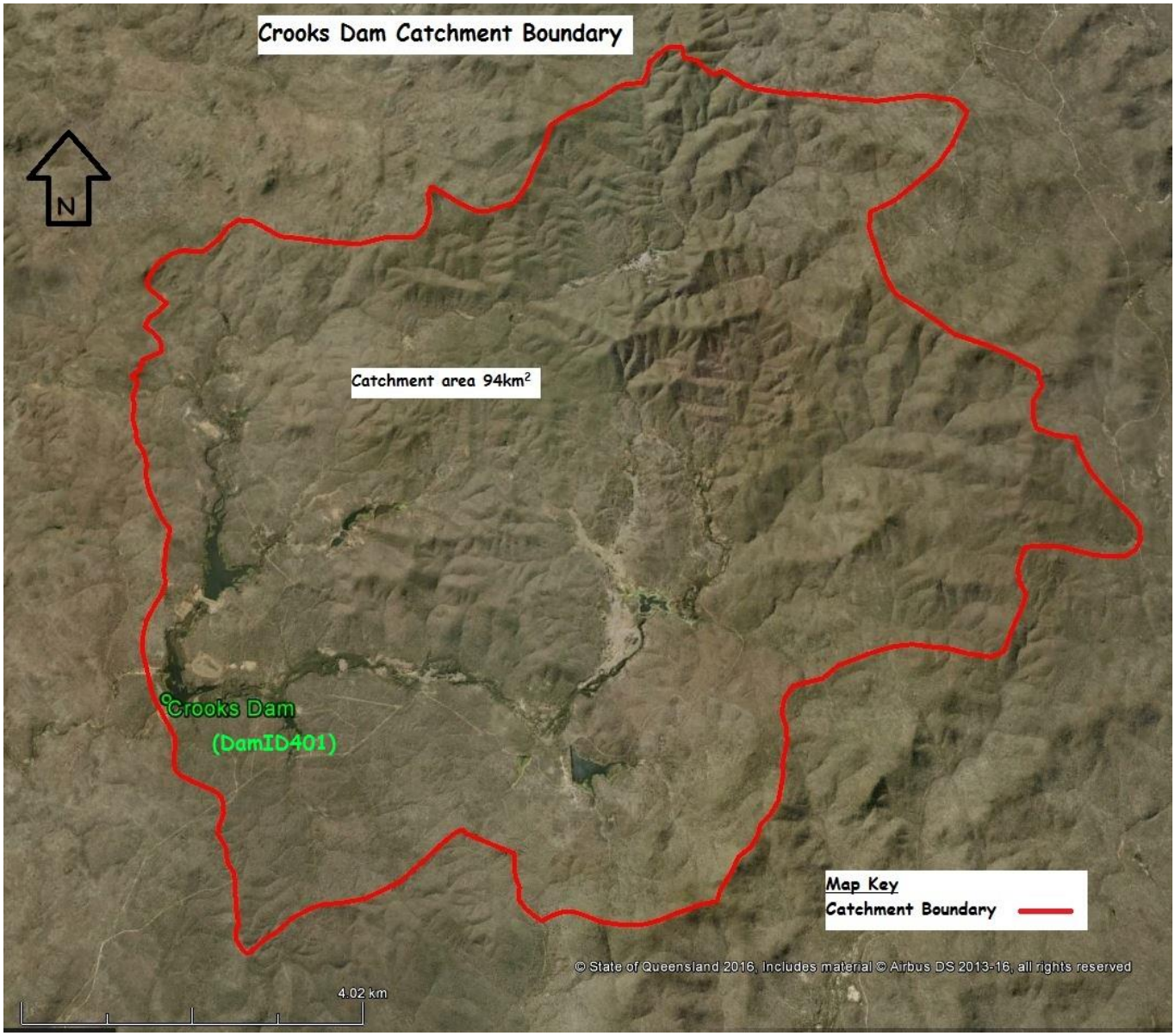
Appendix 1 has been redacted

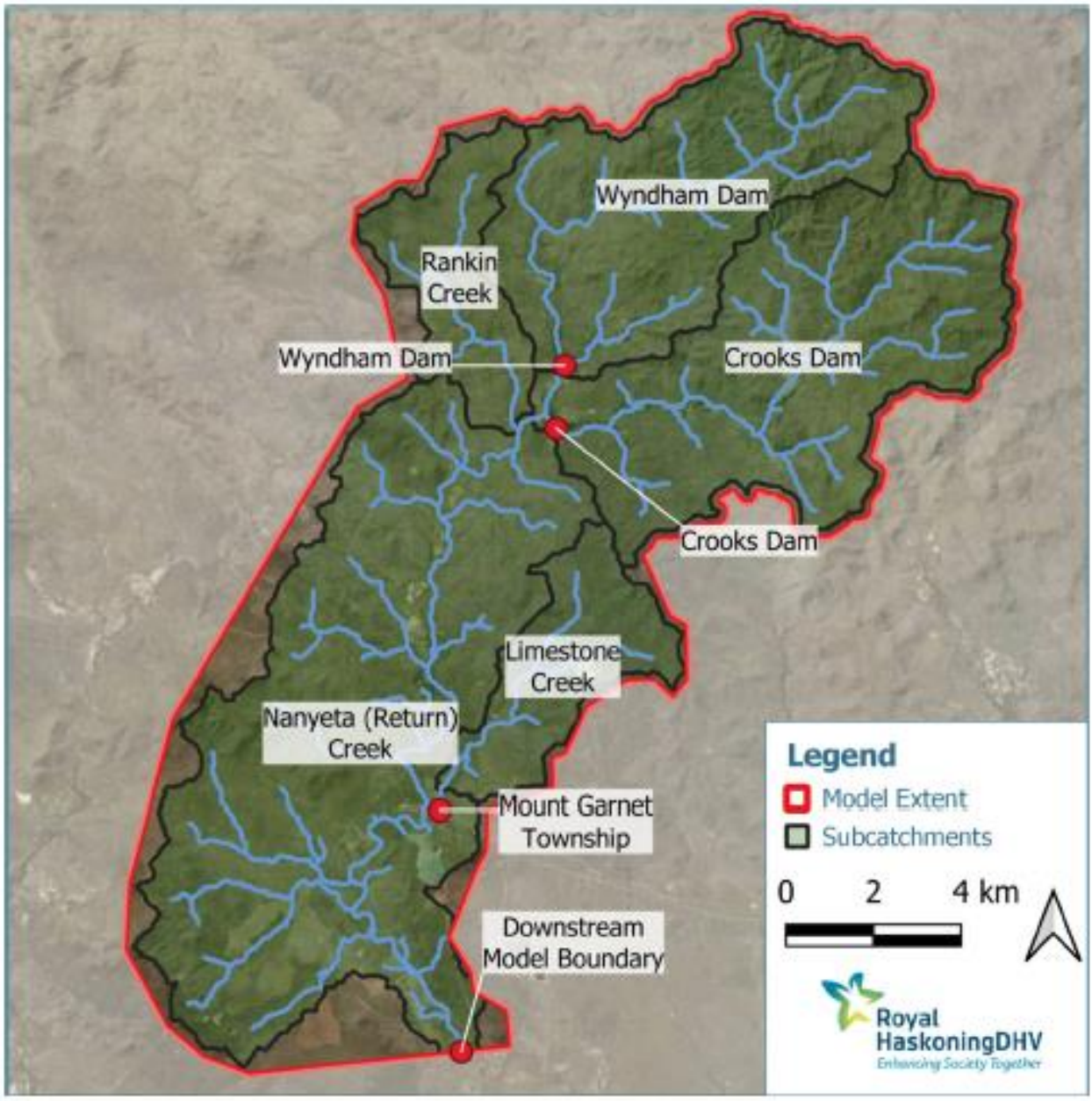
APPENDIX 2
CROOKS and WYNDHAM DAMS LOCALITY PLAN & ACCESS ROUTE

N
Wyndham Reservoir
Wyndham Dam Embankment
Crooks Reservoir
Crooks Dam Embankment
Nanyeta Creek
Kennedy Highway
Mount Garnet


Crooks Dam Access Route
N
Downstream culvert crossings, Brownville Rd
Crooks Dam (0053)
(DamID401)
11.0km Left Bank Crooks Dam Travel time 20-30 min
9.0km take left road
4.0km stay straight to Irvenbank
Coolgarra Road
Start 0.0km Mica St
Mt Garnett
Map Key
Dam Access Route
There is no anternate access
4.08 km
Tour Guide

APPENDIX 3
CROOKS and WYNDHAM DAM CATCHMENT BOUNDARY PLANS
(CROOKS AND WYNDHAM DAMS)


Crooks Dam Catchment Boundary
N
Catchment area 94km²
Crooks Dam
(DamID401)
Map Key
Catchment Boundary
© State of Queensland 2016, Includes material © Airbus DS 2013-16, all rights reserved
4.02 km


Wyndham Dam
Rankin Creek
Wyndham Dam
Crooks Dam
Crooks Dam
Limestone Creek
Nanyeta (Return) Creek
Mount Garnet Township
Downstream Model Boundary
Legend
Model Extent
Subcatchments
0 2 4 km
Royal HaskoningDHV
Enhancing Society Together

APPENDIX 4
INSPECTION SAFETY PROTOCOL

All personnel who visit the dam sites are to observe this protocol.

(1) Two officers must be present at each inspection, as per Induction training.
(2) Inspections are to be carried out when conditions are deemed to be safe as per inspection and risk assessment/s.
(3) Officers on site should carry suitable primary communication devices such as mobile phones and satellite phones and consider suitable backup communication devices such as UHF, VHF spot trackers as required in approved risk assessments.
(4) During an emergency event access to the dam structure, main spillway and fuse plug emergency spillways is not to be made by boat.
(5) Only personnel authorised by the EEC or COM are to visit the dam site during dam hazard or dam emergency events.

For more detailed Safe Work Practice procedures and requirements refer to SOP – 4 – Safety and Health.

APPENDIX 5
POTENTIAL PROBLEM IDENTIFICATION

INSPECTION OF EMBANKMENT DAMS

INSPECTING FOR DEFICIENCIES: SUMMARY

TYPE OF DEFICIENCY	LOOK FOR
SEEPAGE	A water flow or sand boil on the lower portion of the downstream slope or toe area, especially at the groins. Wet areas or areas where the vegetation appears greener or lusher on the embankment slope or toe area. 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.) Turbidity or cloudiness of the seepage.
CRACKING	Desiccation Cracking: A random honeycomb pattern of cracks usually found on the crest and the downstream slope. Transverse Cracking: Cracks that are perpendicular to the length of the dam usually found on the crest. Longitudinal Cracking: Cracks that are parallel to the length of the dam. Longitudinal cracks may be associated with stability problems in the slopes.
INSTABILITY	Slides on the upstream or downstream slopes. Bulging, especially at the toe of the dam.
DEPRESSIONS	Misalignment in the crest and embankment slopes found by sighting along fixed points. Sinkholes found by checking and probing each depression, if safe to do so. Remember, sinkholes have steep, bucket like sides while minor depressions have gently sloping, bowl like sides.
MAINTENANCE CONCERNS	Inadequate Slope Protection: Check for bald areas or areas where the protection is sparse or damaged. 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. Inappropriate Vegetative Growth: Check for excessive and deep rooted vegetative growth. Debris: Check for debris on and around the dam, especially near the spillways. Animal Burrows: Check for damage caused by burrowing animals.

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

WHEN TO GET FURTHER ASSISTANCE

Several of the deficiencies covered in this unit are very serious. If you observe any of the following deficiencies, you need to advise the Emergency Event Coordinator (EEC):

- 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 need to notify the EEC.

APPENDIX 6
WEATHER MONITORING, RSAS, BOM and RAINFALL DURATION CURVES

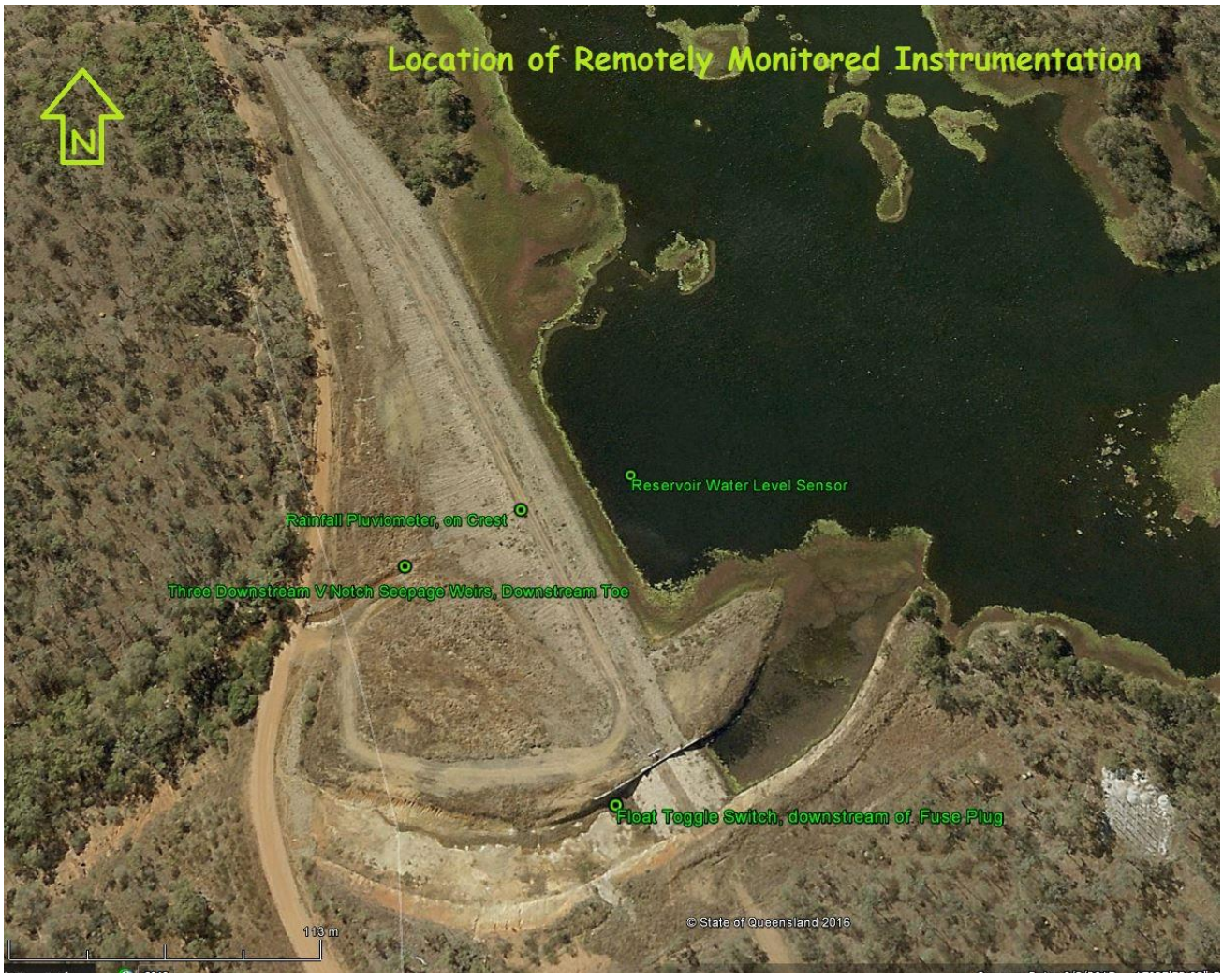
Remote Sensing and Alert System (RSAS)

The RSAS provides two primary functions

1) Displays monitored instrumentation on the RSAS Portal providing real time, hourly updates of the following storage attributes
- Storage (Reservoir) level (m)
- Cumulative Rainfall (mm)
- Three V Notch weirs (m), measuring downstream seepage
- Fuse plug toggle switch (On/Off) to indicate fuse plug triggering
- CCTV real time observation and photographs

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

The location of the remotely monitored Instrumentation is outlined below update map reqd CCTV & storage boards



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, intemperate data and make decisions including issuing directions and initiating emergency messaging.

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

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 SOP14 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 COM 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.

If an Activation Trigger is received, Stand Up, EL 695.0m, sampling frequency will increase to every half hour while the RWL remains above 695.0m.

Logging in to the Qteq Portal to view storage attributes

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 DoR dam monitoring sites, inclusive Crooks 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

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 resources 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 and likely timing of triggering of the fuse plug; Plotting of rainfall to identify if the storm event is still developing or has passed; and
- Obtaining overall rainfall totals for the site.

RSAS Output/Readings Guide

RSAS Output/Readings	Possible Interpretation
Reservoir Water Level	
Rapidly falling reservoir water level (>0.1m per hour). Dry Weather (no rainfall recorded)	Sunny Day failure of Crooks Dam.
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 of Crooks Dam developing or has occurred.
Downstream V-Notch Weirs	
Rapid rise in one or more V notch weir water level(s) (>0.01m per hour)	Flow of water through Crooks Dam Embankment indicating the possible development of a crack or failure mechanism has occurred. If combined with high intensity rainfall it could be caused by localised overland flow downstream of the embankment
Rainfall Gauge	
Rapid Rise in Rain Fall	High intensity rainfall event occurring over the dam.
Fuse Plug Float Switch	
Fuse plug switch activated.	• Discharges over fuse plug crest or through the fuse plug embankment; • Fuse Plug Spillway triggered; • High localised rainfall.

Automatic SMS alerts

Crooks Dam
The following pre-set levels are programmed to send an SMS trigger message to the DoR RSAS Notification telephone list below and the RSAS.

Storage Levels

EL 691.30 m (Reset 691.1 m)	Main Spillway Crest Level SOP 14
EL 692.00 m	ALERT level
EL 692.56 m	**LEAN FORWARD** level
EL 695.00 m	STAND UP level
EL 695.30 m	Auxiliary Spillway –Fuse Plug Crest Level
EL 696.00 m	0.3m below Main Embankment Crest

V-Notches 100 mm for each of the three (3) V-Notches
(is over 50 mm higher than highest past reading)

Auxiliary Spillway Channel Float Switch activated
fuse plug breached

DoR RSAS Notification telephone list for Crooks & Wyndham SMS messages

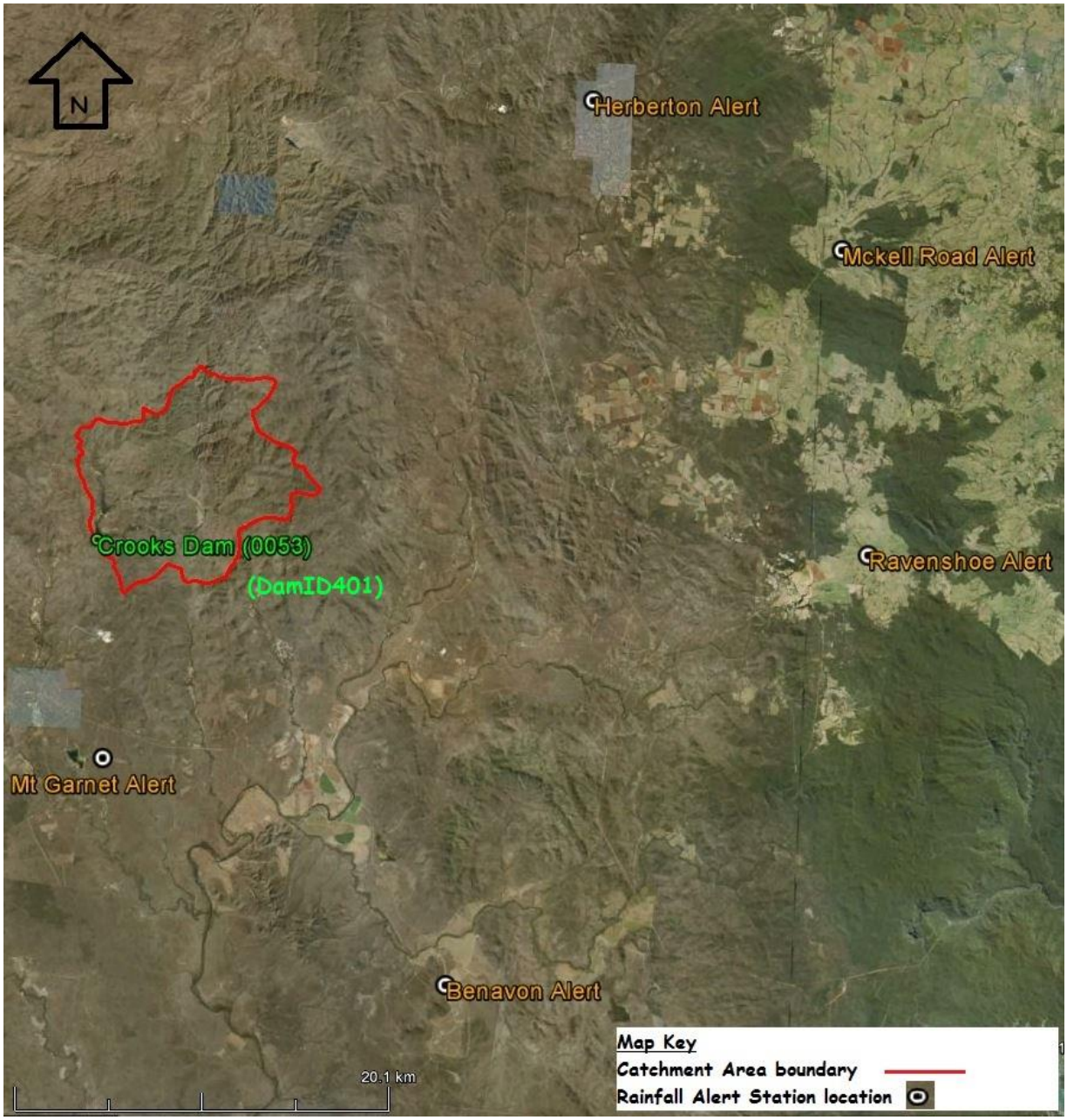
[redacted]

Bureau of Meteorology

A large amount of useful information can be obtained from the Bureau of Meteorology (BOM) web site (www.bom.gov.au) that can assist in assessing the potential rainfall and development of flood inflows to the dam. The information includes “weather radar” images (refer to the Cairns based radar site).

It is important to note that the information available from this site may be up to 10 minutes out of date (i.e. radar images are refreshed at intervals of approximately 10 minutes).

There are 5 BOM rainfall gauge sites that may be useful in providing information on rainfall, including the spread of the rainfall system and whether the rainfall is uniform or otherwise across the area.
The weather stations located in the area around the dam are shown on the map below. The catchment boundary plan is located in Appendix 3.



To access 1.0 hr 3.0 hr and 24hr rainfall totals

- Hover curser over blue “QLD” Tab at top of page
- Scroll down to and left click “Rainfall and River conditions”
- On right hand side of screen under “Zoom in to:” Tab, scroll down to and left click “Cairns to Ingham”
- On right hand side of screen under “Other Links” Tab, scroll down and left click “Rain & River Data”
- In lower left hand Table next to “Herbert, Tully, Johnstone, Mulgrave-Russell, Barron, Daintree” River Basin, left click “1hr” Rainfalls Tab,
- In the Herbert Table read rainfall data for Stations Herberton AL, Ravenshoe AL, Ben Avon AL and Mt Garnet AL.
- In the Johnstone Table read rainfall data for Mckell Road AL Station.

- Move to top left tool bar and left click – back arrow

Repeat process to access 3.0hr and 24hr rainfall totals

- Left click – "3hr" Rainfalls Tab for same River Basin as above – read rainfall data for the same rainfall stations.
- Move to top tool bar and left click – back arrow
- Left click – "24 hr" Rainfalls Tab for same River Basin as above – read rainfall data for the same rainfall stations.
- To exit page, hover curser over blue "Home" Tab, at the very top of the page and left

Radar Image of Rainfall Prediction

The BOM website provides radar images of rainfall that might be approaching the catchment area.

- Go to the website: www.bom.gov.au
- Left click on the Rain Radars Icon
- Left click on the Cairns location
- Left click on the 128 km icon
- Analyse radar data for Mt Garnet, Herberton and Ravenshoe areas. Note location of Crooks Dam catchment in map above.

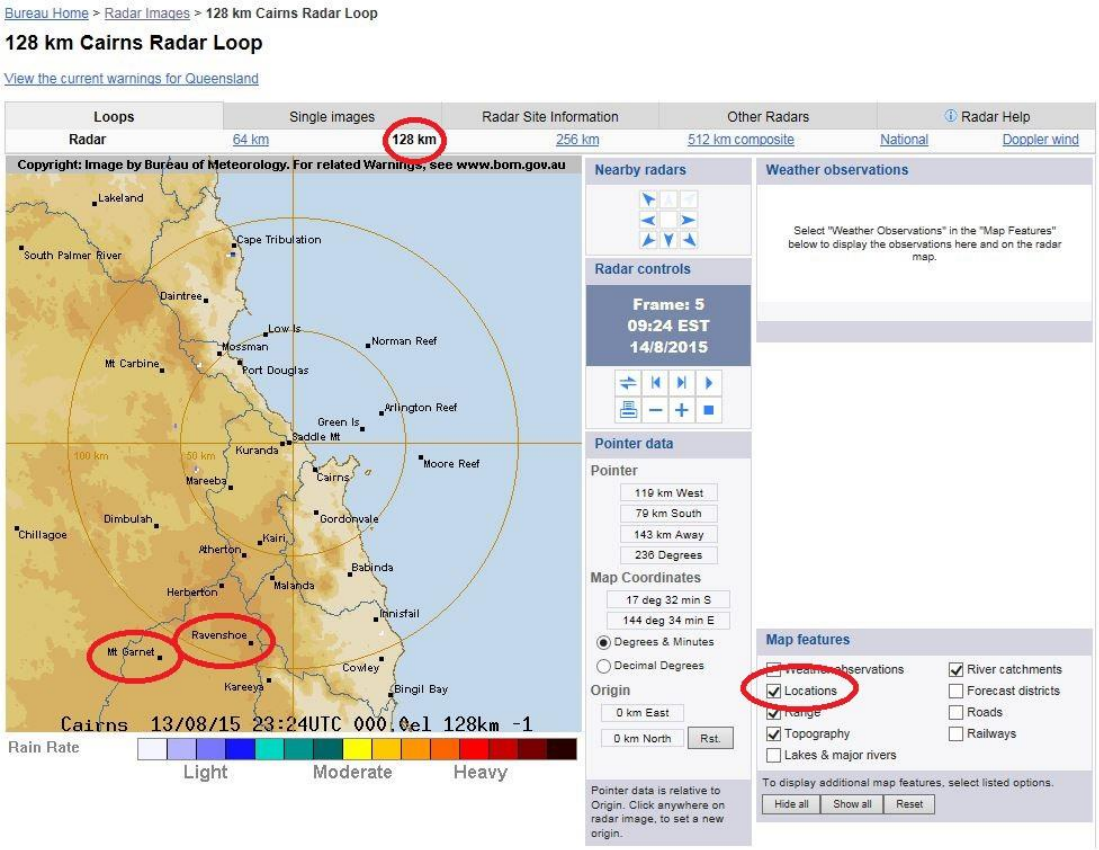
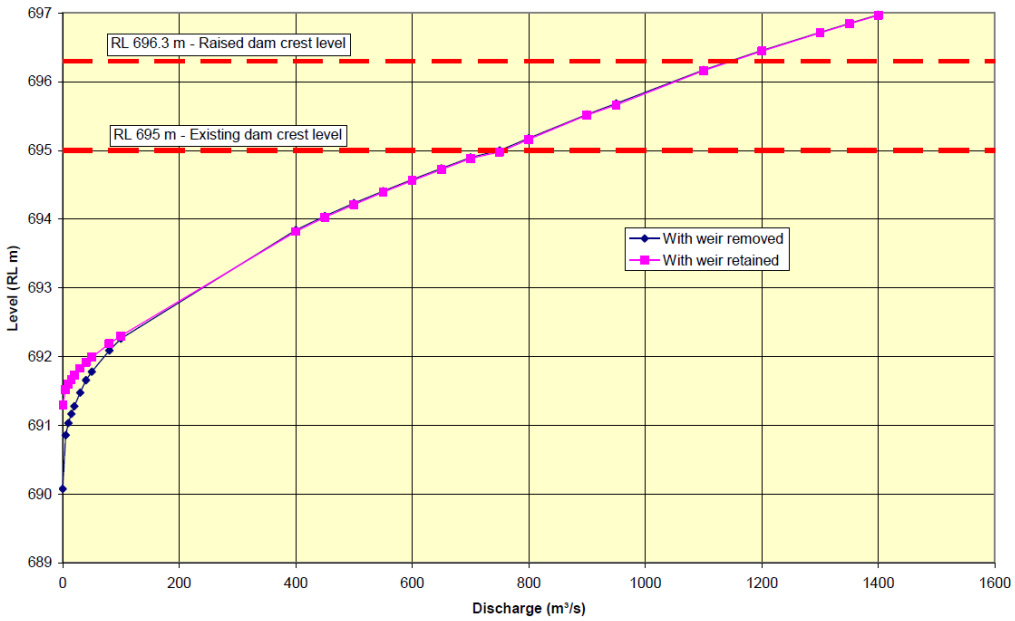


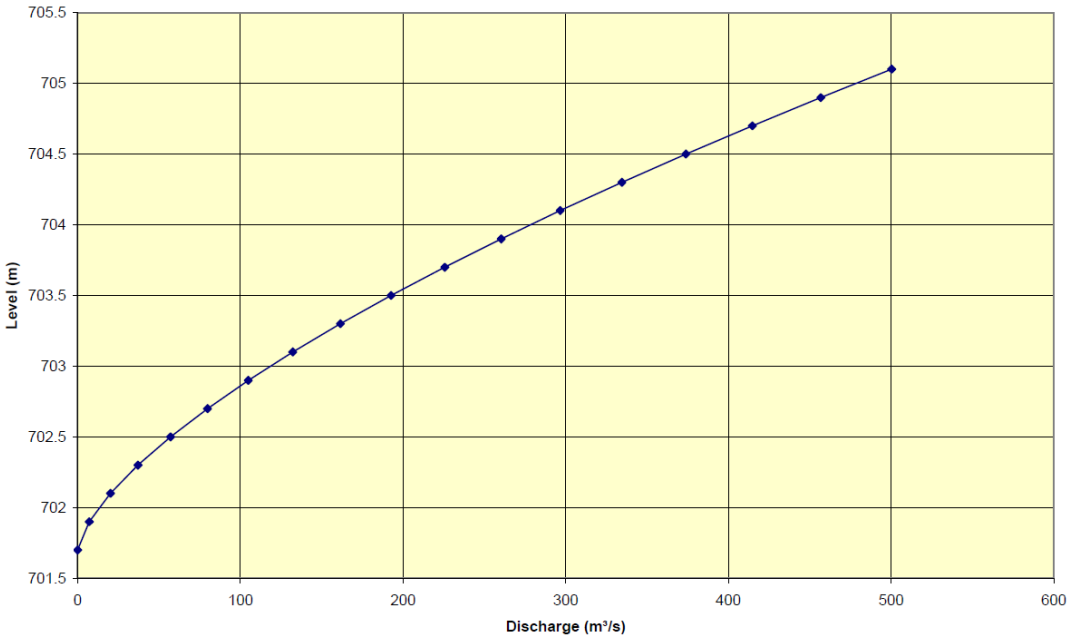
Figure 6.5.2 – BOM Radar 512km Cairns

APPENDIX 7
SPILLWAY RATING TABLES AND FLOOD DURATION CURVES

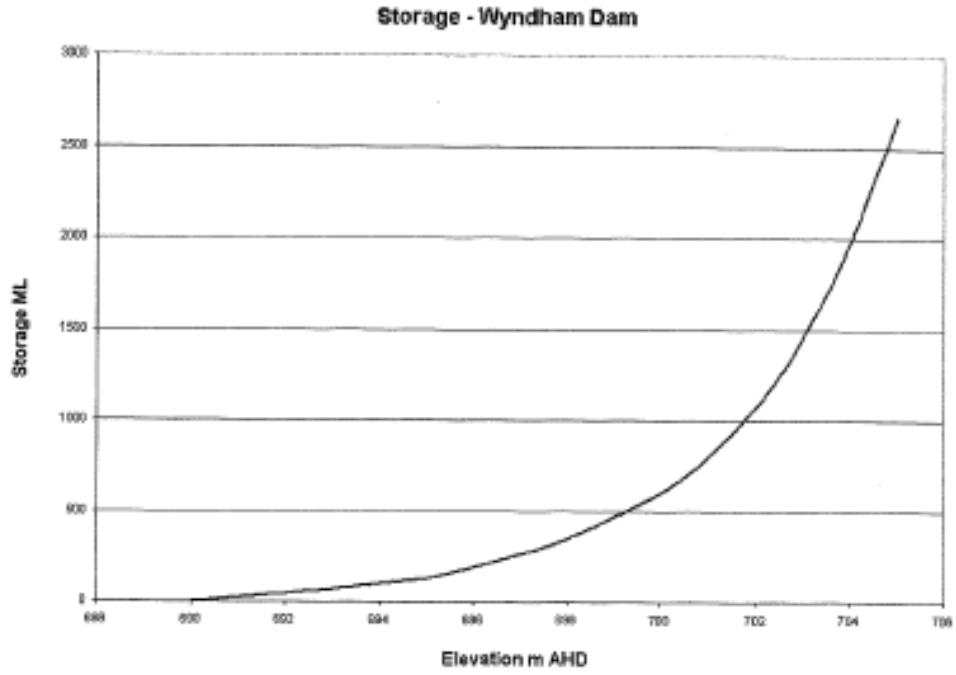
Service Spillway Rating Curve – Crooks Dam

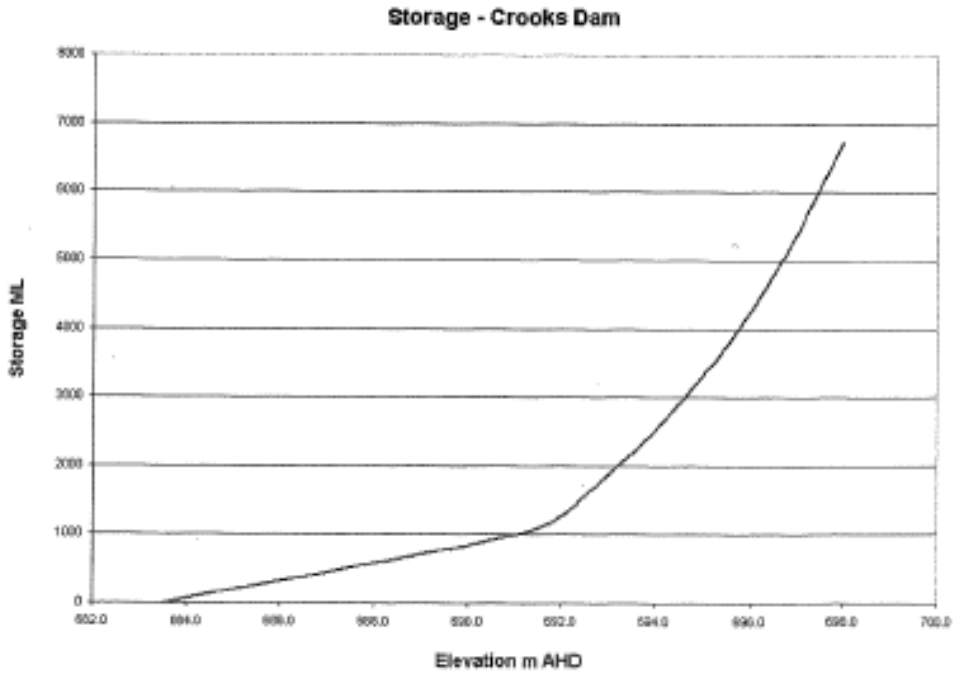


Service Spillway Rating Curve – Wyndham Dam



Storage Curves





APPENDIX 8

SOP 14 Small to Medium Spillway Overflows

Department of Resources

Crooks Dam

Standing Operating Procedures

for

Small to Medium Spillway Overflows

SOP - 14

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- 2 ..... Scope X
- 3 ..... Personnel Affected and Responsibilities X
- 4 ..... Actions XI
- 5 ..... References XI

Appendices

Appendix A –Inspecting for Deficiencies

1. Purpose

This SOP exists to manage the small to medium spillway overflow events that occur at Crooks Dam.

This SOP applies when the dam reservoir level reaches 691.3m, and is below 692.0m.

The dam is managed by DoR. Tablelands Regional Council (TRC) is under contract to undertake routine dam safety inspections and approved minor repairs. A MOU between DoR and RoadTek Works Manager, Asset Services North, Cairns exists to provide major maintenance projects as requested.

2. Scope

This Procedure applies to all spillway overflow events that are less than the alert event trigger with a storage level below EL 692.00m. The personnel are the EEC, COM Dam Inspection Officers and the TRC DIO listed in the EAP for Crooks Dam.

3. Personnel Affected and Responsibilities

Director, Asset Management, DoR (DM)	The person responsible for authorising/approving the Emergency Action Plan, the Standing Operating Procedures and the Operation and Maintenance Manual.
Central Operations Manager, Technical Services, DoR (COM)	The person responsible for approving the persons undertaking the roles of TRC DIO and, for managing, receiving, storing and checking data for the dam, reviewing and authorising documentation produced by the TRC and consultants on the dam and initiating investigations into abnormal behaviour of the dam. Manages the Distribution, Approval and Revision Control relating to this Procedure.
Emergency Event Coordinator (EEC)	The DoR emergency event coordinator
Local Disaster coordinator, (LDC)	Local Person nominated *in the Local Disaster Management Plan* as the coordinator of responses in an emergency event
Dam Inspection Supervisor (DIS)	TRC person appointed to coordinate dam inspections and minor works.
Dam Inspection Officer (DIO)	TRC person appointed to undertake inspections
Dam Engineer (DE)	Engineer appointed to undertake inspections

4. Procedures

The EEC is responsible for monitoring the dam water levels, storage height and rainfall conditions and predict when the spillway is likely to overflow. If the storage level is predicted to reach the alert level trigger EL 691.3m, the EEC is to notify the COM.

The EEC is to inform the LDC when the spillway is likely to overflow.

The LDC should be aware of the Reservoir Water Level from EEC notifications and the BOM website – See Appendix 6 and consider the closure of the dam access road (Brownville Road) at Irvinebank turnoff and north of the spillway causeway if safe to do so, See Figure1.

Road Closed information should be displayed on the Tablelands Regional Council (TRC) website.

If RSAS is Not Working/Unreliable
The EEC is to notify the COM, 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.

Special Inspections DIO
The EEC is to notify the COM of the need for a special inspection by the DIO.

The EEC requests the special inspection through the DIS.

The DIS assess the risk and coordinates the inspection if safe to do so.

The EEC outlines the scope requirements and frequency for the special inspection. Appendix B gives a guide for inspecting the Dam for deficiencies.

Dam instrumentation including storage height gauge, rain gauge and V notch weirs are recorded with time at the dam.

Photographs are taken.

A telephone call and brief report is required to the EEC before leaving the dam.

A written inspection report is required by the EEC.

5. References

- Emergency Action Plan, Crooks Dam.

Appendix B
INSPECTING FOR DEFICIENCIES: SUMMARY

TYPE OF DEFICIENCY	LOOK FOR
SEEPAGE	A water flow or sand boil on the lower portion of the downstream slope or toe area, especially at the groins. Leakage around conveyance structures such as outlet works. Wet areas or areas where the vegetation appears greener or more lush on the embankment slope or toe area. Blocked toe drains. An increase in the amount of water being released from toe drains. (Remember to take into account changes in the reservoir level.) Turbidity or cloudiness of the seepage.
CRACKING	Desiccation Cracking: A random honeycomb pattern of cracks usually found on the crest and the downstream slope. Transverse Cracking: Cracks that are perpendicular to the length of the dam usually found on the crest. Longitudinal Cracking: Cracks that are parallel to the length of the dam. Longitudinal cracks may be associated with stability problems in the slopes.
INSTABILITY	Slides on the upstream or downstream slopes. Bulging, especially at the toe of the dam.
DEPRESSIONS	Misalignment in the crest and embankment slopes found by sighting along fixed points. Sinkholes found by checking and probing each depression, if safe to do so. Remember, sinkholes have steep, bucket like sides while minor depressions have gently sloping, bowl like sides.
MAINTENANCE CONCERNS	Inadequate Slope Protection: Check for bald areas or areas where the protection is sparse or damaged. 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. Inappropriate Vegetative Growth: Check for excessive and deep rooted vegetative growth.

	Debris: Check for debris on and around the dam, especially near outlet works or spillway inlets. Animal Burrows: Check for damage caused by burrowing animals.

Note: This tabulation taken from 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 EEC–DoR:

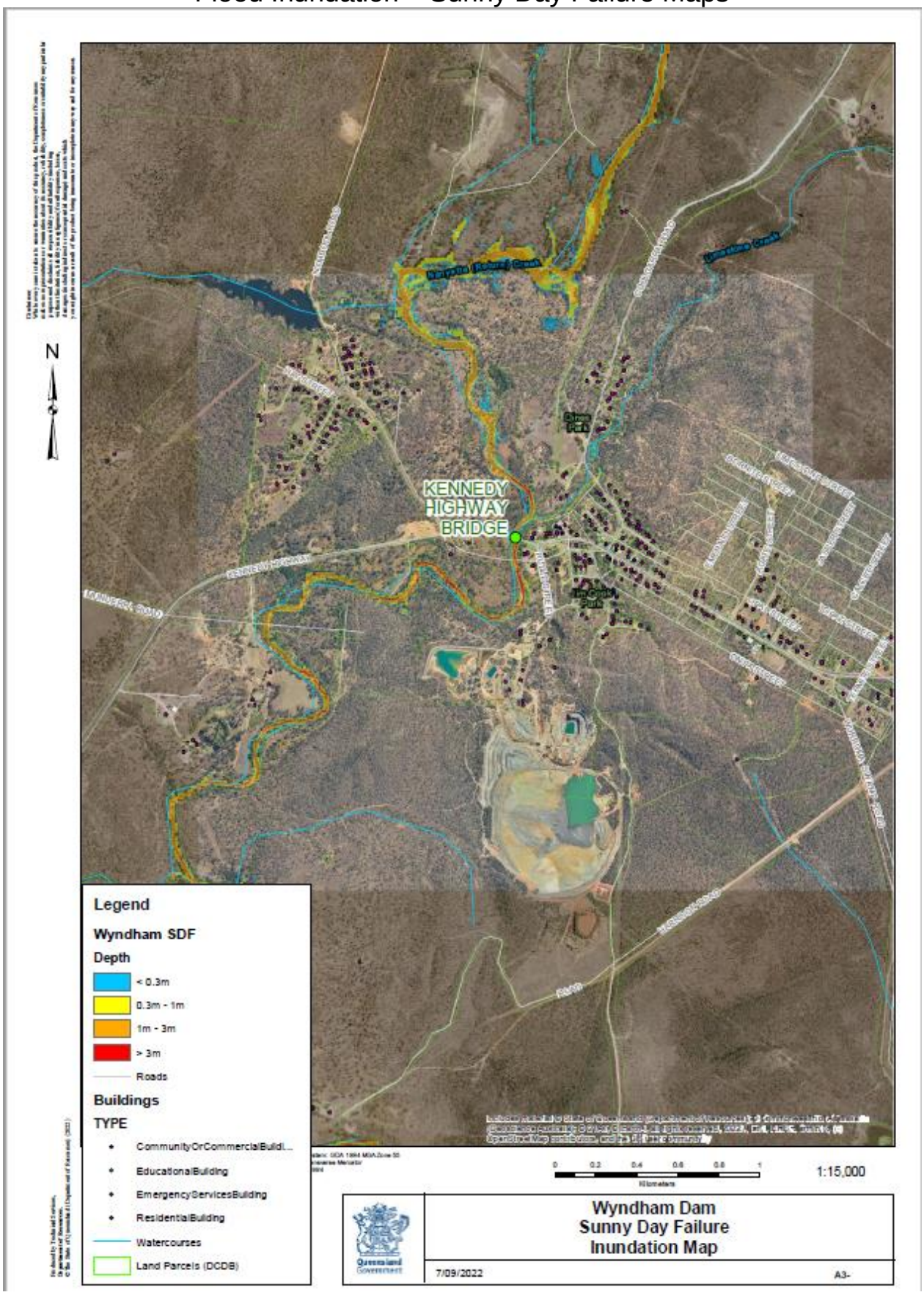
- Sand boils or turbid seepage.
- Seepage that has increased since the last inspection (taking the reservoir level into consideration).
- Cracking that extends below the reservoir level or potential reservoir level.
- Transverse and longitudinal cracking.
- Deep seated slides or bulging associated with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

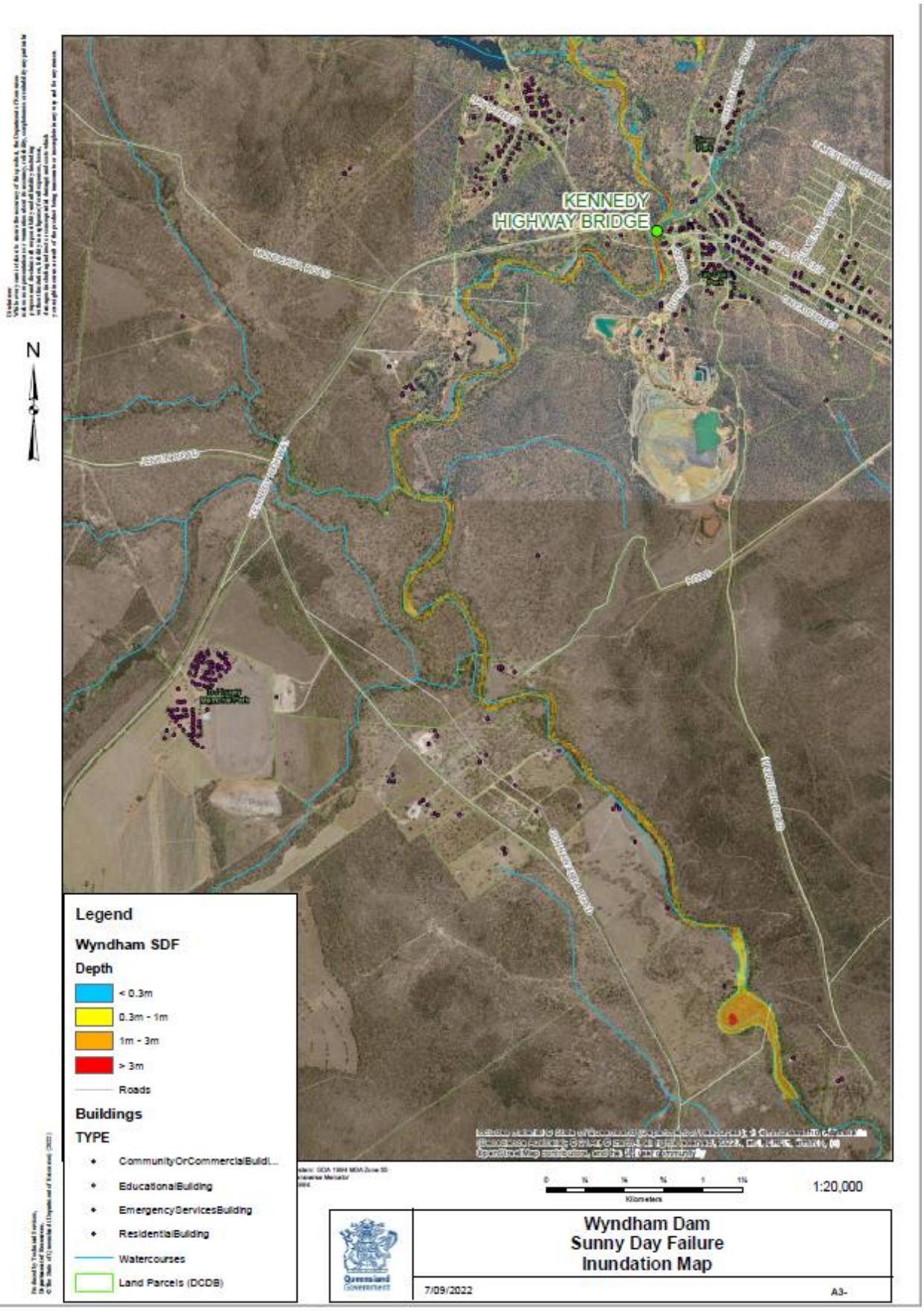
If you are unsure whether or not a condition poses a threat to the safety of the dam, you should discuss your findings with the EEC, DoR.

APPENDIX 9

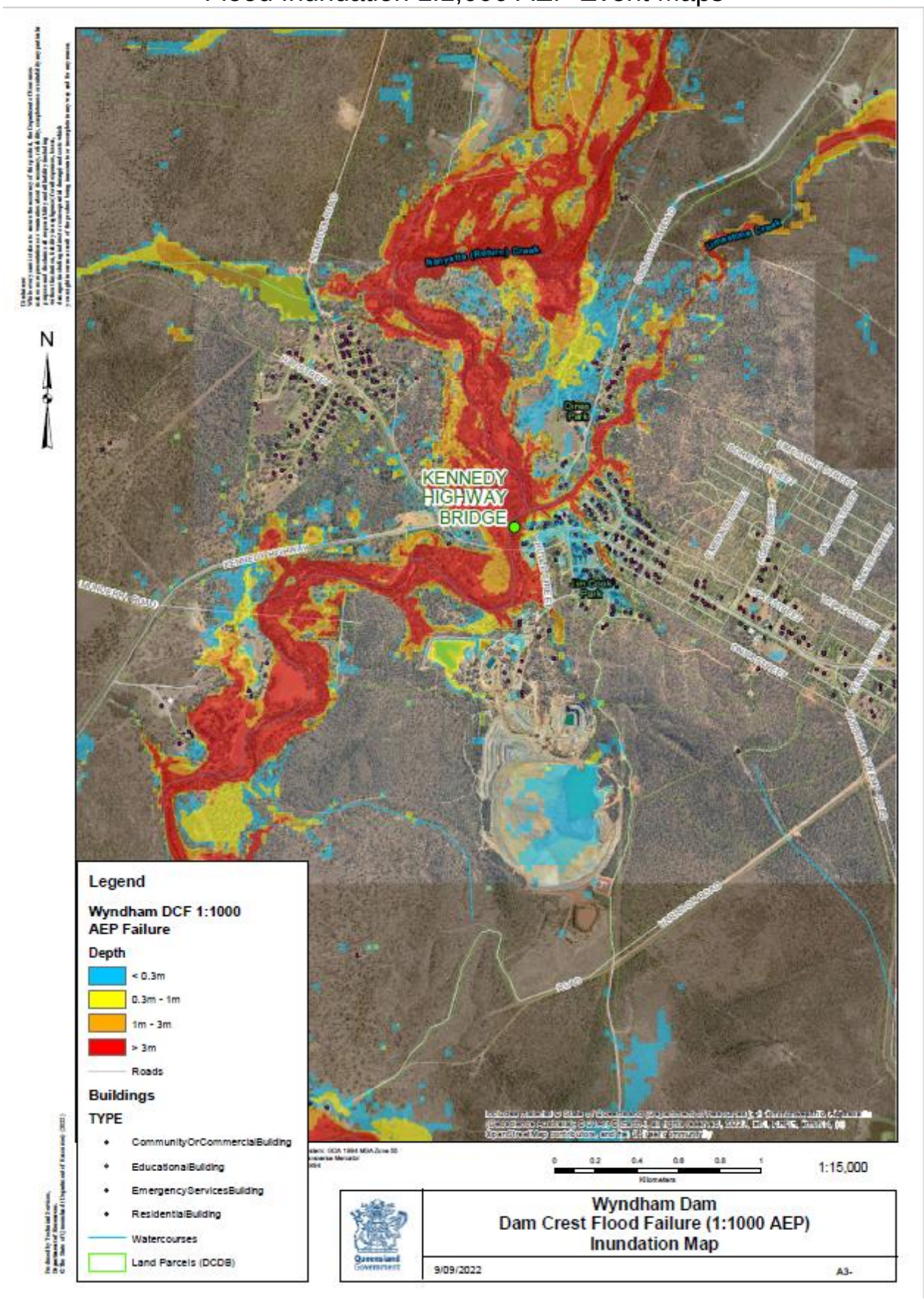
EVENT INUNDATION FLOOD MAPPING

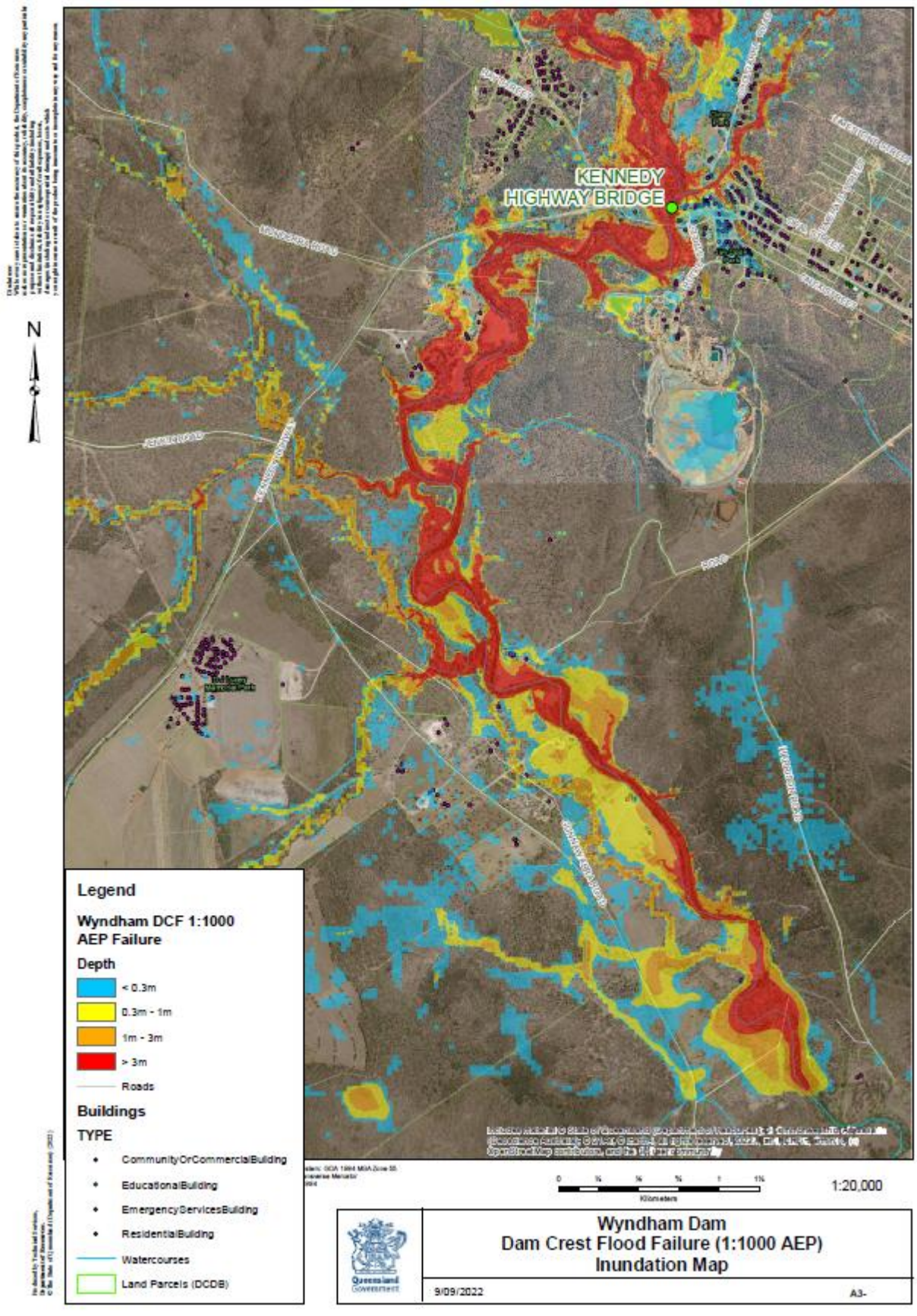
Flood Inundation – Sunny Day Failure Maps



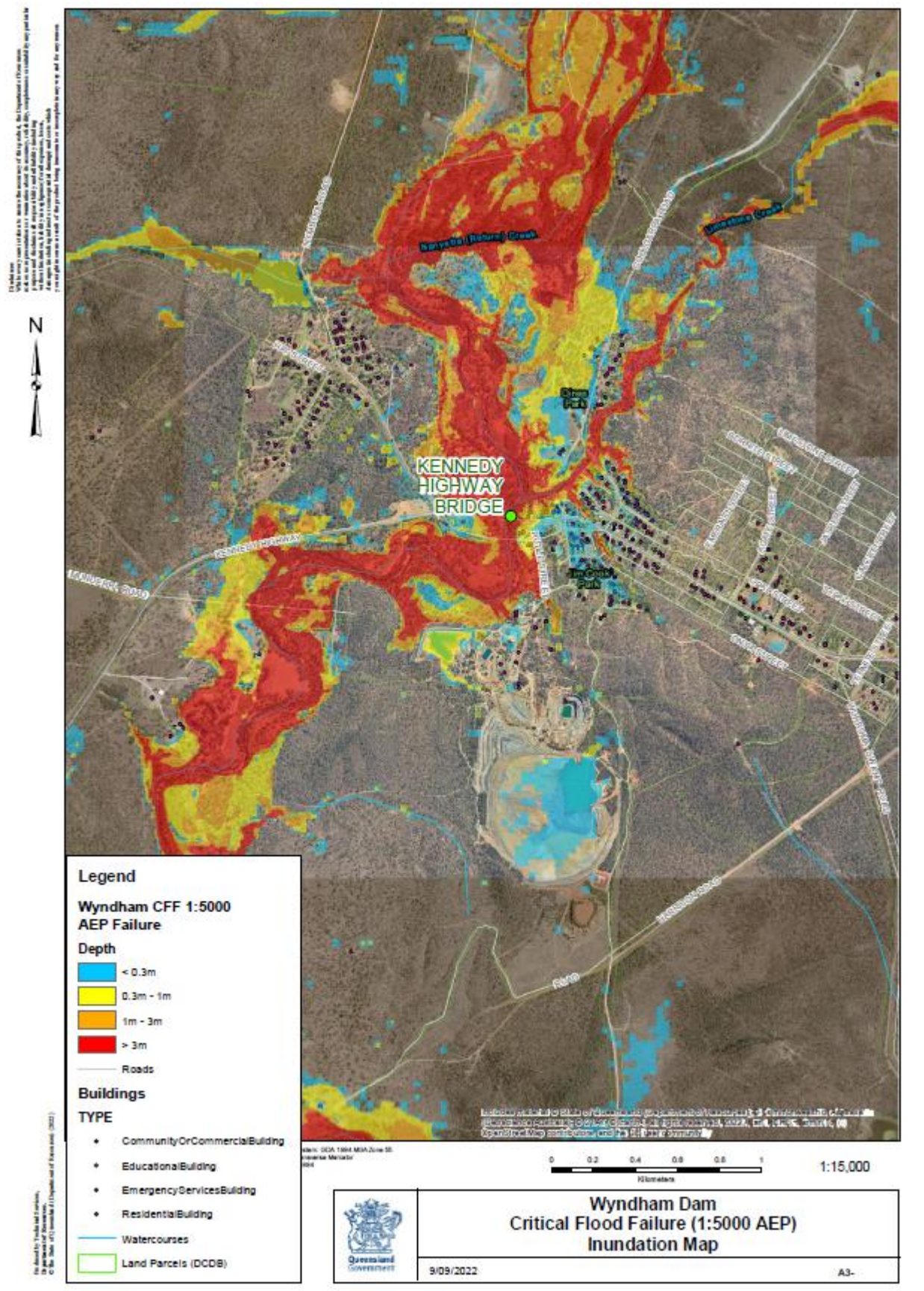

KENNEDY HIGHWAY BRIDGE
N
Legend
Wyndham SDF
Depth
< 0.3m
0.3m - 1m
1m - 3m
> 3m
Roads
Buildings
TYPE
CommunityOrCommercialBuildi...
EducationalBuilding
EmergencyServicesBuilding
ResidentialBuilding
Watercourses
Land Parcels (DCDB)
Kilometers
1:20,000
Wyndham Dam
Sunny Day Failure
Inundation Map
7/09/2022
A3-

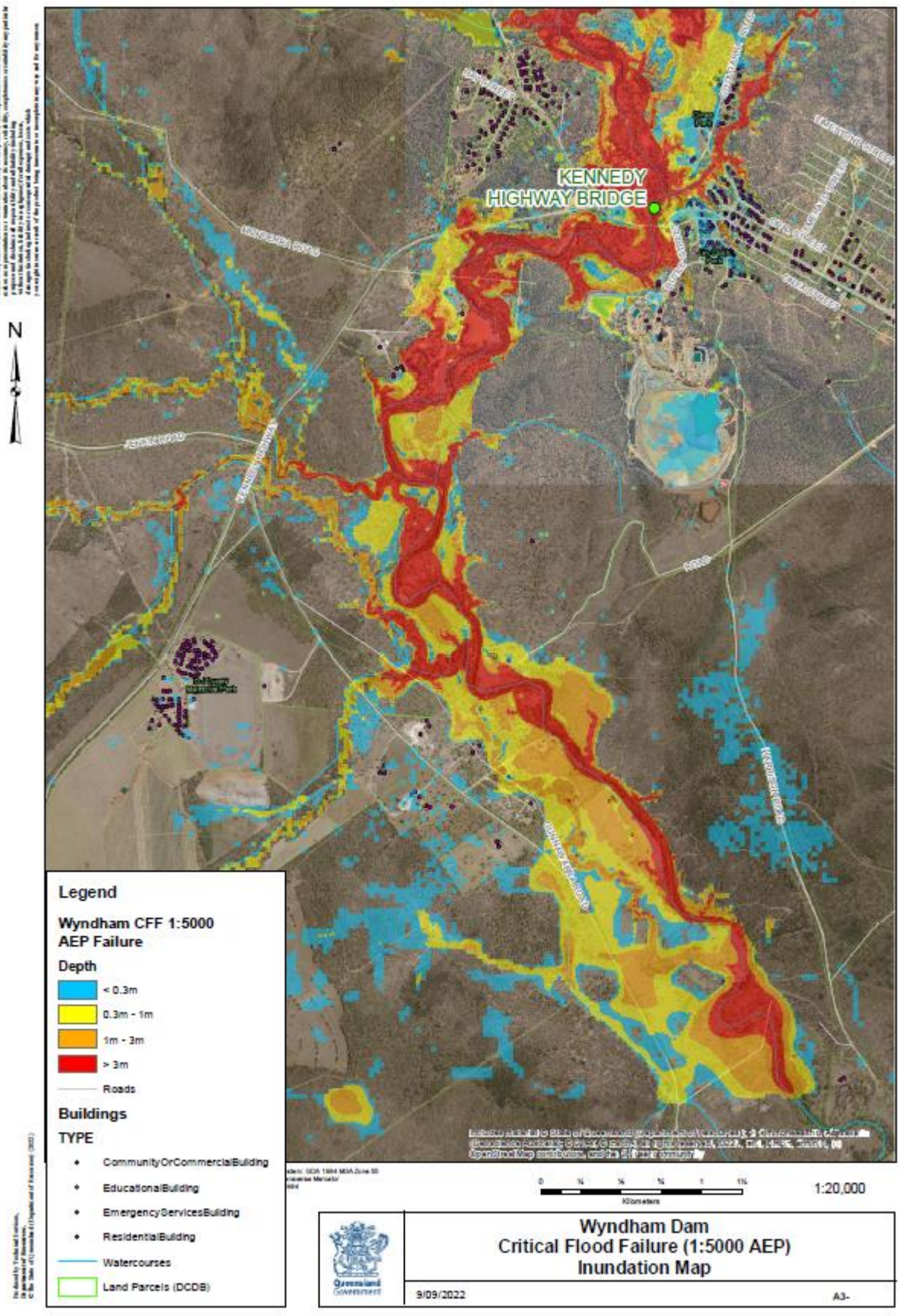
Flood Inundation 1:1,000 AEP Event Maps



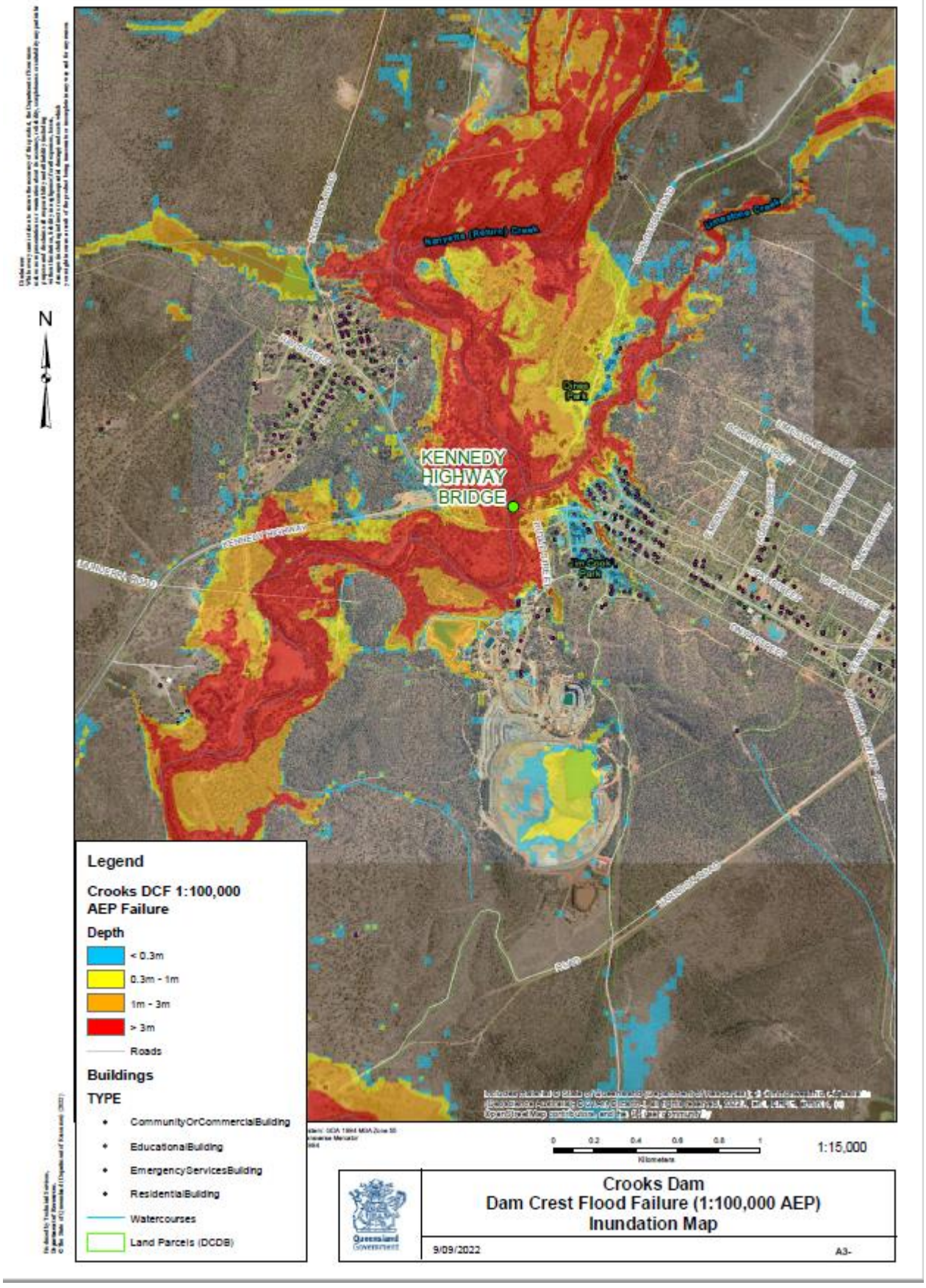

KENNEDY HIGHWAY BRIDGE
N
Legend
Wyndham DCF 1:1000 AEP Failure
Depth
< 0.3m
0.3m - 1m
1m - 3m
> 3m
Roads
Buildings
TYPE
CommunityOrCommercialBuilding
EducationalBuilding
EmergencyServicesBuilding
ResidentialBuilding
Watercourses
Land Parcels (DCDB)
Kilometers
1:20,000
Wyndham Dam
Dam Crest Flood Failure (1:1000 AEP)
Inundation Map
9/09/2022
A3-

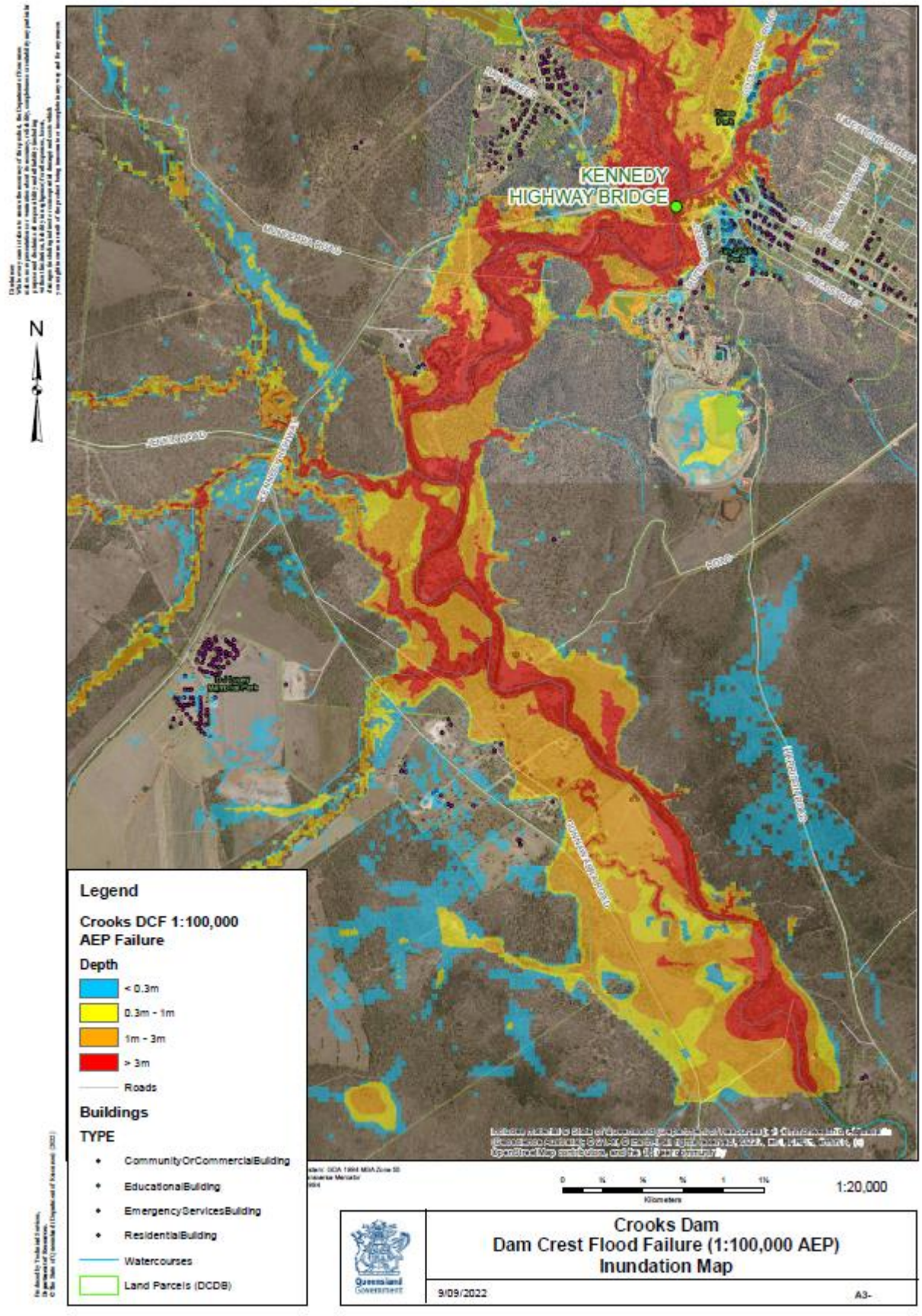
Flood Inundation 1:5,000 AEP Event Maps



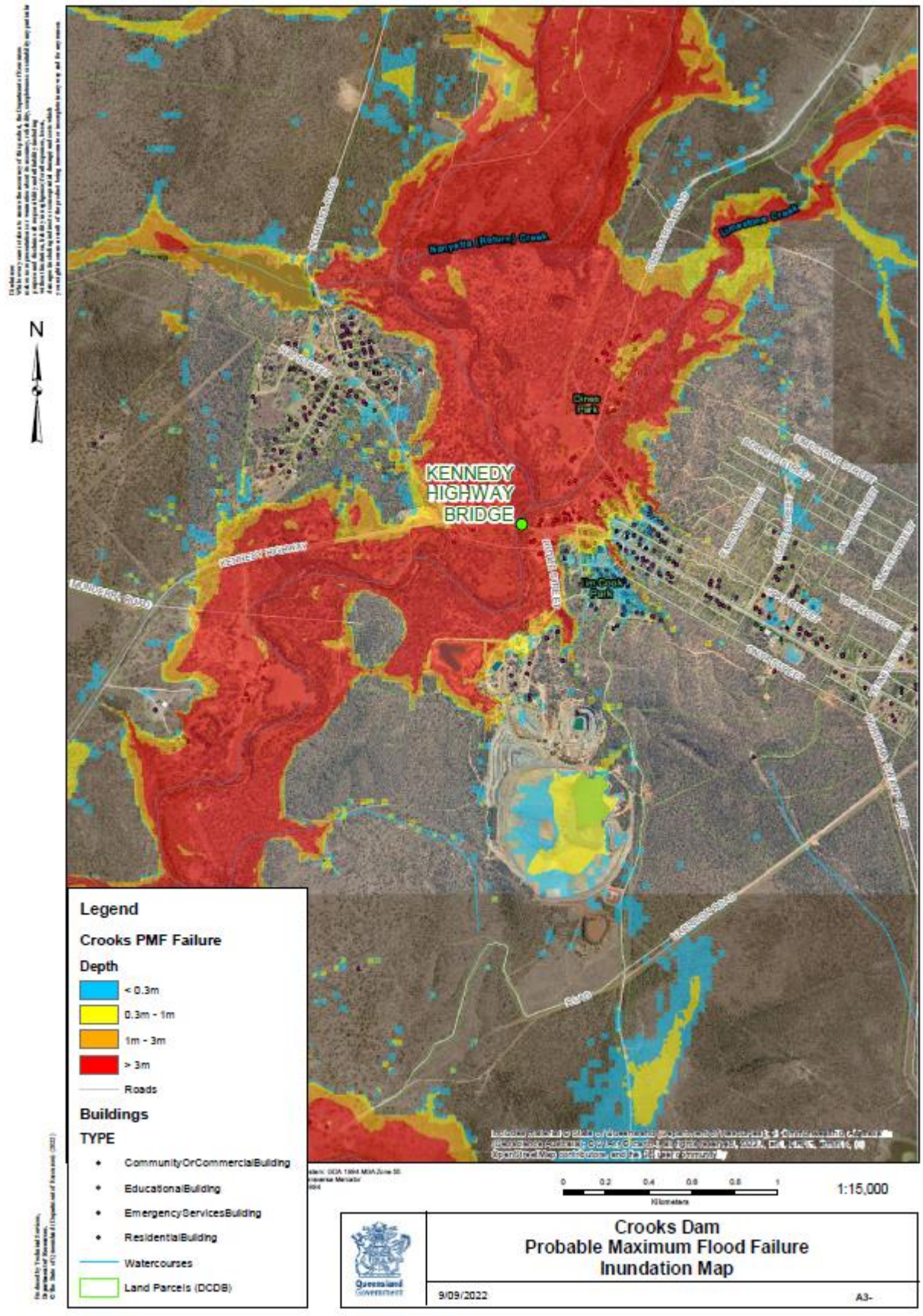

KENNEDY
HIGHWAY BRIDGE
N
Legend
Wyndham CFF 1:5000
AEP Failure
Depth
< 0.3m
0.3m - 1m
1m - 3m
> 3m
Roads
Buildings
TYPE
CommunityOrCommercialBuilding
EducationalBuilding
EmergencyServicesBuilding
ResidentialBuilding
Watercourses
Land Parcels (DCDB)
1:20,000
Wyndham Dam
Critical Flood Failure (1:5000 AEP)
Inundation Map
9/09/2022
A3-

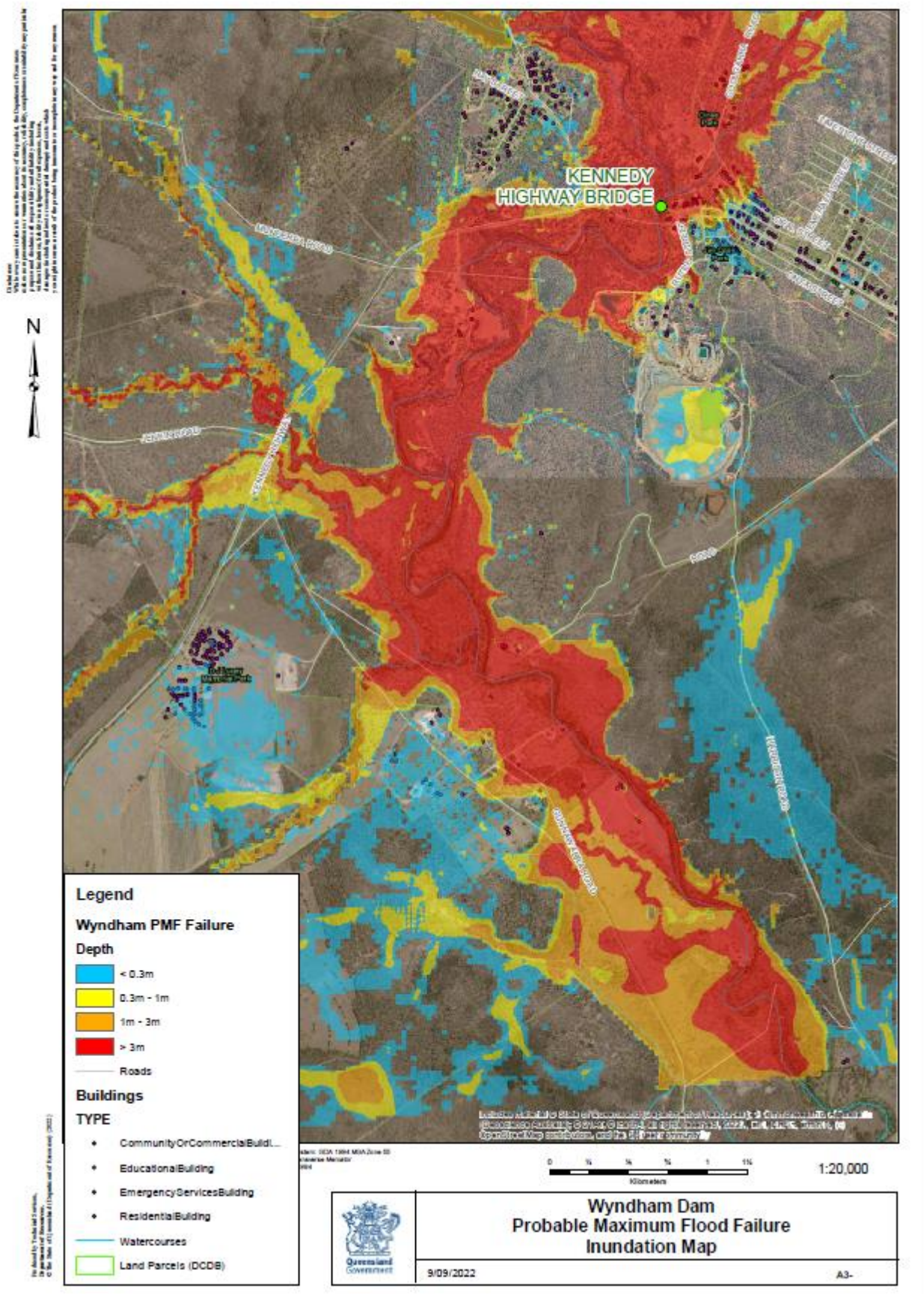
Flood Inundation 1:100,000 AEP Event Maps




KENNEDY HIGHWAY BRIDGE
N
Legend
Crooks DCF 1:100,000 AEP Failure
Depth
< 0.3m
0.3m - 1m
1m - 3m
> 3m
Roads
Buildings
TYPE
CommunityOrCommercialBuilding
EducationalBuilding
EmergencyServicesBuilding
ResidentialBuilding
Watercourses
Land Parcels (DCDB)
1:20,000
Crooks Dam
Dam Crest Flood Failure (1:100,000 AEP)
Inundation Map
9/09/2022
A3-

Flood Inundation - PMP Event Maps




KENNEDY HIGHWAY BRIDGE
N
Legend
Wyndham PMF Failure
Depth
< 0.3m
0.3m - 1m
1m - 3m
> 3m
Roads
Buildings
TYPE
CommunityOrCommercialBuildi...
EducationalBuilding
EmergencyServicesBuilding
ResidentialBuilding
Watercourses
Land Parcels (DCDB)
0 ½ ¾ 1 1½
Kilometers
1:20,000
Wyndham Dam
Probable Maximum Flood Failure
Inundation Map
9/09/2022
A3-

APPENDIX 10

CRITICAL RESERVOIR WATER LEVELS AND ACTIVATION TRIGGER JUSTIFICATIONS

EAP Activation triggers, discussion and justifications

The catchment of area Crooks Dam is relatively small and travel time for flood or change in flow conditions to impact on the township of Mt Garnett is calculated to be less than 1.0 hour, therefore there is potential for 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 developing event to ensure sufficient lead time is provided to both Counter Disaster Groups and PAR. The Stand Up is set to provide sufficient time for orderly evacuations in the event of the worst possible event and reduce the need for frequent unnecessary evacuations.
Also refer to attached Activity Table, EAP Triggers, Critical Water Levels and Impacted Features/Actions.

Individual Activation triggers

SOP 14, Activation Trigger Justification,
Allows for small to medium downstream releases from the dam without activating the EAP
RDSWU are notified, Brownville Road is closed

Alert, Activation Trigger Justification,
Considered early enough to provide sufficient time to LDMG make considerations regarding future resources
PAR are notified at this stage

Lean Forward, Activation Trigger
Early enough to provide sufficient lead time to LDMG to consider allocating or coordinating resources if required
Provides time for PAR to prepare for potential evacuation via nominated evacuation route.

Stand Up, Activation Trigger Justification
Provides sufficient time for PAR evacuation to occur before period of high risk above 696.3m
Before Crooks fuse plug triggers

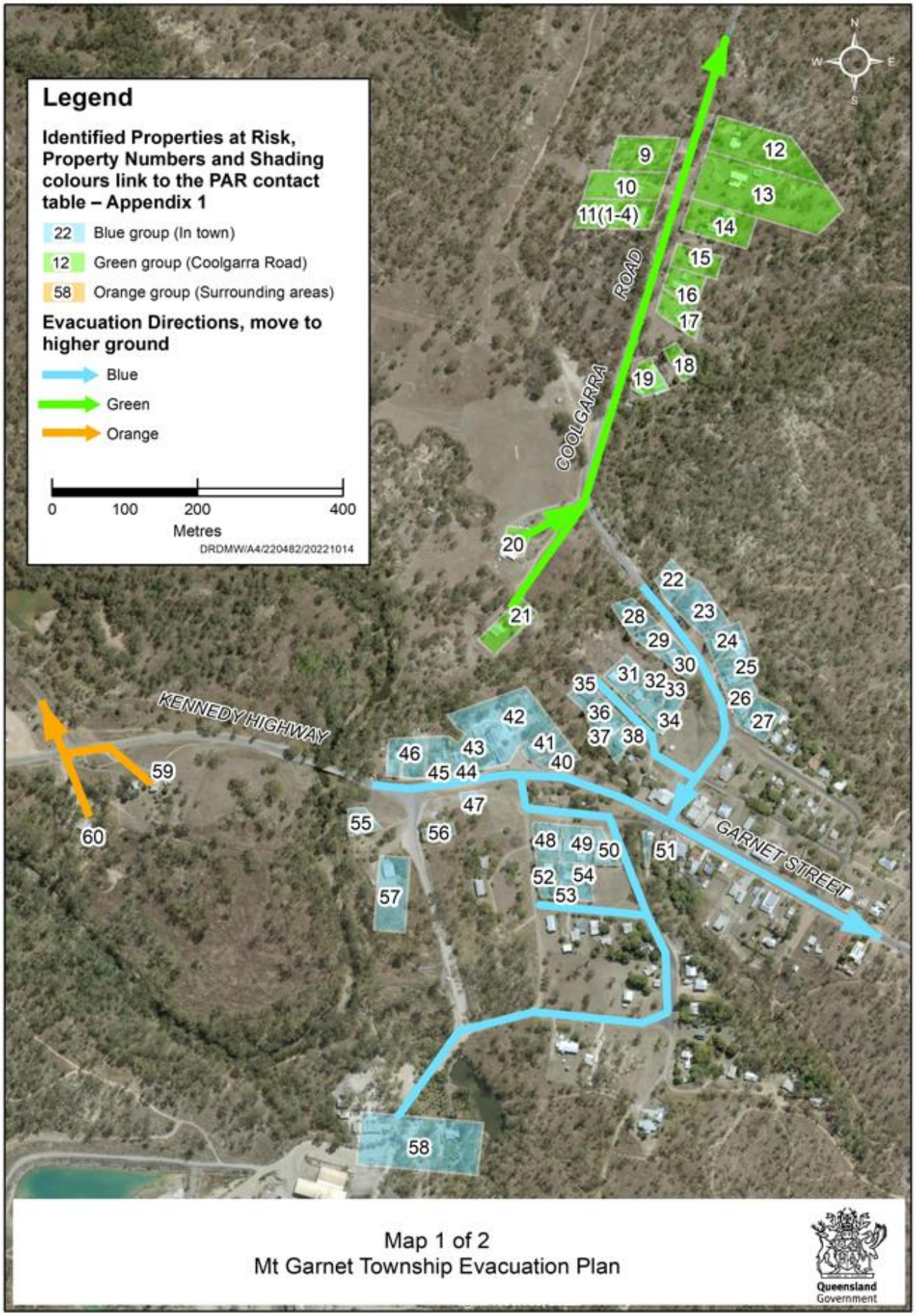
Stand Down, Activation Trigger Justification
Set low enough to ensure any event is truly over to reduces likelihood of EAP reactivation
Ensures all impacted features are no longer affected

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

Alert Status	Reservoir Water Level (m)	Dam Downstream Release (M3/s)	AEP Approx. (1 in x years)	PAR dwellings	Impacted Features/ actions
Crooks Dam full	691.3	0	-	0	
SOP 14	691.3 to 692.0	0 to 50		0	Brownville Road flooded RDSWU notified
Alert	692.0 to 693.0	50 to 250	-	0	PAR notified Limestone Creek Causeway may be flooded pending local conditions
Historical Maximum	692.9	212	-	0	
Lean Forward	693.0 to 695.0	250 to 780	-	0	PAR notified Limestone Creek Causeway may be flooded
Wyndham Dam fuse plug 1 triggers	693.5	350	50	0	Limestone Creek Causeway may be flooded
Stand Up	695.0	780	Just before 1,000	0	PAR Evacuations Kennedy Highway Bridge flooded
Wyndham Dam crest EL	703.8	430	1,000	30	
Crooks Dam fuse plug triggers	695.6	950	1,000	30	
Crooks Dam crest EL	696.4	1980	100,000	39	
PMF	699.3m		10,000,000	39	
Stand Down	Below 692.0				Kennedy Highway Bridge clear Limestone Creek Causeway may still be flooded pending local conditions

Appendix 11

PAR EVACUATION GROUPS AND EVACUATION ROUTES


Legend
Identified Properties at Risk, Property Numbers and Shading colours link to the PAR contact table – Appendix 1
22 Blue group (In town)
12 Green group (Coolgarra Road)
58 Orange group (Surrounding areas)
Evacuation Directions, move to higher ground
Blue
Green
Orange
0 100 200 400
Metres
DRDMW/A4/220482/20221014
N
W
E
S
COOLGARRA ROAD
KENNEDY HIGHWAY
GARNET STREET
9
10
11(1-4)
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
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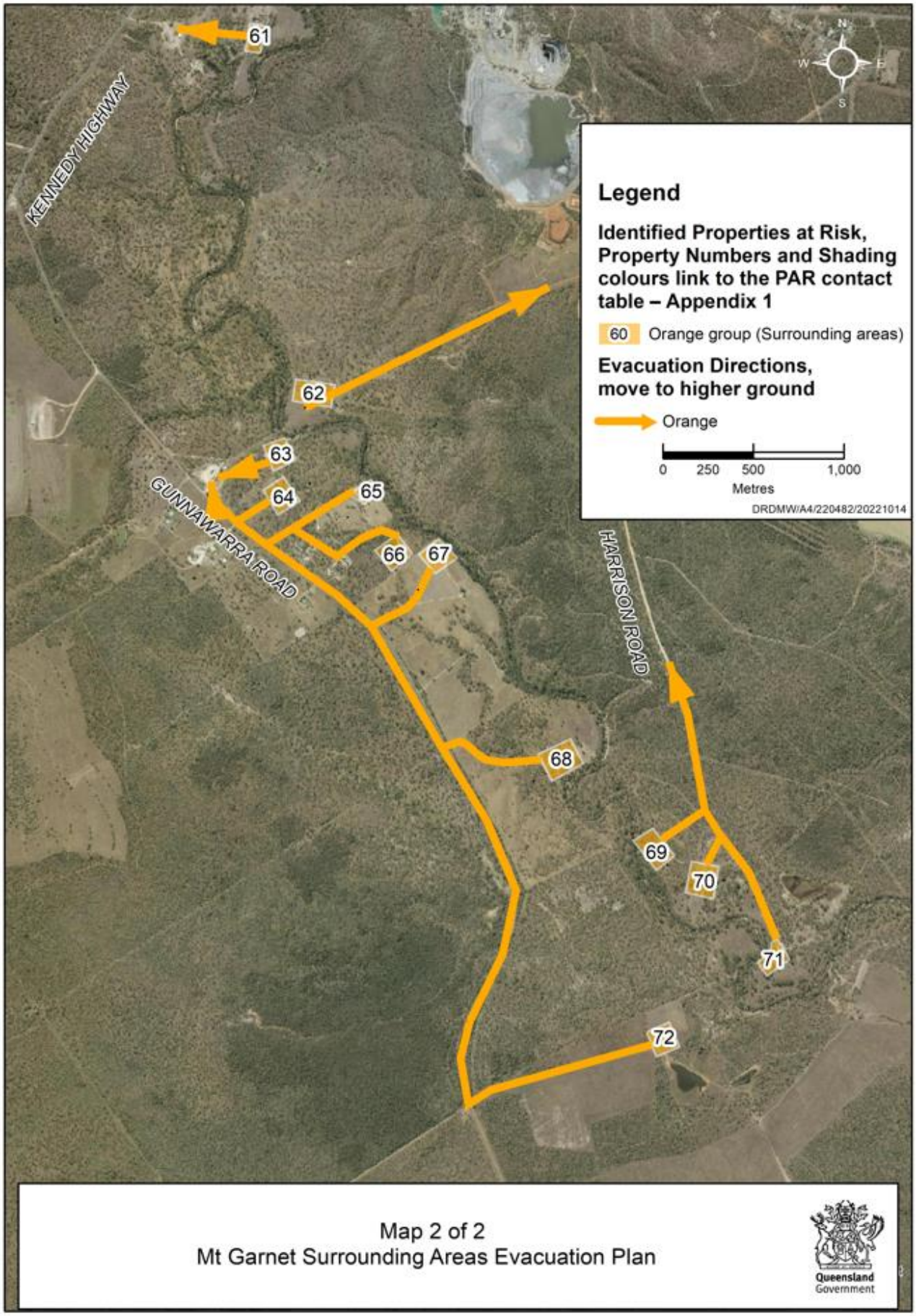
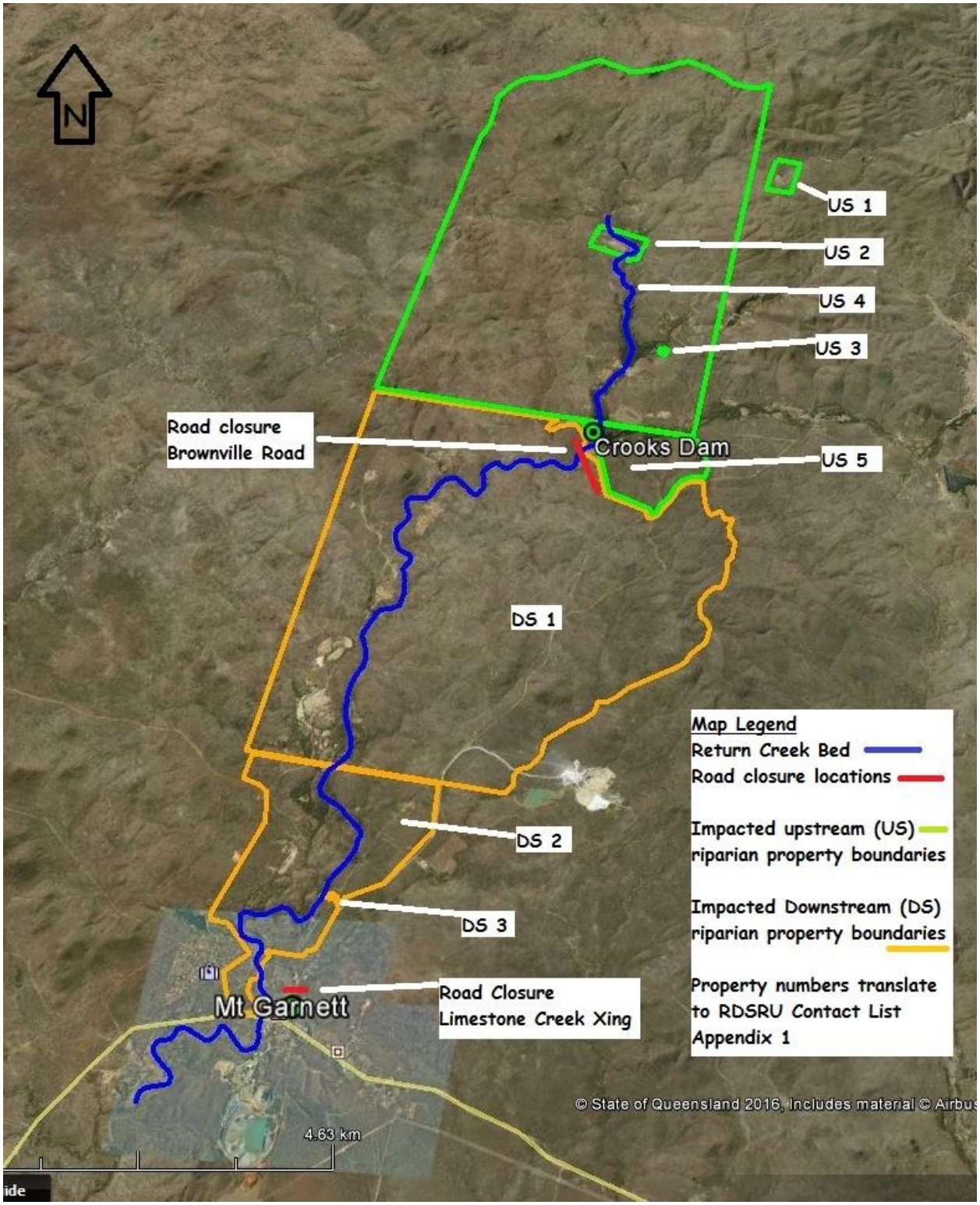
51
52
53
54
55
56
57
58
59
60
Map 1 of 2
Mt Garnet Township Evacuation Plan
Queensland Government


61
KENNEDY HIGHWAY
62
63
64
65
66
67
GUNNAWARRA ROAD
HARRISON ROAD
68
69
70
71
72
N
W
E
S
Legend
Identified Properties at Risk, Property Numbers and Shading colours link to the PAR contact table – Appendix 1
60 Orange group (Surrounding areas)
Evacuation Directions, move to higher ground
Orange
0 250 500 1,000
Metres
DRDMW/A4/220482/20221014
Map 2 of 2
Mt Garnet Surrounding Areas Evacuation Plan
Queensland Government

APPENDIX 12

RIPARIAN and DOWNSTREAM WATER USERS (RDSWU) LOCALITY MAP

RIPARIAN and DOWNSTREAM WATER USERS (RDSWU) LOCALITY MAP



For RDSRU contact details refer to Appendix 1

APPENDIX 13

Standing Operating Procedure

SOP 16

for

Sending Messages using Burst SMS

Table of Contents
Page

- 1 ..... Purpose 11
- 2 ..... Process 11
- Recording 16
- 3 ..... Personnel Affected and Responsibilities 16

3.1 Data Collection 16

3.2 Reporting 16

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.

1. Process

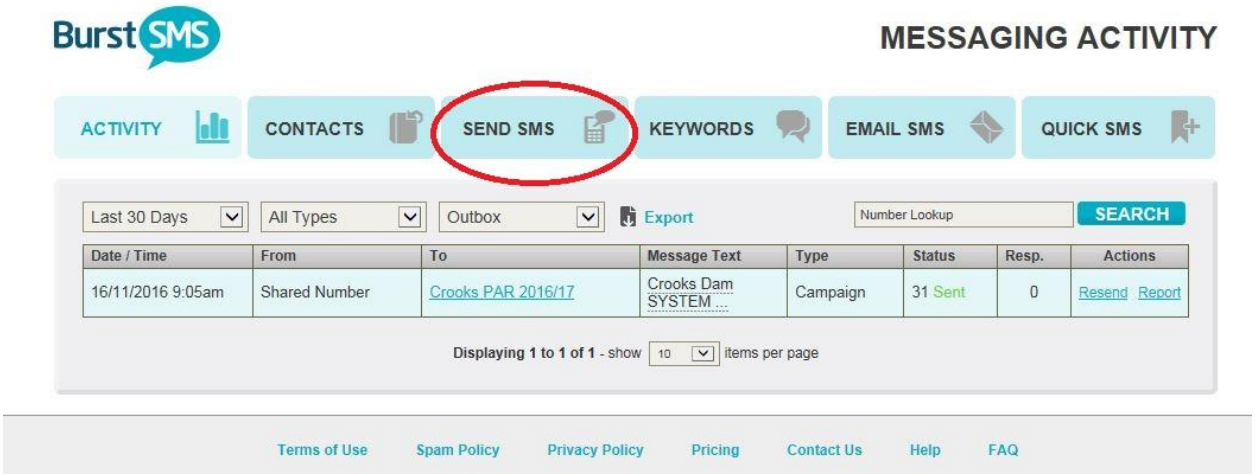
1) Log into Burst SMS, www.burstsms.com.au

The Login button is in the top right hand side of home page

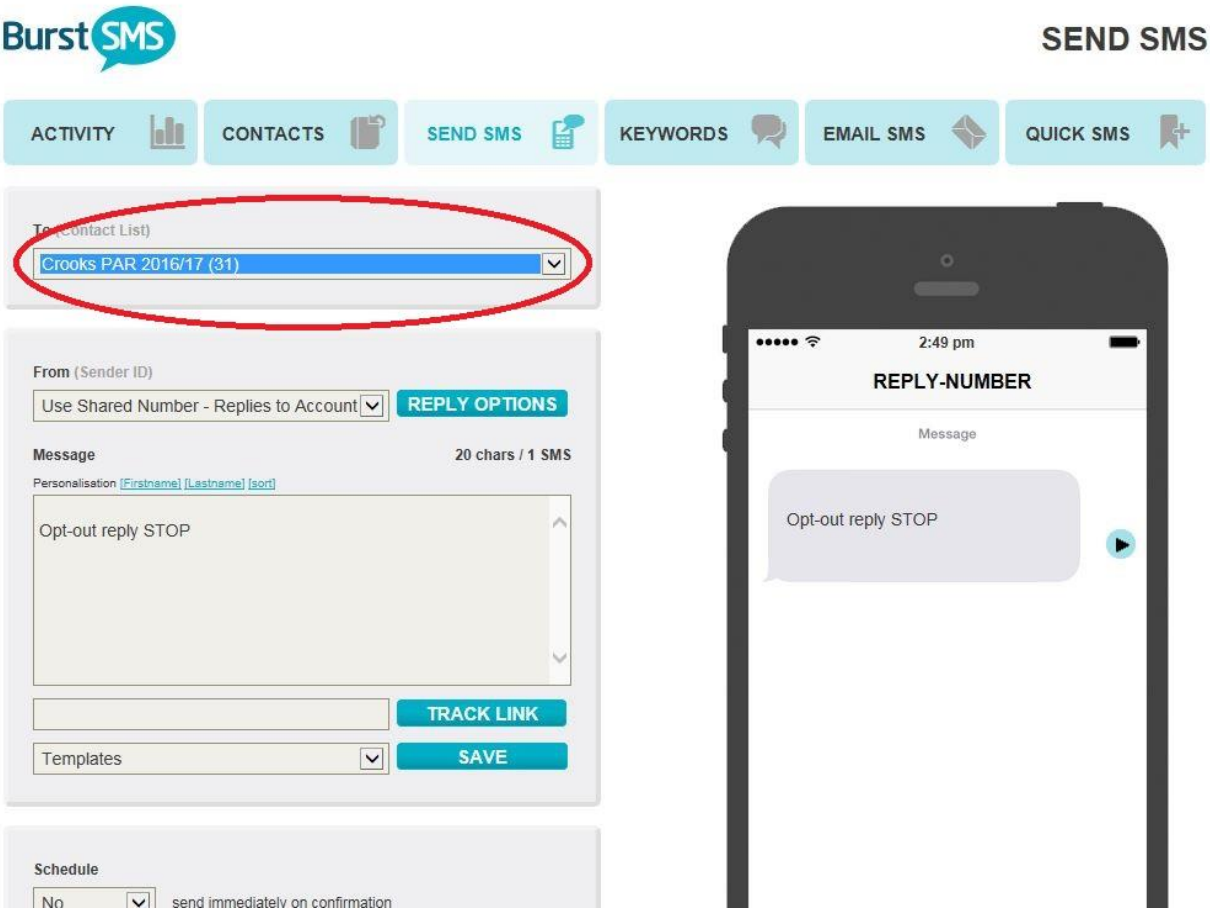
In the login page enter your email address and password, then press login.

2) To send an SMS

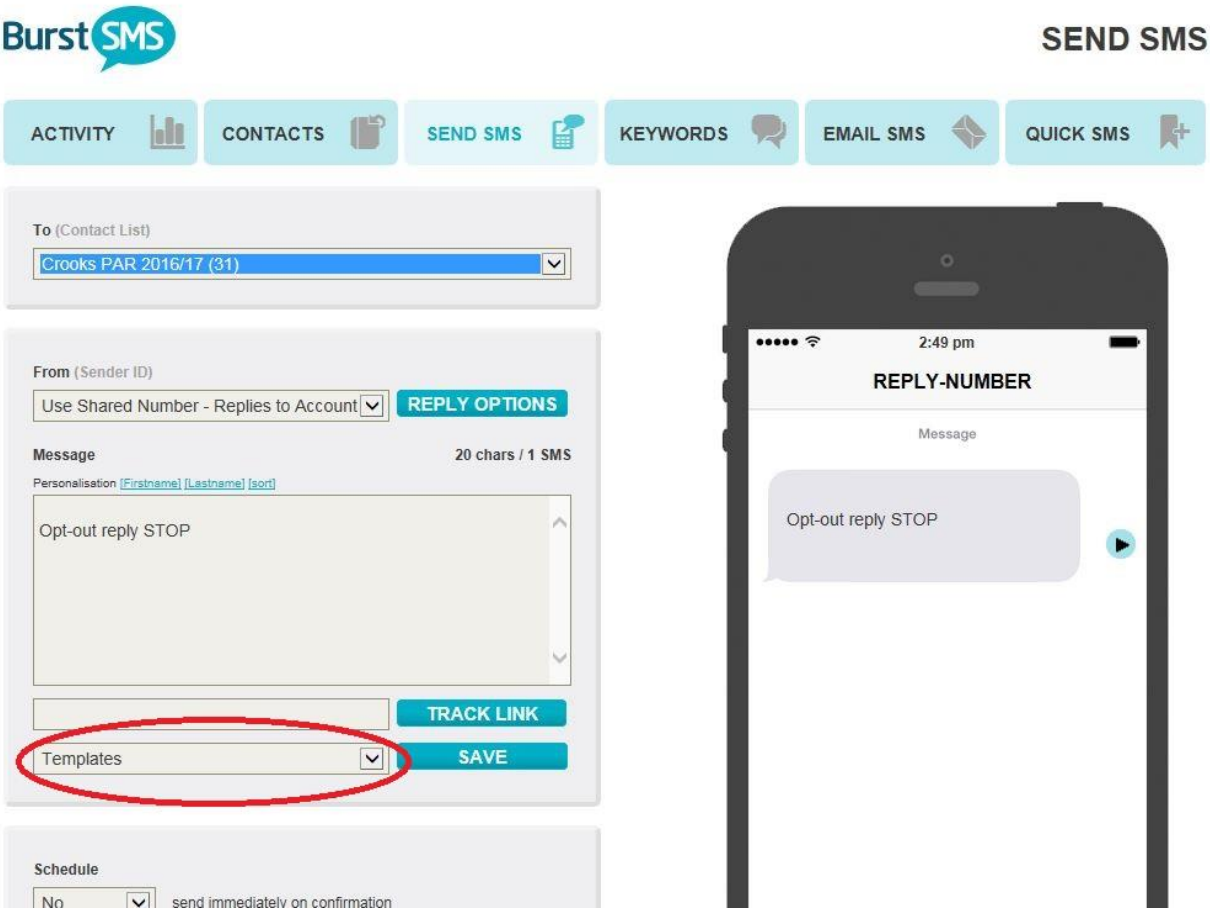
- Select **SEND SMS** tab



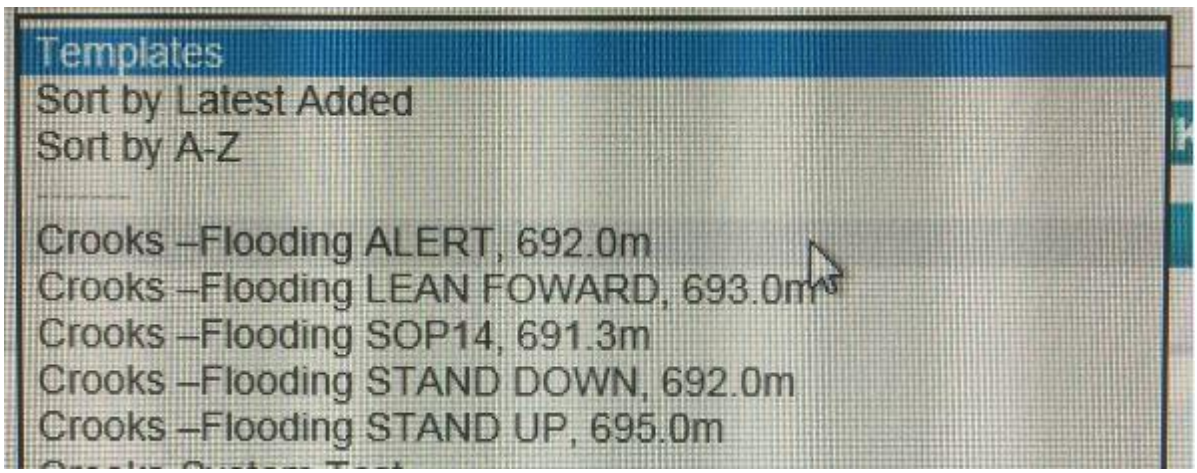
- Ensure the **To Contact List** is correct for the target **Dam**, in this case **Crooks** and the **Activation Status**



- Left Click the **Templates** tab to display available preloaded messages.



- 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 **Crooks**
- **Note** currently only **Flooding** event messages are preloaded **messaging for all other events** will need to be created**,** a **Crooks-Blank Template** is preloaded as a guide to the required message format**, refer to EEC Communication Activity Tables to complete content.**

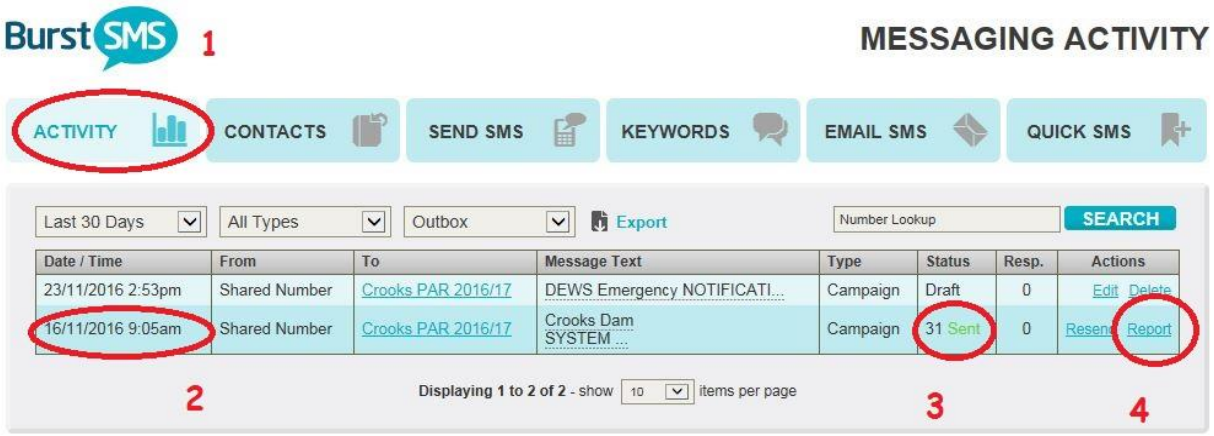


- Carefully review the content of the draft message in the simulated phone image on the right hand side.
- Some messages have various options that require final editing
- Ensure to edit UPDATE field, **time** for the next update and editing for **am/pm**

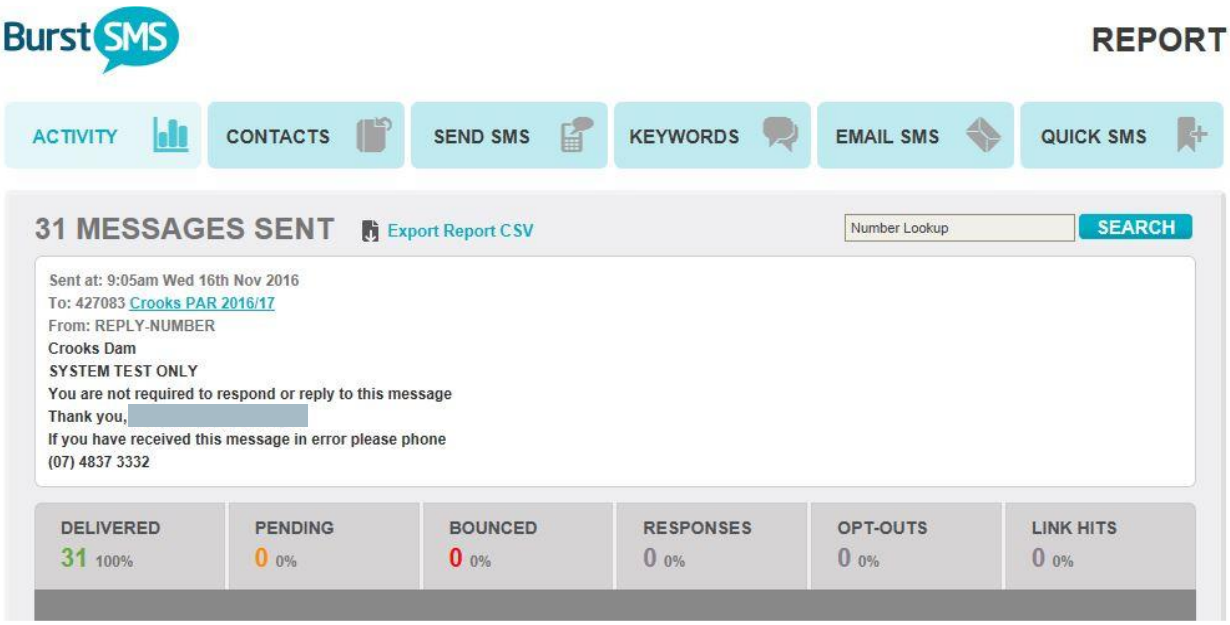
- Click on the NEXT button on the bottom of the screen

Final check and send, check the **To Target Group** and **simulated message**, if all correct press **SEND**.

3) Sent Message Reporting



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



Delivered means the message has been delivered to the recipients 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

Recording

Message information will remain on the Burst SMS portal after you shut down.

For longer term recording it is recommended an **Export Report** is copied securely on an internal system Edocs.

Personnel Affected and Responsibilities

Director Asset Management, DoR	Authorises/approves this procedure.
Central Operations Manager	Receives all dam safety inspection reports and advises the Director Technical Services if the dam is behaving abnormally. Manages the distribution, approval and revision control related to this procedure.
Emergency Event Coordinator	Undertakes messaging, analysis and the saves the activity reporting.

Data Collection

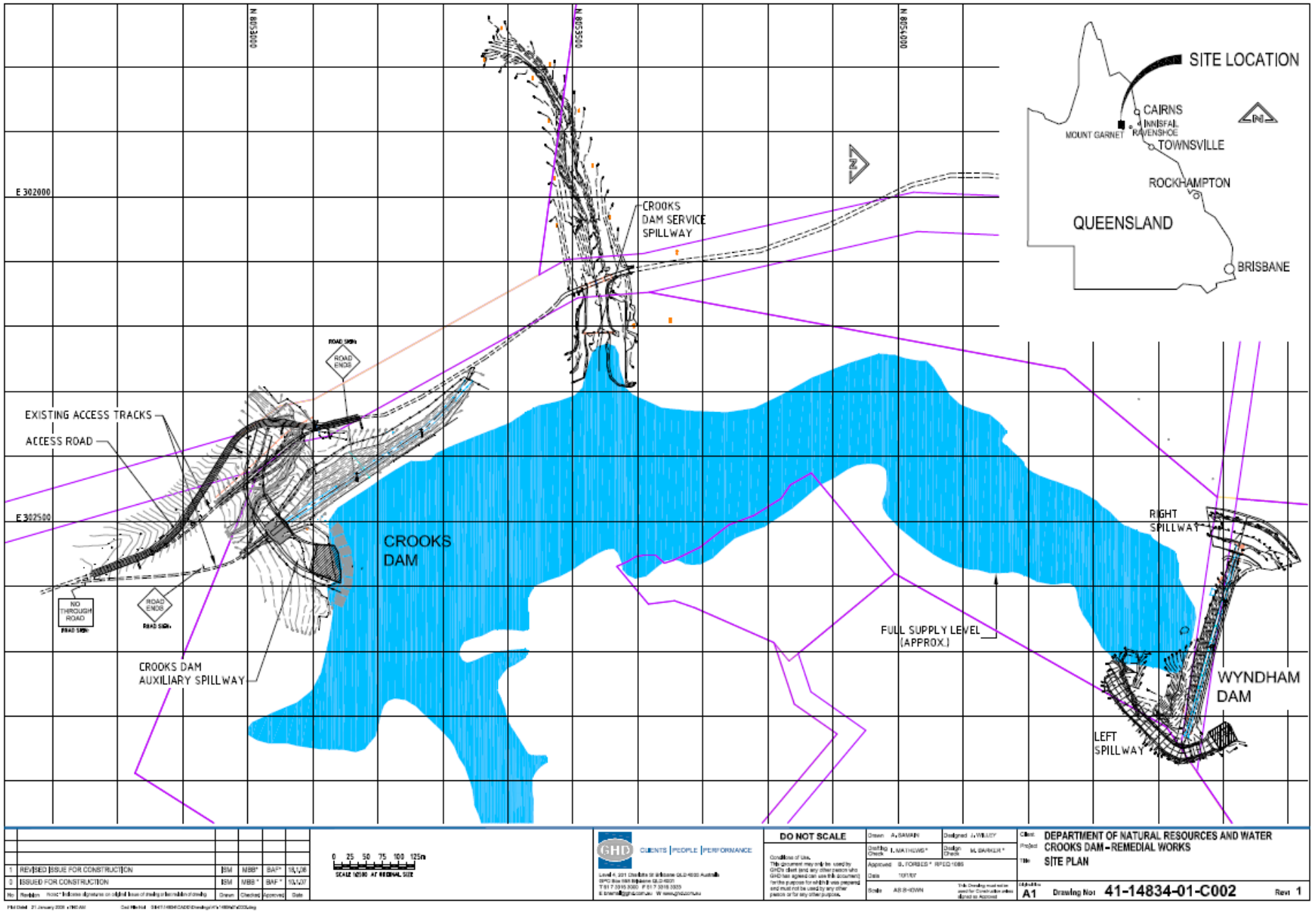
Activity reporting to be saved on Edocs under Crooks Dam

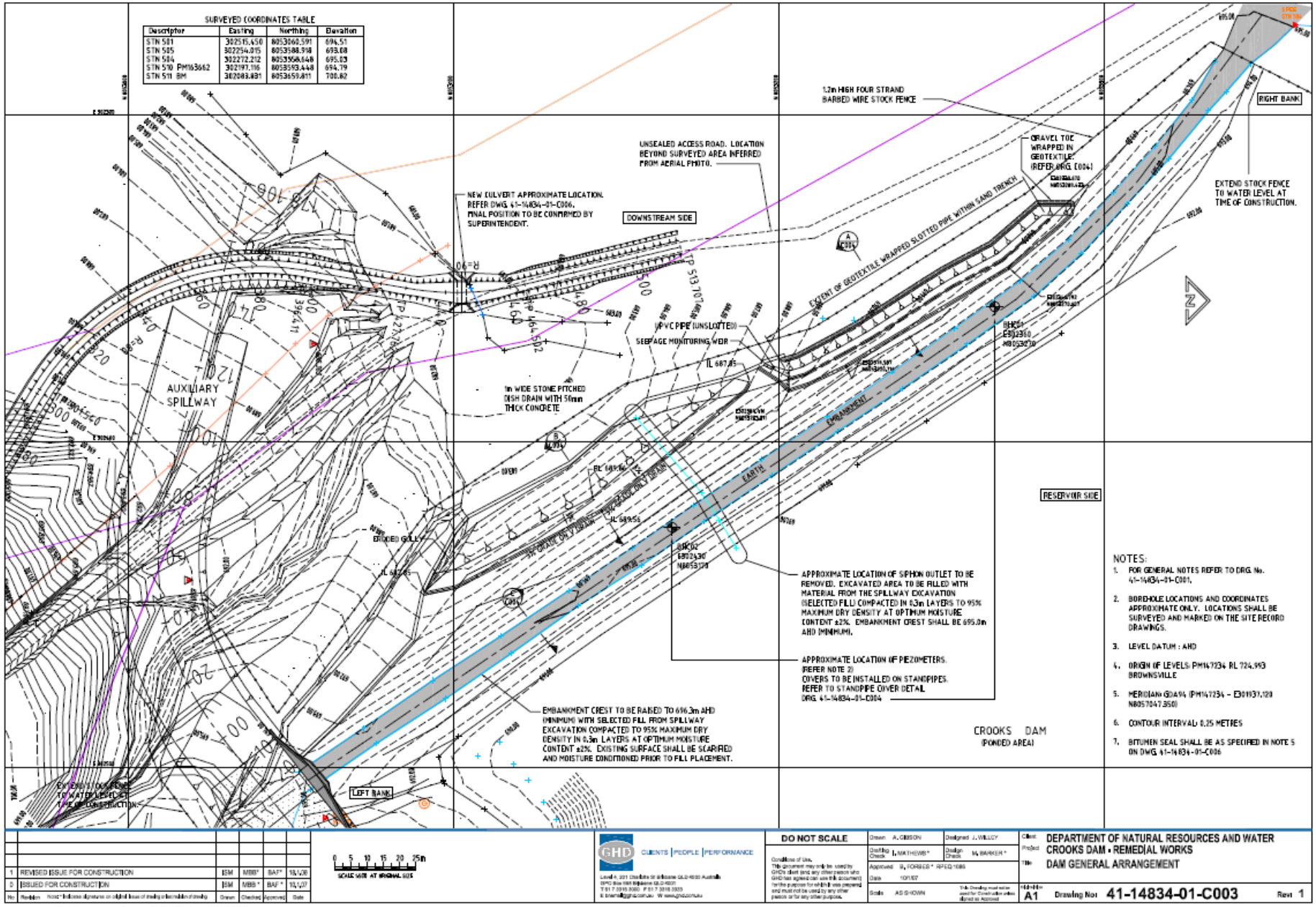
Reporting

Reporting of activity will be included in the Emergency Event Report if required.

APPENDIX 14

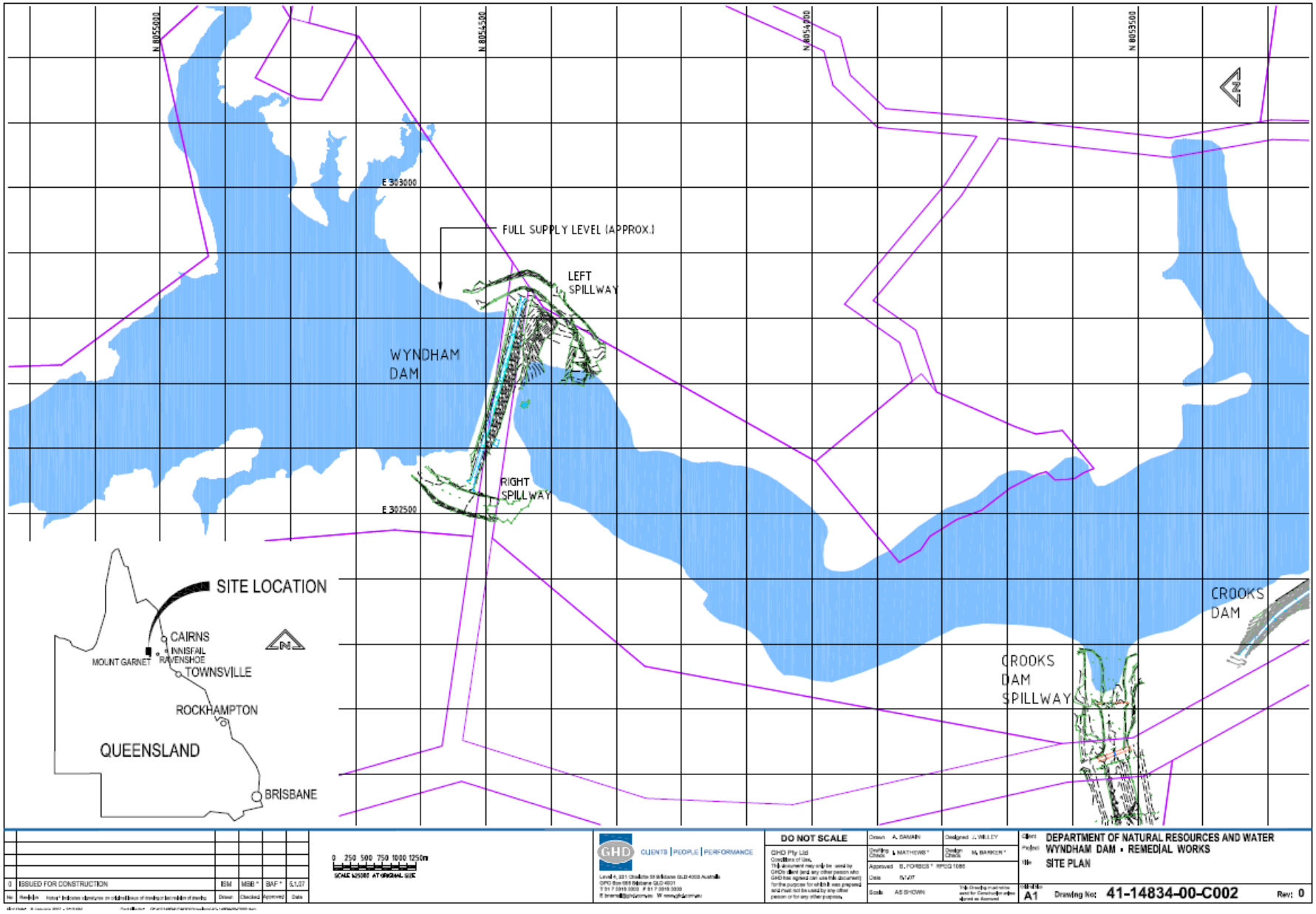
CROOKS DAM DRAWINGS

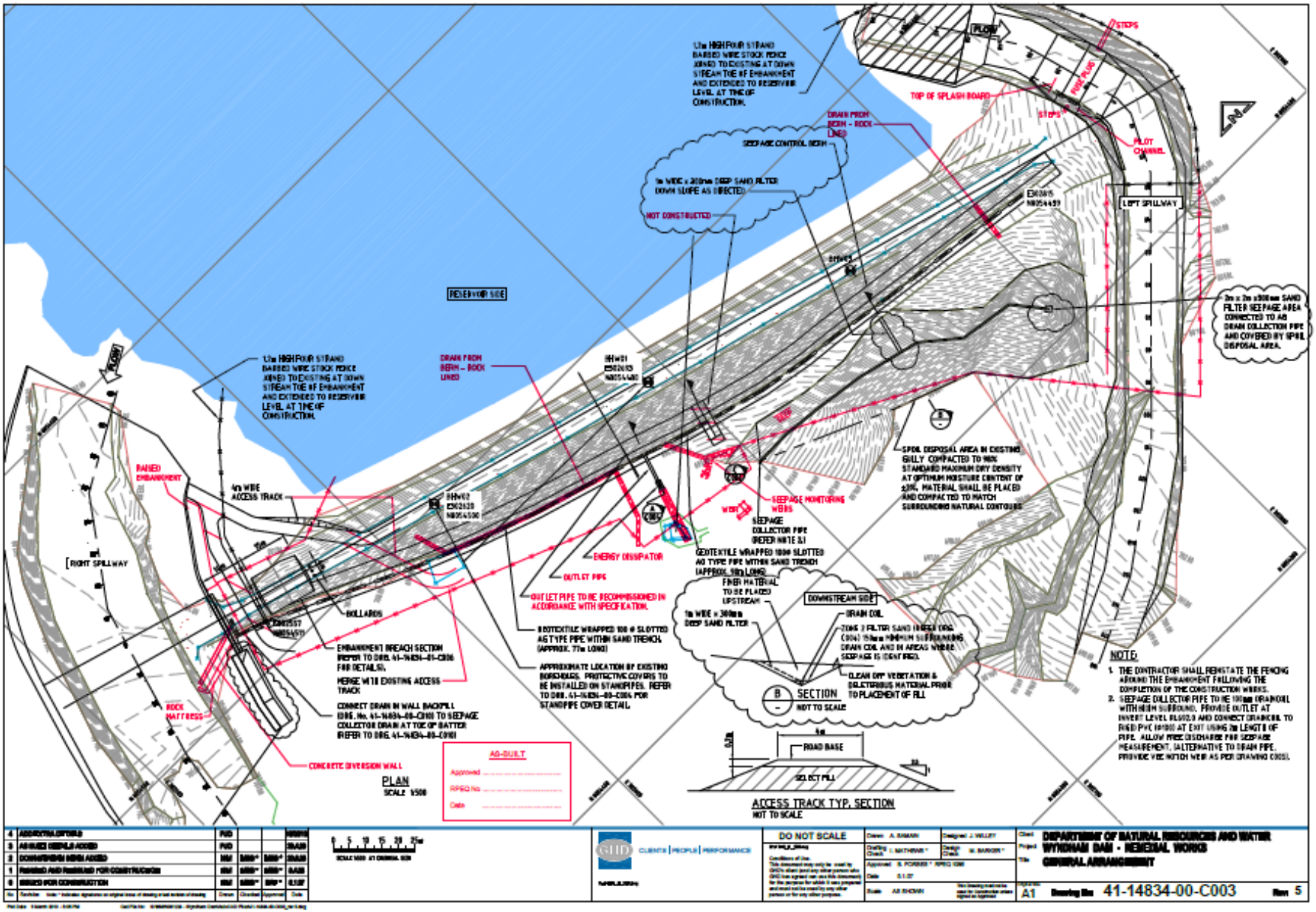

SITE LOCATION
CAIRNS
INNISFAIL
MOUNT GARNET
RAVENSHOE
TOWNSVILLE
ROCKHAMPTON
QUEENSLAND
BRISBANE
N 8073000
N 8072500
N 8072000
E 302000
E 302500
CROOKS DAM SERVICE SPILLWAY
EXISTING ACCESS TRACKS
ACCESS ROAD
ROAD ENDS
NO THROUGH ROAD
CROOKS DAM
CROOKS DAM AUXILIARY SPILLWAY
FULL SUPPLY LEVEL (APPROX.)
RIGHT SPILLWAY
LEFT SPILLWAY
WYNDHAM DAM
1 REVISED ISSUE FOR CONSTRUCTION
0 ISSUED FOR CONSTRUCTION
0 25 50 75 100 125m
SCALE 1:2500 AT ORIGINAL SIZE
GHD
CLIENTS | PEOPLE | PERFORMANCE
DO NOT SCALE
DEPARTMENT OF NATURAL RESOURCES AND WATER
CROOKS DAM – REMEDIAL WORKS
SITE PLAN
A1
Drawing No: 41-14834-01-C002
Rev: 1


SURVEYED COORDINATES TABLE
Descriptor | Easting | Northing | Elevation
STN 501 | 382515.450 | 8053360.591 | 694.51
STN 505 | 382254.015 | 8053388.598 | 693.08
STN 504 | 382272.212 | 8053568.448 | 695.03
STN 510 PM163662 | 382197.116 | 8053593.448 | 694.79
STN 511 BM | 382083.881 | 8053659.811 | 700.82
1.2m HIGH FOUR STRAND BARBED WIRE STOCK FENCE
UNSEALED ACCESS ROAD. LOCATION BEYOND SURVEYED AREA INFERRED FROM AERIAL PHOTO.
NEW CULVERT APPROXIMATE LOCATION. REFER DWG. 41-14834-01-C006. FINAL POSITION TO BE CONFIRMED BY SUPERINTENDENT.
DOWNSTREAM SIDE
GRAVEL TOE WRAPPED IN GEOTEXTILE. (REFER DRG. C004)
RIGHT BANK
EXTEND STOCK FENCE TO WATER LEVEL AT TIME OF CONSTRUCTION.
EXTENT OF GEOTEXTILE WRAPPED SLOTTED PIPE WITHIN SAND TRENCH
PVC PIPE (UNSLOTTED)
SEEPAGE MONITORING WEIR
IL 687.85
1m WIDE STONE PITCHED DISH DRAIN WITH 50mm THICK CONCRETE
AUXILIARY SPILLWAY
EMBANKMENT
EARTH
RESERVOIR SIDE
APPROXIMATE LOCATION OF SIPHON OUTLET TO BE REMOVED. EXCAVATED AREA TO BE FILLED WITH MATERIAL FROM THE SPILLWAY EXCAVATION (SELECTED FILL) COMPACTED IN 0.3m LAYERS TO 95% MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT ±2%. EMBANKMENT CREST SHALL BE 695.0m AHD (MINIMUM).
APPROXIMATE LOCATION OF PIEZOMETERS. (REFER NOTE 2) COVERS TO BE INSTALLED ON STANDPIPES. REFER TO STANDPIPE COVER DETAIL DRG. 41-14834-01-C004
EMBANKMENT CREST TO BE RAISED TO 696.3m AHD (MINIMUM) WITH SELECTED FILL FROM SPILLWAY EXCAVATION COMPACTED TO 95% MAXIMUM DRY DENSITY IN 0.3m LAYERS AT OPTIMUM MOISTURE CONTENT ±2%. EXISTING SURFACE SHALL BE SCARIFIED AND MOISTURE CONDITIONED PRIOR TO FILL PLACEMENT.
CROOKS DAM (PONDED AREA)
LEFT BANK
NOTES:
1. FOR GENERAL NOTES REFER TO DRG. No. 41-14834-01-C001.
2. BOREHOLE LOCATIONS AND COORDINATES APPROXIMATE ONLY. LOCATIONS SHALL BE SURVEYED AND MARKED ON THE SITE RECORD DRAWINGS.
3. LEVEL DATUM : AHD
4. ORIGIN OF LEVELS: PM147234 RL 724.993 BROWNSVILLE
5. MERIDIAN GDA94 (PM147234 – E301937.120 N8057047.350)
6. CONTOUR INTERVAL 0.25 METRES
7. BITUMEN SEAL SHALL BE AS SPECIFIED IN NOTE 5 ON DWG. 41-14834-01-C006
1 REVISED ISSUE FOR CONSTRUCTION
0 ISSUED FOR CONSTRUCTION
DO NOT SCALE
GHD CLIENTS | PEOPLE | PERFORMANCE
DEPARTMENT OF NATURAL RESOURCES AND WATER
CROOKS DAM - REMEDIAL WORKS
DAM GENERAL ARRANGEMENT
A1
Drawing No 41-14834-01-C003
Rev 1

APPENDIX 15

WYNDHAM DAM DRAWINGS


N 8055000
N 8054500
N 8054000
N 8053500
E 303000
E 302500
FULL SUPPLY LEVEL (APPROX.)
LEFT SPILLWAY
RIGHT SPILLWAY
WYNDHAM DAM
CROOKS DAM
CROOKS DAM SPILLWAY
SITE LOCATION
CAIRNS
INNISFAIL
MOUNT GARNET
TOWNSVILLE
ROCKHAMPTON
QUEENSLAND
BRISBANE
DO NOT SCALE
DEPARTMENT OF NATURAL RESOURCES AND WATER
WYNDHAM DAM - REMEDIAL WORKS
SITE PLAN
A1
Drawing No: 41-14834-00-C002
Rev: 0


1.8m HIGH FOUR STRAND BARBED WIRE STOCK FENCE JOINED TO EXISTING AT DOWN STREAM TOE OF EMBANKMENT AND EXTENDED TO RESERVOIR LEVEL AT TIME OF CONSTRUCTION.
TOP OF SPLASH BOARD
STEPS
ROAD PLAN
PILOT CHANNEL
LEFT SPILLWAY
DRAIN FROM BERM - ROCK LINED
SEEPAGE CONTROL BERM
1m WIDE x 300mm DEEP SAND FILTER DOWN SLOPE AS DIRECTED
NOT CONSTRUCTED
RESERVOIR SIDE
3m x 2m x 300mm SAND FILTER SEEPAGE AREA CONNECTED TO AG DRAIN COLLECTION PIPE AND COVERED BY SPOIL DISPOSAL AREA.
SPOIL DISPOSAL AREA IN EXISTING GULLY COMPACTED TO 98% STANDARD MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT OF ±3%. MATERIAL SHALL BE PLACED AND COMPACTED TO MATCH SURROUNDING NATURAL CONTOURS
RAISED EMBANKMENT
4m WIDE ACCESS TRACK
RIGHT SPILLWAY
SEEPAGE MONITORING WEIRS
SEEPAGE COLLECTOR PIPE (REFER NOTE 3.)
GEOTEXTILE WRAPPED 100Ø SLOTTED AG TYPE PIPE WITHIN SAND TRENCH (APPROX. 90m LONG)
ENERGY DISSIPATOR
OUTLET PIPE
OUTLET PIPE TO BE RECOMMISSIONED IN ACCORDANCE WITH SPECIFICATION.
FINER MATERIAL TO BE PLACED UPSTREAM
DOWNSTREAM SIDE
1m WIDE x 300mm DEEP SAND FILTER
DRAIN COIL
BOLLARDS
GEOTEXTILE WRAPPED 100 Ø SLOTTED AG TYPE PIPE WITHIN SAND TRENCH. (APPROX. 77m LONG)
APPROXIMATE LOCATION OF EXISTING BOREHOLES. PROTECTIVE COVERS TO BE INSTALLED ON STANDPIPES. REFER TO DWG. 41-14834-00-C004 FOR STANDPIPE COVER DETAIL.
EMBANKMENT BREACH SECTION REFER TO DWG. 41-14834-01-C006 FOR DETAILS).
MERGE WITH EXISTING ACCESS TRACK
CONNECT DRAIN IN WALL BACKFILL (DWG. No. 41-14834-00-C005) TO SEEPAGE COLLECTOR DRAIN AT TOE OF BATTER (REFER TO DWG. 41-14834-00-C004)
ROCK MATTRESS
CONCRETE DIVERSION WALL
PLAN
SCALE 1:500
AS-BUILT
B SECTION
NOT TO SCALE
ROAD BASE
SELECT FILL
ACCESS TRACK TYP. SECTION
NOT TO SCALE
NOTE
1. THE CONTRACTOR SHALL REINSTATE THE FENCING AROUND THE EMBANKMENT FOLLOWING THE COMPLETION OF THE CONSTRUCTION WORKS.
2. SEEPAGE COLLECTOR PIPE TO BE 100mm DRAINCOIL WITH NEEDLE SURROUND. PROVIDE OUTLET AT INVERT LEVEL RL902.0 AND CONNECT DRAINCOIL TO RIGID PVC 100ØD AT EXIT USING 2m LENGTH OF PIPE. ALLOW FREE DISCHARGE FOR SEEPAGE MEASUREMENT. (ALTERNATIVE TO DRAIN PIPE. PROVIDE VEE NOTCH WEIR AS PER DRAWING C005).
DO NOT SCALE
GHD
CLIENTS | PEOPLE | PERFORMANCE
DEPARTMENT OF NATURAL RESOURCES AND WATER
WYNDHAM DAM - REMEDIAL WORKS
GENERAL ARRANGEMENT
A1
41-14834-00-C003
Rev 5

APPENDIX 16

Training

Internal TS only scenario events are held regularly, at least annually as part of pre wet season preparations after annual EAP reviews by all officers with active roles in this and other TS EAP's, the purpose of these sessions are to improve working knowledge of the w

EAP reinforcement sessions are held between the TS EEC, LDC and DIO's generally on an annual basis as part of pre wet season preparations to discuss any EAP changes, reinforce roles and responsibilities, responses, procedures and identify improvements.
Recent events, June 2016, Aug 2017, May 2018.

Training and scenario exercises may be organised by the COM. These will include TS officers, TRC Officers and the appropriate Local Disaster Management Group personnel. These exercises may rotate between the four EAP's and frequency is ultimately dependent on individual LDMG's availability.
Recent event, Crooks Dam October 2015.

Other Events, TS staff actively participate in larger scenario training exercises by invitation when organized by LDMG involving LDMG and DDMG to increase awareness, responses, and procedures as well as identify improvements in the EAP and how it successfully integrates into the larger district disaster management plan.
Recent Event, Nov 2017.

A record of the training is to be entered into the table below.

Officer	EAP Role	Dam Safety Training	EAP Reinforcement LDC& DIOs	LDMG and DDMG Scenario Training
	EEC	July 2014	June 2016 August 2017 May 2018	TS Mar2020 LDC & DDMG training Oct 2019
	EEC Backup 1 (as nominated)	October 2015	Nil	TS Mar 2020
	EEC Backup 2 (as nominated)	April 2019	May 2018	TS Mar 2020
	COM	June 2018	Nil	TS Mar 2020
	DM	2012	Nil	TS Mar 2020
	LDC	N/A	June 2016 May 2018	LDC & DDMG Oct 2019

[redacted]	DIS & DIO Backup	2018	Nil	Nil
[redacted]	DIO	2019	Nil	Nil
[redacted]	DIO	2019	August 2017	Nil
[redacted]	DIO Backup	2021		
[redacted]	DIO Backup	2021		
[redacted]	EAP Engineer	October 2015	August 2017	Nil

APPENDIX 17

SOP 15

Emergency Event Coordination

Department of Resources

Standing Operating Procedures

For

Emergency Event Coordination

SOP - 15

Table 1 Acronyms

EEC	Emergency Event Coordinator
DM	Director, Asset Management
COM	Central Operations Manager, Technical Services

Procedure

The RSAS Alert System will send an automatic SMS Alert message instantaneously to the current Crooks On-Call Contact List, detailing the dam name, date, time, activation status, and latest relevant instrumentation readings.

The nominated EEC for Crooks dam should respond ASAP but has 5 minutes to respond via SMS text to the Crooks Distribution Group via the existing established TS Iphone Circulation Message Group Text indicating to the COM 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 COM or DM will respond via SMS text to the Crooks Distribution Group via the existing established TS Iphone Circulation Message Group Text that they have acknowledged the alert and will appoint an alternative EEC officer.

If neither the COM 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 COM or DM directly by phone, after which other officers are to stand by.

Table 2 below is to be updated when officers go on leave and distributed to the EEC's, COM and DM.

Table 2 On-Call Contact List

Nominated Emergency Event Coordinator	Dam Name	Mobile Number
	Crooks and Wyndham Dam	
	Copperfield River Gorge Dam	
	Corella Dam	
	Glen Niven Dam	
Backup Officers		
COM		
DM		