

EMERGENCY ACTION PLAN — FRED HAIGH DAM (ID 0272)

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Prepared by Sunwater Limited

Controlled Copy No.

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Approved by the delegate of the Chief Executive, Department of Regional Development, Manufacturing and Water until 1 May 2026.

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Emergency activation quick reference – Dam Hazards

The Emergency Action Plan (EAP) for Fred Haigh Dam covers dam hazards evaluated within Sunwater's Dam Safety Management Program. Use the following table to select the relevant section of the EAP that deals with the dam hazard.

NOTE: The Incident Coordinator (IC) is responsible for activating the EAP unless otherwise directed by the Flood Operations Decision Maker (FODM) or Dam Safety Technical Decision Maker (DSTDM). Should the IC be unavailable, the Local Event Coordinator (LEC), Owner's Regional Representative (ORR) or Dam Duty Officer (DDO) is responsible. Table 1: Emergency activation guick reference - Dam Hazards

Dam Hazards and section	Activation levels for dam hazards				
numbers	Alert	Lean Forward	Stand Up	Stand Down	
Flood operations See section 6	• Storage EL 75.46 m and rising (0.1 m below FSL)	• Storage above FSL 75.56 m	• Storage above EL 77.06 m (Moderate flood classification level)	 Storage EL 75.86 m and falling with no forecast increase in EL for 48 hours 	
Piping: embankment, foundation, or abutments See section 7	 Increasing leakage through an embankment, the foundations, or abutments 	 Increasing leakage through an embankment, the foundations, or abutments with cloudy water 	 Piping condition has been established 	• Risk assessment has determined that failure risk has reduced	
Earthquake See section 8	 Earthquake reported or felt in the area, AND Intensity less than 5 Modified Mercalli (MM) 	 Earthquake reported or felt in the area, AND Intensity greater than or equal to 5MM, OR Intensity less than 5MM and change detected during surveillance inspection 	 Earthquake reported or felt in the area, AND A possible failure path has been identified 	 Risk assessment has determined that failure risk has reduced 	
Terrorist threat/activity or high energy impact See section 9	• Not applicable	• Not applicable	 Possible terrorist activity noticed at dam or threat received Large explosion heard/observed at dam (e.g., bomb explosion, aircraft hit) Failure in progress or likely due to impact or explosion, and sufficient water in storage to create a dam hazard 	 Risk assessment has determined that failure risk has reduced 	

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Emergency activation quick reference – Other Emergency Situations

The EAP for Fred Haigh Dam covers one other emergency situation evaluated within Sunwater's Dam Safety Management Program. Use the following table to select the relevant section of the EAP that deals with the other emergency situation.

NOTE: The IC is responsible for the decision to activate the EAP. Should the IC be unavailable, the LEC or DDO is responsible for the decision.

Table 2: Emergency activation quick reference - Other Emergency Situations

	Activation levels			
Other Emergency Situations	Communications Failure – Dam Site (DDO)	Communications Failure – Local Area (LEC/ORR)	Communications Failure – Brisbane (IC/DSTDM)	
and section numbers	• Site managed (DDO - becomes LEC)	Brisbane managed by IC	 Locally managed by LEC 	
		Activation triggers for other emergency situations		
Comms Failure See section 10	• Unable to communicate to or from dam site	• Unable to communicate to or from local area	• Unable to communicate to or from Sunwater Brisbane	

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Document control

Authorisation of document

Name	Position/role	Signature	Date
	EAP Program Lead —Prepared for submission		24/09/2024

Document revision history

lssue	Date	Prepared by	Reason for change	eDOCS#
2	May 2008		Significant changes of Fred Haigh Dam Emergency Action Plan to reflect Sunwater Management structure and other minor changes.	739102
3	October 2011		Significant changes of Fred Haigh Dam Emergency Action Plan to reflect current Sunwater Management structure and other changes.	1060331
4	October 2015		New Emergency Action Plan developed at expiry of 3E approval. Issued for consultation with Relevant Disaster Management Groups.	1688946
5	October 2016		Contact details updated and Emergency alert polygon updated.	2036690
6	August 2017		Revised and reviewed Emergency Action Plan developed at expiry of approval. Also includes updates that reflect the Water Legislation (Dam Safety) Amendment Act 2017, implementation of changes to Sunwater management structure, new event management roles and addition of new Emergency Activation section (Other Emergency Situations).	2148429
7	September 2018		Amended contacts and associated sections, e.g., Organisation chart & Controlled Copy Holders list. Minor error corrections and other non-substantive changes.	2367179
7.1	September 2019		Yearly update of contacts and associated sections, e.g., Organisation chart & Controlled Copy Holders list. Added Downstream Notification map. Minor error corrections and other non-substantive changes.	2467062
7.2	September 2020		Amended contacts and associated sections, e.g., Organisation chart & Controlled Copy Holders list. Minor error corrections and other non-substantive changes.	2571776
8.0	August 2021		Revised and reviewed at expiry of approval. Error corrections and other non-substantive changes to improve readability and useability. Incorporated global non-substantive EAP changes resulting from feedback from previous internal and external reviews. Amended to comply with the new Sunwater branding. Amended contacts and associated sections, e.g., Organisation chart & Controlled Copy Holders list. Updated access and catchment maps. Updated messaging to new standard for consistency. Updated Roles and Responsibilities.	2590343
8.1	October 2021		Replaced outdated Discharge Curves with new version. Minor error corrections and updates including most recent Schedules of Matters.	2661675
8.2	September 2022		Amended contacts and associated sections. Minor error corrections and other non-substantive changes. The Chemical Hazard section has been removed as it is not a Dam Safety Hazard and is dealt with in other more relevant documents.	2725899
8.3	September 2023		Added Section 2.5 Fatigue Management Plan. Non- substantive updates as part of Annual Safety Statement. Minor error corrections and readability improvements.	2812536
8.4	September 2024		Wet Season Preparedness – Contact Updates	2865418

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4 Disaster Management Officer — Local Disaster Management Group (LDMG) Bundaberg Regional Council				
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Senior Flood Forecaster	Bureau of Meteorology, Brisbane		
Emergency Management Coordinator	Queensland Police Service, Maryborough		
NOTE: Communication information for each 'Electronic Copy Holder' is in Appendix A.			

1. References, abbreviations, and definitions

1.1 References/associated documents

Ref	Document title	Reference/location
A	Water Supply (Safety and Reliability) Act 2008—Current as of 25 May 2020	https://www.legislation.qld.gov.au/view/whole/pdf/inforce/current /act-2008-034
В	Emergency action plan for referable dam guideline (RDMW 2021)	https://www.resources.qld.gov.au/ data/assets/pdf file/0018/84 015/eap-guideline.pdf
С	Queensland State Disaster Management Plan 2023 (Queensland's Disaster Management Arrangements)	https://www.disaster.qld.gov.au/ data/assets/pdf file/0027/3393 36/Interim-2023-QSDMP-V1.2.pdf
D	Queensland Government arrangements for coordinating public information in a crisis	L1159-DPC2739-Crisis-Communication-Document.pdf (disaster.qld.gov.au)
E	Guidelines for the Development of Communication Education, Awareness and Engagement Programs (2010)	manual-45-guidelines-for-the-development-of-communication- education-awareness-and-engagement-programs.pdf (aidr.org.au)
F	Queensland Emergency Alert Manual – M.1.174 (September 2018)	M.1.174 Queensland Emergency Alert Manual (disaster.qld.gov.au)
G	Sunwater website — Emergency Action Plans, Flood Maps and Dam Emergency Sirens	Emergency Management - Sunwater
Н	Sunwater website — Emergency Notification Service	Sunwater Emergency Notification Service - Sunwater
I	Professional Engineers Act 2002 (RPEQ) — September 2013	Professional Engineers Act 2002 (legislation.qld.gov.au)
J	Sunwater (Internal) Fred Haigh Dam Failure Impact Assessment June 2017	eDOCS# 2171400
к	Sunwater (internal) Fred Haigh Dam Comprehensive Risk Assessment (January 2010)	eDOCS# 897876
L	Sunwater Operations (internal) Fred Haigh Dam — Hazard Management Toolkit (HMT)	Only available with Sunwater internal versions of EAPs
М	Sunwater (internal) Strategic Event Procedure	Strategic Event Procedure
N	Sunwater (internal) Fred Haigh Dam Safety Condition Schedule	<u>eDOCS# 1740554</u>
0	Queensland Disaster Management Act 2003 (December 2020)	Disaster Management Act 2003 (legislation.qld.gov.au)
Р	Queensland Disaster Management Guidelines	Queensland Disaster Management Guidelines
Q	Guidelines on Selection of Acceptable Flood Capacity for Dams (ANCOLD, 2000)	ANCOLD
R	Queensland Dam Safety Management Guidelines (RDMW October 2020)	Queensland Dam Safety Management Guidelines
S	Australian Rainfall and Runoff (ARR) 2016	Home - Australian Rainfall and Runoff (ga.gov.au)
Т	Sunwater (internal) Fred Haigh Dam Operation and Maintenance Manual	Policies, Procedures and Guidelines - Fred Haigh Dam Operations and Maintenance (O&M) Manual - All Documents - Default (Function and Activity) (sharepoint.com)
U	Guidelines on Dam Safety Management (ANCOLD, 2003)	ANCOLD ISBN: 0-731027620
V	Guidelines on Consequence Categories for Dams (ANCOLD, 2012)	ANCOLD ISBN: 978-0-9808192-5-0
W	Guideline for Failure Impact Assessment of Water Dams (RDMW 2018)	Guideline for failure impact assessment of water dams (resources.qld.gov.au)
х	Sunwater (internal) Emergency Alert Protocol	eDOCS# 2156253
Y	Water Act 2000	https://www.legislation.qld.gov.au/view/pdf/inforce/current/act- 2000-034
Z	Sunwater (internal) Fatigue Management Procedure	Fatigue Management Procedure

1.2	Abbreviations and acronyms		
ABC	Australian Broadcasting Corporation	MM	Modified Mercalli
AEP	Annual Exceedance Probability	O&M	Operation & Maintenance
AHD	Australian Height Datum	OB	Observation Bore
AMTD	Adopted Mean Thread Distance	OC	Operations Centre
ANCOLD	Australian National Committee on Large Dams	OCDO	Operations Centre Duty Officer
AWS	Australian Warning System	OCO	Operations Coordinator
BOM	Bureau of Meteorology	OM	Operator Maintainer
CED	Chief Engineer Dams	OMGR	Operations Manager
CEO	Chief Executive Officer	OS	Operations Supervisor
CRA	Comprehensive Risk Assessment	ORR	Owner's Regional Representative
CTG	Counter Terrorism Group	PAR	Population at Risk
D/S	Downstream	PDSE	Principal Dam Safety Engineer
DCF	Dam Crest Flood	PFRM	Predictive Flood Routing Model
DCL	Dam Crest Level	PLL	Probable Loss of Life
DDC	District Disaster Coordinator	PMF	Probable Maximum Flood
DDMG	District Disaster Management Group	PMP	Probable Maximum Precipitation
DDMP	District Disaster Management Plan	PMPF	Probable Maximum Precipitation Flood
DDO	Dam Duty Officer	PWRE	Principal Water Resources Engineer
DDS	Director Dam Safety	QDMC	Queensland Disaster Management Committee
DSR	Dam Safety Regulator	QFD	Queensland Fire Department
DSSC	Dam Safety Surveillance Coordinator	QPS	Queensland Police Service
DSTDM	Dam Safety Technical Decision Maker	RB	Right Bank
EAP	Emergency Action Plan	RC	Regional Council
EA	Emergency Alert	RCC	Roller Compacted Concrete
EER	Emergency Event Report	RDMW	Department of Regional Development,
EGMO	Executive General Manager Operations		Manufacturing & Water
EGME&WR	Executive General Manager Engineering & Water	ROC	Regional Operations Centre
	Resources	RPEQ	Registered Professional Engineer of Queensland
EL	Elevation Level	RSL	Reduced Supply Level
ELT	Executive Leadership Team	SCED	Senior Civil Engineer Dams
FCL	Fixed Crest Level	SCTN	Security and Counter Terrorism Network
FODM	Flood Operations Decision Maker	SDCC	State Disaster Coordination Centre
FSL	Full Supply Level	SDF	Sunny Day Failure
GM	General Manager	SDTE	Senior Dam Technical Engineer
HMT	Hazard Management Toolkit	SES	State Emergency Service
IC	Incident Coordinator	SMS	Short Message Service
IFHC	Incremental Flood Hazard Category	SMT	Sunwater Media Team
IGEM	Inspector-General Emergency Management	SO	Standby Operator
LB	Left Bank	SOP	Standing Operating Procedure
LDC	Local Disaster Coordinator	SRT	Strategic Response Team
LDMG	Local Disaster Management Group	SS	Storage Supervisor
LDMP	Local Disaster Management Plan	SWL	Storage Water Level
LEC	Local Event Coordinator	SWRE	Senior Water Resources Engineer
MAP	Manager Asset Planning	U/S	Upstream
Max. OL	Maximum Operating Level	WHS	Workplace Health & Safety
ME	Manager Environment	WQ	Water Quality

1.3 Business terms and definitions

The meaning of terms used in this section are set out in accordance with relevant legislation or as defined by operator requirements.

Term	Definition	
Terms defined in accordance with the Water Supply (Safety and Reliability) Act 2008 (ref_A) (the Act)		
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. NOTE: Various dam failure modes have been referred to as <i>hazards</i> in this document e.g., piping, instability, and overtonning 	
Dam hazard event	 Means an event arising from a <i>dam hazard</i> if: persons or property may be harmed because of the event, AND a coordinated response, involving two or more of the following <i>relevant entities</i>, is unlikely to be required; each <i>local group</i> and <i>district group</i> 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 <i>emergency event</i>. 	
Disaster management plan	Of a <i>district group</i> or local government, means the group's District Disaster Management Plan (DDMP) or local government's Local Disaster Management Plan (LDMP) under ref O.	
District group	For an EAP, means a district group established under ref O, section 22 whose disaster district under that Act could, under the plan, be affected by a <i>dam hazard</i> .	
Emergency event	Means an event arising from a <i>dam hazard</i> if: • persons or property may be harmed because of the event, AND • any of the following apply:	
	 o a coordinated response, involving two or more of the following <i>relevant entities</i>, is likely to be required; each <i>local group</i> and <i>district group</i> for the EAP, each local government whose area may be affected, the Chief Executive, another entity the owner of the dam considers appropriate, OR o the event may arise because of a disaster situation declared under ref O, OR o an entity performing functions under the State <i>Disaster Management Plan</i> may, under that plan, require the owner of the dam to give the entity information about the event. 	
Local group	For an EAP, means a local group established under ref O, section 29 whose local government area could, under the plan, be affected by a <i>dam hazard</i> .	
Notice response	A dam owner's written response to a notice following an assessment of an EAP by a local government or <i>district group</i> .	
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 Act, AND the assessment states the dam has, or the proposed dam after its construction will have, a category one or category two 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 <i>dam hazard event</i> or <i>emergency event</i> were to happen for the dam, e.g., the owners of parcels of farmland adjacent to the dam or residents of a township each <i>local group</i> and <i>district group</i> for the EAP each local government whose local government area may be affected if <i>a dam hazard event or emergency event</i> were to happen the Chief Executive another entity the owner of the dam considers appropriate e.g. the Queensland Police Service (OPS). 	

Term	Definition
-	Terms consistent with Queensland Disaster Management Guidelines (ref P)
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
Concurrent Flooding	widespread flooding of farmland is likely. Flood flows downstream of a dam that are not a result of dam outflows; for instance, those from adjacent catchments or from the sea, and which occur in the same period as downstream releases or flooding from the dam.
Dam crest (ref Q)	The lowest elevation of the non-overflow crest section of the dam excluding handrails, parapets or wave walls that have not been designed to store water.
Dam crest flood (ref Q)	The flood event which, when routed through the reservoir, results in a still water reservoir level equivalent to the lowest dam crest level.
Dam failure	Dam failure is the physical collapse of all or part of a dam or the uncontrolled release of any of its contents.
Downstream releases	Downstream releases are outflows from the dam made through appurtenant structures such as spillways or outlet works that are in accordance with the design of the dam.
Earthquake	A sudden release of energy in the earth's crust or upper mantle, usually caused by movement along a fault plane or by volcanic activity, resulting in the generation of seismic waves that can be destructive. The potential consequences of an earthquake include: • settlement, sliding, or overturning of monoliths in the dam wall • initiation of seepage lines in the foundations or abutments that could lead to piping damage and potential inoperability of appurtenant works.
Flood release	A flood release from a dam occurs when catchment inflows raise the storage level above the Full Supply Level (FSL) resulting in a discharge from the spillway of the dam.
Piping	Internal scour caused by the water flow and seepage that occurs through earth dams, dam foundations, or dam abutments. The internal scour can lead to the formation of a pipe, which can lead to a failure of the dam.
Plane strike or other impact	The impact of a plane, meteorite, or other high energy item on or in close vicinity of a dam that could damage the dam structure or create a wave that could overtop the dam.
Plane strike or other impact	The impact of a plane, meteorite, or other high energy item on or in close vicinity of a dam that could damage the dam structure or create a wave that could overtop the dam.
Probable maximum flood (ref R)	The flood resulting from the <i>probable maximum precipitation</i> coupled with the worst flood-producing catchment conditions that can be realistically expected in the prevailing meteorological conditions.
Probable maximum precipitation (ref R)	The theoretical greatest depth of precipitation for a given duration that is physically possible over a particular drainage basin.

Term	Definition
Probable maximum precipitation flood (ref S)	The flood resulting from the <i>probable maximum precipitation</i> coupled with typical catchment conditions.
Stability, main embankment	High foundation pore pressure peaks may reduce the Factor of Safety against slip circle failure to an unacceptable level.
'Sunny Day' failure	A failure that occurs at the FSL and there is no concurrent rain associated flooding.
Terrorist activity	A deliberate attempt to damage, fail or contaminate a dam.

2. Introduction

2.1 Context

Under the *Water Supply (Safety and Reliability) Act (2008)* (ref A, 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.

This EAP has been prepared in accordance with Chapter 4 of the Act and the Emergency action plan for referable dam guideline (RDMW 2021) (ref B) and the Queensland State Disaster Management Plan 2023 (ref C). The content requirements for EAPs are contained in section 352H of the Act.

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 types (e.g., flood operations or piping risk):

- identify the area likely to be affected by a dam hazard event or emergency event arising from the dam hazard
- identify each circumstance that indicates a material increase in the likelihood of the dam hazard event or emergency event happening
- state when and how the owner of the dam plans to warn persons who may be harmed, or whose property may be harmed by an event caused by the dam hazard, if one happens, and/or there is a material increase in the likelihood of an occurrence, including the order of priority in which the persons or categories of persons are to be warned
- 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
- 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 district 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 a 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 Fred Haigh Dam has been assessed as **Bundaberg Regional Council (BRC)**. Sunwater has provided the **Bundaberg Local Disaster Management Group (LDMG)** 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 Fred Haigh Dam is **Bundaberg Police District Disaster Management Group** (DDMG). Sunwater has provided the DDMG with a copy of the draft EAP for review.

NOTE: Sunwater has attempted to write the EAP to cope with all reasonably foreseeable emergency situations. However, there is considerable uncertainty about how any emergency situation might develop and progress. Factors such as the weather, the location, the mechanics, and the rate and size of any actual failure can considerably affect any resulting flood discharges. Therefore, a significant number of assumptions have had to be made in compiling sections of the EAP. Some variation in outcome should be expected where the event differs from the assumed behaviour.

2.2 Purpose

The purpose of this EAP is:

- to minimise the risk of harm to persons or property if a dam hazard event or emergency event for the dam happens
- to identify dam hazards that could occur at Fred Haigh Dam and the area likely to be affected for each hazard
- to prescribe emergency actions taken by the dam owners and operating personnel in identifying and responding to dam hazards and notifying relevant entities.

It is possible for more than one dam hazard to exist at Fred Haigh Dam at the one time. In such a circumstance, it may be necessary to act on the procedures within separate sections simultaneously.

The focus of this EAP is the management of dam hazards at Fred Haigh Dam by the owner of the dam (Sunwater) and the communication and notification of dam hazards to the LDMGs, DDMGs and broader community. However, the EAP sits within the broader emergency response framework. This EAP has been developed to be consistent with and support the objectives of the Bundaberg Regional Council Local Disaster Management Plan (LDMP) and associated sub plans.

2.3 Scope

The Fred Haigh Dam EAP covers:

- dam hazards evaluated within Sunwater's Dam Safety Management Program
- details about the dam that are relevant to a dam hazard
- identification of circumstances that indicates a material increase in the likelihood of a dam hazard event and/or emergency event happening
- triggers for activation of a tiered response to dam hazard event or emergency event
- roles and responsibilities in responding to a dam hazard event or emergency event
- notification, warning, and communication protocols
- inspection, monitoring, and reporting protocols during emergencies (ref D)
- other relevant information that may assist with identifying the area affected by a dam hazard event or emergency event, and the management of such.

2.4 Sunwater training

Training of the use and implementation of this EAP document is carried out at various times throughout the year. Specific pre-wet season training is undertaken leading up to the wet season. During this period, Sunwater staff complete work instructions for site preparations and from July to September carry out checks on; stores, supplies of fuel and the current EAP such as contact details for individuals and dam information.

The EAP training that is carried out on-site includes walkthroughs of new changes, scenario (role play) and Q&A to check the knowledge and competency of all those who attended. This on-site training is presented to relevant Sunwater staff (DDO's, LECs and ICs) and disaster management stakeholders. DSTDM and FODM information sessions are carried out once a year with the same walkthrough of new changes and Q&A, but this is not specific to any one Dam. New Sunwater employees in these various roles also have a walkthrough of the EAP.

NOTE: All enquiries regarding EAP training should be directed to

Sunwater is also working towards carrying out exercises involving each local authority and disaster management stakeholders. Where there is more than one referable dam in a local area, the exercise could involve more than one dam, or the location will be rotated. This full test would involve the State Disaster Coordination Centre (SDCC) and include the (non-live) testing of Emergency Alerts (EAs). The test results relating to numbers of alerts generated will be shared with local authority and disaster management stakeholders.

2.5 Fatigue management plan

Sunwater has a Fatigue Management Procedure (ref Z). This document recognises fatigue as an important workplace hazard and has identified and outlined control processes to mitigate the risk of fatigue impaired HSE incidents. A copy of Sunwater's Fatigue Management Procedure can be provided upon request.

2.6 Community information

In accordance with current Australian guidance (ref E), Sunwater with the assistance of the local councils will ensure community education around messaging and impacts of the EAP and its related events is undertaken and continually improved by incorporating actions from Lessons learnt (section 2.7).

Sunwater currently provides information externally to customers, (D/S) residents and the community in a range of methods or channels in relation to dam hazards and emergencies. Individuals can access information through Facebook, Twitter, the Sunwater web page (<u>sunwater.com.au</u>), Sunwater App

(<u>sunwater.com.au/community/sunwater-app/</u>) and at several show/field days across regional Queensland where Sunwater may have stalls and information available.

Notifiable D/S residents are also provided information in text messages, phone calls and emails in the event of an activation of this EAP.

In the event of an emergency event or when otherwise required, Sunwater and the affected local government also have the use of the National Emergency Alert System to send a voice message and SMS in accordance with ref F. This service is provided by Telstra and managed by Queensland Fire Department (QFD) at the SDCC. The process Sunwater follows is documented in Appendix A7.

A copy of all Sunwater approved EAPs are available to the public on the Sunwater website (ref G). These copies are redacted to protect people's personal details.

2.7 Lessons learnt

Sunwater carries out Lessons Learnt workshops as part of its post event management. These Lessons Learnt can result in changes to the EAP. These are captured and if applicable to this document are implemented at the earliest opportunity and are made available in the next EAP update to the Dam Safety Regulator (DSR) as part of Sunwater's continual improvement of its EAPs. The Lessons Learnt actions if relevant are provided to stakeholders, such as the LDMGs, DDMGs, other dam owners and the Department of Regional Development, Manufacturing and Water (RDMW) as appropriate.

In addition, Sunwater requests any post event learnings be communicated regarding operational effectiveness and areas for improvement.

2.8 Downstream notification lists

Sunwater has compiled the notification lists through an iterative process. At least every five years, Sunwater writes to all lot on plan landholders that are impacted in the downstream zones. In addition to individual letters, advertisements are placed yearly in local papers to capture any new residents in the areas. All year, applicable individuals can register to receive notifications for this EAP and are able to register either through the Sunwater website (ref H) or by calling Sunwater Customer Enquiries on 13 15 89.

2.9 Dam hazard management within Sunwater

Key aspects of the dam hazard management framework are:

- Central to the framework is the role of IC for any dam hazard at a dam. The IC will maintain overall responsibility for a coordinated response to the dam hazard incident.
- The IC is responsible for activating the EAP when the dam reaches an EAP activation level, unless instructed to activate by the FODM or the DSTDM who have determined that it is reasonably likely that the dam could reach an EAP activation level. Should the IC be unavailable, the LEC followed by the DDO is responsible for the activation. If the IC loses all communications during a dam hazard, then as a fail-safe position, the LEC followed by the DDO will assume the duties and responsibilities of the IC. However, communications failure could result in some communication processes defined in this EAP not being carried out. As this is an identified risk, guidance has been provided to assist with mitigating this risk in Section 10 (Other emergency situation communications failure).
- Sunwater's in-house engineering (includes FODM and DSTDM) and technical staff will provide technical advice to the IC, LEC and DDO on an as needs basis. The FODM and DSTDM will also make flood and dam engineering decisions respectively during a dam hazard. These roles are filled by Registered Professional Engineers of Queensland (RPEQs), or by experienced engineers under the direct supervision of an RPEQ and are suitably qualified professionals as defined in ref I. Such advice will be provided within an established framework of SOPs, models, standards, and manuals wherever possible.

The Sunwater dam hazard management framework is illustrated in Figure 1 below.

Figure 1: Sunwater dam hazard management framework



3. Dam details

3.1 General dam information

Location: The Fred Haigh Dam is located approximately 30 km north of Gin Gin at AMTD 76.4 km on the Kolan River. A dam locality plan can be found in Appendix B5.

Purpose: The purpose of the dam is to supply irrigation water to the Bundaberg Irrigation Area and water for urban and industrial development in the region.

Construction: The dam was constructed in 1974, as a zoned earth embankment with a concrete spillway. In 2006, a 2m high crest parapet wall was added to the top of the embankment.

Specification: The table below lists general specifications of Fred Haigh Dam.

Table 3: Fred Haigh Dam specificat	tions
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Description	Specification
Main Dam	Zone earth-fill embankment with central clay core
Full Supply Level (FSL)	EL 75.56 m
Historical recorded max storage — Jan 2013	EL 82.429 m
Embankment crest level	EL 84.09 m (nominal)
Crest parapet wall level (top of concrete section)	EL 85.96 m (as-built survey)
Length	449 m (excluding spillway — 47 m)
Maximum embankment height above foundation	52 m (approx.)
Storage capacity at FSL	562,045 ML
Spillway	Uncontrolled ogee crest with concrete lined chutes terminating with flip bucket dissipater
Spillway crest level	EL 75.56 m
Spillway capacity at embankment crest level	2,464 m³/s (212,890ML/d)
Spillway capacity at crest parapet wall level	3,660 m ³ /s (316,224ML/d)
Outlet description	1x 2,134 mm I.D. steel pipe to the pump station & 1x 1,067 mm I.D. steel pipe to the river outlet (bifurcates to 2x 914 mm I.D. steel pipe each with 762 mm fixed cone valves)
Outlet capacity at FSL (2 x 762 mm fixed cone valves)	1,400 ML/d (max at 100% open for both valves) 460 ML/d (operational at 25% open for both valves)
Saddle Dam	Earth-fill with U/S rip rap protection
Embankment crest level	EL 84.09 m (nominal)
Crest parapet wall level (top of concrete section)	EL 85.95 m (as-built survey)
Length	120 m
Maximum embankment height above foundation	12 m (approx.)

All levels are to Australian Height Datum, AHD.

Conversion for Dam is AHD = ((State Datum in feet x 0.348) + 0.303) m.

The rating and storage curves for Fred Haigh Dam can be found in Appendix C2 and Appendix C3.

3.2 Population at risk

The Population at Risk (PAR) from flood events through or failure of Fred Haigh Dam was assessed in the 2017 Failure Impact Assessment (FIA), ref J. The result of this assessment is that the dam is a Category 2 referable dam, under RDMW guidelines. Category 2 dams have a PAR of greater than 100. Under ANCOLD (2012) guidelines, the dam is classed as 'High A' as the failure results in major damage and loss.

The Sunny Day Failure (SDF) of the dam would result in a PAR of 317 and a Potential Loss of Life (PLL) of 6. The largest incremental consequence from the flood failure scenarios modelled is for the Dam Crest Flood (DCF), with an incremental PAR of 567 and an incremental PLL of 29. The PAR are typically located around the Bucca Township.

The 2017 Failure Impact Assessment (FIA)(ref J) provides further information on PAR. The PAR and PLL assessments are currently being updated as part of ongoing CRA work. This is due to be completed in late 2021.

3.3 Spillway adequacy

According to the 2017 FIA, ref J, the spillway has a capacity of 3,660 m^3/s , which is equivalent to the 1 in 25,000 Annual Exceedance Probability (AEP) event.

The 2010 Comprehensive Risk Assessment (CRA), ref K, concluded the dam is capable of passing 100% of the Acceptable Flood Capacity (AFC) via a risk-based approach. An updated CRA is currently being prepared and is due to be completed in late 2021.

3.4 General arrangement

The general arrangement drawings are in Appendix B1.

4. Dam Safety Management Program

4.1 Inspections and monitoring

To maintain the dam and comply with regulatory requirements, the following is applicable to Fred Haigh Dam.

4.1.1 Inspections

- Routine Visual Inspection: Conducted as per routine surveillance Work Order or as directed by the DSTDM
- Detailed Inspection: Conducted annually
- Comprehensive Inspection: Conducted five -yearly

4.1.2 Instrumentation and monitoring

The following instrumentation is monitored at Fred Haigh Dam.

- Settlement/movement measurement:
 - 25 surface settlement points: 12 located along the crest of the embankment, 5 located on the upstream face, and 8 located on the downstream face of the embankment
 - 3 surface settlement points located on the crest of the Saddle Dam.
- Pore pressure measurement:
 - o 14 hydraulic piezometers located in one cross-section within the embankment.

NOTE: The location of instrumentation and monitoring equipment is detailed in the drawings in Appendix B1.

4.2 Emergency inspections and monitoring

If required, triggers for emergency inspections and monitoring of Fred Haigh Dam are detailed in the action tables across all the dam hazard scenarios.

5. Roles and responsibilities

Roles and responsibilities	Position holder
Owner (Sunwater)	CEO
• Liaise with the Board and Minister.	EGMO
• Execute Sunwater Strategic Event Procedure (ref M) and Business Continuity Plans, if required.	EGME&WR
• Ensure necessary resources are available to manage any event.	
• Maintain an up-to-date list of notifiable D/S residents (Appendix A4) of Fred Haigh Dam. The downstream limit is indicated in the drawing in Appendix B2 by the zone labelled <i>Limit of downstream notification area</i> .	
 At all times, aim to provide timely advice and support to the LDMGs in the affected local government areas and the DDMGs in the affected disaster districts. 	
• During a dam hazard emergency event that occurs with little or no warning, undertake the following actions to ensure the community is informed as soon as possible:	
o notify the residents listed in Appendix A4 via SMS	
o contact SDCC Watch Desk to request an Emergency Alert campaign throughout the Fred Haigh Dam Emergency polygons	
• During a dam hazard event that occurs with adequate warning; notify the residents listed in Appendix A4 via SMS, unless otherwise agreed with the LDMGs .	
 Record communications, notifications and observations as required. 	
Strategic Response Team (SRT)	Various ELT members
• Facilitate the assessment, escalation and notification and management of strategic response and recovery for a high or extreme risk, or impact, event. Responsible for the following key activities:	as per SRT roster
o initial and ongoing assessment of event status and requirements	
o development, and revision of, strategic objectives based on requirements	
o identifying, managing, and monitoring strategic risks	
o monitor media and stakeholder/customer impacts	
 managing/overseeing event communications including media, stakeholder, customer and internal communications. 	
Record communications, notifications and observations as required.	
Owner's Head Office Representative	GM Asset Integrity
 Authorise the issuing of EAPs, SOPs and O&M Manuals and amendments. 	GM Asset
 Facilitate Dam Safety Training Courses for Service Managers, Operations Supervisor, Dam Operators, and other staff as appropriate and ensure that all staff required to undertake Dam Safety work are trained and accredited. 	Management
 Ensure that risks identified in CRAs or other technical reports undertaken in relation to Dam Safety are included in the EAP. 	
• Ensure visual inspections and instrumentation monitoring frequencies conform to ANCOLD Guidelines.	
• Ensure all Dam Safety work orders, work instructions and lesson learned outcomes are fully implemented.	
 Ensure requirements of the Dam Condition Schedule (ref N) are met 	
• Ensure the work instructions are correct and the Logbooks, SOPs, Data Books and EAPs are reviewed annually as per ref N.	
• Undertake and prepare the 5 yearly Comprehensive Inspection Reports with suitably qualified personnel within the time specified in ref N and that work orders are created for recommendations and work is undertaken as required.	
 Undertake Annual Inspections and prepare reports within the time frames specified in ref N and that work orders are created for recommendations and work is undertaken as required. 	
• Review the Dam Safety Instrumentation Database and evaluate data to verify the structural integrity of the dams on a regular basis and maintain a spread sheet for verification for audit and quality control.	
 Record communications, notifications and observations as required. 	

Flood — FSL 75.56 m

Emergency Action Plan

Roles and responsibilities	Position holder
Owner's Regional Representative (ORR)	GM Burnett & Lower
Liaise with the Storage Supervisor/Operator Maintainer.	Mary
Arrange dam specific training and accreditation for relevant staff.	0C0
• Ensure competent, trained and accredited personnel operate the storages.	OS
• Undertake the role of LEC as required:	
o liaise with the Local Disaster Coordinator (LDC) or proxy	
o activate the EAP, when necessary	
o ensure the EAP is implemented appropriately and carry out the LEC role as required	
• Ensure all work orders, work instructions and lesson learned outcomes are fully implemented.	
Record communications, notifications and observations as required.	
Technical Advisor	GM Environment
 Analyse the situation and provide expert technical advice. 	
• Discuss issues with peers and other technical experts and make sound decisions to mitigate the risk	
• Determine response to incidents and emerging issues.	
 Record communications, notifications and observations as required. 	
Dam Safety Technical Decision Maker (DSTDM)	Various personnel as
• Maintain current RPEQ accreditation.	per DSTDM roster
 Analyse the situation and provide expert technical advice in relation to Dam Safety. 	
• Discuss dam hazards with peers and other technical experts and make sound decisions to reduce the risk.	
 Determine response to dam safety incidents and emerging issues. 	
 Issue warning on dam failure and advise on potential remedial measures. 	
• Liaise with DSR as required.	
• Ensure the EAP is implemented appropriately from a dam safety perspective and carry out the DSTDM role as required.	
 Record communications, notifications and observations as required. 	
Flood Operations Decision Maker (FODM)	Various personnel as
Maintain current RPEQ accreditation.	per FODM roster
• Provide hydrological advice in relation to predicted and actual dam outflows including assessment of weather and flood warnings and other related matters as identified in the OC SOP.	
 Interpret and apply rainfall data in accordance with the OC SOP, including, as required under the OC SOP, liaising with BOM. 	
 Ensure the EAP is implemented appropriately and carry out the FODM role as required. 	
 Record communications, notifications and observations as required. 	
Sunwater Media Team (SMT)	Various personnel as
 Analyse sensitive issues, discuss with the Owner and issue media releases. 	per Media Team roster
• Handle public and customer comments (including social media) and advise the Owner if necessary.	
 Liaise with the IC and update QDMC of flood events. 	
 Record communications, notifications and observations as required. 	
Incident Coordinator (IC)	Various personnel as
 Notify LDMGs, or councils if LDMGs not Stood Up, of intent to use the Emergency Alert. 	per IC roster
• Activate the EAP, when necessary.	
• Ensure the EAP is implemented appropriately and carry out the IC role as required.	
 Arrange Situation Reports and determine frequency, as required. 	
 Record communications, notifications and observations as required. 	
Local Event Coordinator (LEC)	Various personnel as
Refer to ORR role.	per LEC roster
Dam Duty Officer (DDO)	SOM
Complete accreditation to operate and maintain relevant storage.	SS
• Ensure the EAP is implemented appropriately and carry out the DDO role as required.	
Iake direction from the DSTDM and IC as requested.	
Arrange immediate site inspection and make informed assessment of the situation.	
• Escalate any issue not covered in the EAP or where actions are not clear.	
 Record communications, notifications and observations as required. 	

Roles and responsibilities	Position holder
Councils	
Councils have legislated local government functions, as per Section 80 of ref O. These include:	
• Ensure it has a disaster response capability.	
• Approve its local disaster management plan.	
 Ensure information about an event or a disaster in its area is promptly given to the DDMG for the disaster district in which area it is situated. 	
• Perform other functions given to the local government under ref O.	
And as per Section 352HB of the Act:	
• Must assess (in consultation with its LDMG) the EAP for consistency with the LDMP.	
Queensland Police Service (QPS)	Local Police
Manage the initial situation based on local operational procedures; including but not limited to:	
 conduct emergency operations 	
 coordinate and support Sunwater during a declared emergency at the dam 	
 liaise with relevant organisations 	
 evacuation of persons if required 	
control of essential traffic	
• security of specific area.	
Disaster Management Groups/Personnel - (In addition to requirements outlined in ref O)	LDMG
• LDMG	QFD
 As per IGEM review recommendation, work together with Sunwater and the councils to ensure community education around messaging and impacts of EAP related events is undertaken and continually improves. 	DDMG SCTN Coordinator
o Work with councils and Sunwater to ensure the EAP is regularly exercised.	
 Identify and coordinate the use of resources and support services that may be required for an EAP event, noting that for safety events unique to the dam Sunwater will approach councils to initiate. 	
 During a dam hazard/emergency event, providing they are Stood Up, the LDMGs in the affected local government areas will take the lead role in notifying the broader community. 	
 Identify and provide advice to the relevant DDMGs about support services required by the LDMG to manage an EAP event. 	
o Provide reports and make recommendations to the relevant DDMGs about matters relating to EAP events.	
• QFD	
 Work with dam owner and LDMGs to ensure Emergency Alert polygons are prepared, stored, and tested at the State Watch Desk. 	
• DDMG	
o May review the EAP for consistency with the DDMP.	
• SCTN (Security and Counter Terrorism Network) Coordinator	
o Identifies Areas of Concern during the preparation of disaster plans and provides advice during counter	
terrorism emergency events	
Dam Safety Regulator (DSR)	DDS
Liaise with relevant Minister on necessary actions.	
• Approve this document as required under legislation.	
• Liaise with Chief Executive as required in administering (regulating) the Act.	

6. Dam hazard — flood operations

6.1 Overview

The emergency action described in this section (Dam hazard — flood operations) relates to:

- A dam hazard is where natural catchment inflows fill Fred Haigh Dam to Full Supply Level (FSL) 75.56 m, and the rate of inflow exceeds the capacity of the outlet works. The spillway will then discharge water downstream into the Kolan River. These flood flows can create a dam hazard event. Inflows will also cause the storage to temporarily rise to above the FSL of the storage. NOTE:
 - The greater the rate of inflow, the higher the storage will rise.
 - The higher the storage level rises, the greater the loads on the dam structure.
 - Although unlikely, the greater the loading, the higher the likelihood of a dam failure.
 - Typically, the level of surveillance is increased during flood operations (refer Action tables in this section).
- Spillway discharge from the dam where there have been no indications that a dam failure may be initiating or in progress.

The area likely to be affected by this dam hazard is described as:

- When the storage height exceeds FSL (75.56 m), there will be an impact on low-level road crossings of the Kolan River and other infrastructure in the river such as pump sites.
- When the storage height exceeds the moderate flood level (1.5 m over the spillway), EL 77.06 m, main traffic routes may be affected. Some buildings may be affected above the floor level. Evacuation of flood affected areas may be required. In rural areas, removal of stock is required.
- When the storage height exceeds the major flood level (2.0 m over the spillway) EL 77.56 m, extensive rural areas and/or urban areas are inundated. Many buildings may be affected above the floor level. Properties and towns are likely to be isolated and major rail and traffic routes closed. Evacuation of flood affected areas may be required. Utility services may be impacted.

An indication of the maximum area that may be affected by this dam hazard is presented in the PMPDF inundation map Appendix B3.

The following table shows flood classification triggers as defined by the Bureau of Meteorology (BoM) at Fred Haigh Dam.

Table 4: Flood classification triggers

	Flood classification level	Depth over spillway (m)	Storage elevation (m AHD)
MAJOR 9 8 7 6 6 8 7 8 7 9 8 7 8 8 7 8 8 9 8 7 8 8 9 9 8 9 8 9 8 9 8 9 10 9 10 9 10 10 10 10 10 10 10 10 10 10	Major	2.00	77.56
MODERATE 5 Crops and Grazing MINOR 2	Moderate	1.50	77.06
Below Minor Example of Flood Level Classification	Minor	1.00	76.56

Source: Bureau of Meteorology — http://www.bom.gov.au/qld/flood/brochures/kolan.shtml

The following table shows historical floods experienced at Fred Haigh Dam — Sunwater Station# 135009A.

Table 5: Historical floods experienced at Fred Haigh Dam

Flood rank	Date	Peak height EL (AHD)	Peak height (m over crest)
1	January 2013	82.42 m	6.86 m
2	October 2017	79.58 m	4.01 m
3	December 2010	79.43 m	3.86 m
4	March 2013	78.03 m	2.47 m
5	March 2012	77.63 m	2.07 m

Detailed information on downstream flood impacts is presented in Appendix B.

6.2 Emergency actions

Regarding the emergency action tables in this section, each level of activation includes both its own actions and the actions of any lower level unless those lower-level actions are superseded.

6.2.1 Activation triggers

 Table 6: Flood emergency activation trigger summary

Alert	• Storage EL 75.46 m and rising (0.1 m below FSL)
Lean Forward	• Storage above FSL 75.56 m
Stand Up — greater than moderate flood level	 Storage above EL 77.06 m (Moderate flood classification level)
Stand Up — greater than flood of record	Storage above EL 82.42 m (Flood of record January 2013)
Stand Up — overtopping of crest parapet wall	 Storage above EL 85.95 m (Top of crest parapet wall concrete section) — risk of dam breach
Stand Down	• Storage EL 75.86 m and falling with no forecast increase in EL for 48 hours

While this EAP is not triggered until Fred Haigh Dam reaches a level of 75.46 m, Sunwater and the Bundaberg LDMG will work cooperatively and will endeavour to share intelligence of any rainfall event when either organisation becomes aware of a situation that could result in the activation of the EAP.

In respect of forecast rainfall, as is identified in the roles and responsibilities of the FODM, regard must be had to the OC SOP.

6.2.2 Emergency action roles

Table 7 to Table 12 specify emergency actions for the following roles:

- Dam Duty Officer (DDO)
- Local Event Coordinator (LEC)
- Incident Coordinator (IC)
- Dam Safety Technical Decision Maker (DSTDM)
- Flood Operations Decision Maker (FODM).

Definitions can be found in section 1.3.

Table 7: Flood operations — DDO emergency action								
Activation level	Alert	Lean Forward	Stand Up — greater than moderate flood level	Stand Up — greater than flood of record	Stand Up — overtopping of crest parapet wall	Stand Down		
Activation trigger	 Storage EL 75.46 m and rising (0.1 m below FSL) 	 Storage above FSL 75.56 m 	• Storage above EL 77.06 m	• Storage above EL 82.42 m	 Storage above EL 85.95 m (Top of crest parapet wall concrete section) — risk of dam breach 	• Storage EL 75.86 m and falling with no forecast increase in EL for 48 hours		
Actions	 Record all communication Inspect the dam daily (or as instructed by the DSTDM) and photograph/video and record using approved forms and send to DSTDMIC Undertake site preparations including but not limited to checking (if not already): fuel and operation of backup generator operations of sump pump seal of outlet building communication systems (including backup radio, satellite, phones, fax, and internet) 	 As per previous activation level, AND Continue to inspect the dam daily (or as instructed by the DSTDM) with particular attention to: visual inspection of flow patterns over spillway and dissipator for evidence of scouring inspect embankment for leaks, deformation, and slumping obvious signs of seepage, in particular on the Saddle Dam downstream slopes Read dam instrumentation daily (or as instructed by the DSTDM), as shown in section 4.1.2 	 As per previous activation level, AND Inspect the dam twice daily (or as instructed by the DSTDM) Close road access to spillway — to vehicles Liaise with Campground Manager re: situation At EL 79.42 m isolate power supply to the inlet tower, deck of inlet tower 	 As per previous activation level, AND Inspect the dam 6- hourly (or as instructed by the DSTDM) Close road access to spillway — to public Close the dam crest wall gate (prior to the storage level reaching EL 83.5 m) 	 As per previous activation level, AND Remotely inspect the dam four times daily (or as instructed by the DSTDM) Frequently photograph the spillway and tailwater areas, and after overtopping of the downstream abutment Inspect for scouring or slope failures downstream of the spillway in the vicinity of the Monduran Pump Station 	 Inspect the dam for any damage and photograph any damage identified during the event If required, forward all relevant communication including emails, and inspection sheets for EER to: Update Dam Logbook as per SOP 12 Return to routine surveillance activities and frequencies 		

CONTINUED NEXT PAGE

ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO e.g., taking photographs/video, dam inspections, instrument readings

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Table 7: Flood operations — DDO emergency action								
Activation level	Alert	Lean Forward	Stand Up — greater than moderate flood level	Stand Up — greater than flood of record	Stand Up — overtopping of crest parapet wall	Stand Down		
	 (continued) Record the Storage Level daily (or as instructed by the DSTDM) using gauge boards and confirm accuracy of gauging station Record river height at the tailwater gauge — daily or as instructed Record rainfall — daily Update Dam Logbook as per SOP 12 							
Internal notifications	IC SO	IC SO DSTDM (as required)	IC SO DSTDM (as required)	IC SO DSTDM (as required)	IC SO DSTDM (as required)	Inform all previously notified contacts of stand down		
External notifications	As required	As required	As required	As required	As required	Inform all previously notified contacts of stand down		



Table 8: Flood operations — LEC emergency action								
Activation level	Alert	Lean Forward	Stand Up — greater than moderate flood level	Stand Up — greater than flood of record	Stand Up — overtopping of crest parapet wall	Stand Down		
Activation trigger	 Storage EL 75.46 m and rising (0.1 m below FSL) 	 Storage above FSL 75.56 m 	 Storage above EL 77.06 m 	• Storage above EL 82.42 m	 Storage above EL 85.95 m (Top of crest parapet wall concrete section) risk of dam breach 	• Storage EL 75.86 m and falling with no forecast increase in EL for 48 hours		
Actions	 Record all communication Liaise with LDMG re: situation Develop/implement staff roster NOTE: IC to carry out LEC actions unless LDMG is stood up 	 As per previous activation level, AND Prepare DDO and SDO to stay onsite for up to a week if forecasts are trended towards further inflows Ensure all abnormal observations or damage has been reported to DSTDM and IC 	 As per previous activation level 	As per previous activation level	As per previous activation level	 If required, forward all relevant communication, including emails for EER to: Return to routine activities 		
Internal notifications	DDO IC	DDO IC	DDO IC	DDO IC	DDO IC	Inform all previously notified contacts of stand down		
External notifications	LDMG	LDMG	LDMG	LDMG	LDMG	Inform all previously notified contacts of stand down		

Table 9: Flood operations — IC emergency action								
Activation level	Alert	Lean Forward	Stand Up — greater than moderate flood level	Stand Up — greater than flood of record	Stand Up — overtopping of crest parapet wall	Stand Down		
Activation trigger	• Storage EL 75.46 m and rising (0.1 m below FSL)	 Storage above FSL 75.56 m 	 Storage above EL 77.06 m 	• Storage above EL 82.42 m	 Storage above EL 85.95 m (Top of crest parapet wall concrete section) risk of dam breach 	 Storage EL 75.86 m and falling with no forecast increase in EL for 48 hours 		
Actions	 Record all communication Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS Liaise with the DDO, DSTDM and the FODM Create Incident Report record Update intranet with EAP status NOTE: IC to carry out LEC actions unless LDMG is stood up 	 As per previous activation level, AND Confirm that DDO and SDO are prepared to stay onsite for up to a week if forecasts are trended towards further inflows Ensure all abnormal observations or damage has been reported to DSTDM 	As per previous activation level	As per previous activation level	As per previous activation level	 Deactivate EAP Complete all internal and external notifications Forward all relevant communication, including emails for EER to: Close out Incident Report record Update intranet with EAP status Return to routine activities 		
Internal notifications	DDO LEC/ORR DSTDM FODM SMT SRT	DDO LEC/ORR DSTDM FODM SMT SRT	DDO LEC/ORR DSTDM FODM SMT SRT	DDO LEC/ORR DSTDM FODM SMT SRT	DDO LEC/ORR DSTDM FODM SMT SRT	Inform all previously notified contacts of stand down		
External notifications	D/S Residents LDMG DDMG	D/S Residents LDMG DDMG	D/S Residents LDMG DDMG	D/S Residents LDMG DDMG	SDCC D/S Residents ABC Radio LDMG DDMG	Inform all previously notified contacts of stand down		

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Table 10: Flood operations — LEC and IC external communication plan							
Activation level	Trigger for communications	Group to contact	Method	Message text			
Alert	 Storage EL 75.46 m and rising (preparedness) 	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? What is the status? Advise of current storage level			
		• D/S Residents	 SMS Email Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS.			
	• Storage above FSL 75.56 m	LDMGDDMG	• Phone	Describe current situation with dam: What is the event? What is the status? Advise of current storage level and whether any flood releases are due to commence Discuss any potential road/bridge closures			
		• D/S Residents	 SMS Email Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS.			
Stand Up — greater than moderate flood level	• Storage above EL 77.06 m	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? What is the status? (storage is greater than moderate flood level) Advise of current storage level Advise of any forecasts you are aware of			
		• D/S Residents	 SMS Email Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS.			

Table 10: Flood operations — LEC and IC external communication plan							
Activation level	Trigger for communications	Group to contact	Method	Message text			
Stand Up — greater than flood of record	• Storage above EL 82.42 m	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? What is the status? (storage is greater than flood of record) Advise of current storage level Advise of any forecasts you are aware of			
		• D/S Residents	 SMS Email Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS.			
	 Storage above EL 85.95 m (Top of crest parapet wall concrete section) — risk of dam breach 	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? What is the status? Advise of current storage level Advise of any forecasts you are aware of			
Stand Up — overtopping of crest parapet wall		SDCC Watch Desk	Phone & Email	Complete Emergency Alert Request Form in Appendix A7 and send to SDCC Watch Desk to send to D/S Residents. Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS.			
		• D/S Residents	 SMS Email Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS.			
		 ABC Radio 	• Phone	To be determined.			
Stand Down	 Storage EL 75.86 m and falling with no forecast increase in EL for 48 hours 	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? What is the status? Advise of current storage level Advise EAP has been deactivated			
		• D/S Residents	 SMS Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS.			

Table 11: Flood operations — DSTDM emergency action								
Activation level	Alert	Lean Forward	Stand Up — greater than moderate flood level	Stand Up — greater than flood of record	Stand Up — overtopping of crest parapet wall	Stand Down		
Activation trigger	 Storage EL 75.46 m and rising (0.1 m below FSL) 	 Storage above FSL 75.56 m 	• Storage above EL 77.06 m	• Storage above EL 82.42 m	 Storage above EL 85.95 m (Top of crest parapet wall concrete section) risk of dam breach 	 Storage EL 75.86 m and falling with no forecast increase in EL for 48 hours 		
Action	 Record all communication Provide technical advice to DDO and IC on a need's basis Review surveillance reports and determine if any additional responses are required Review instrumentation data and determine if any additional responses are required Liaise with IC and DDO Advise DSR of EAP activation 	As per previous activation level	As per previous activation level	 As per previous activation level, AND Confirm the dam crest wall gate has been closed, prior to the storage level reaching EL 83.5 m 	As per previous activation level	 If required, forward all relevant communication, including emails for EER to: Return to routine activities 		
Internal notifications	IC DDO	IC DDO	IC DDO	IC DDO	IC DDO	Inform all previously notified contacts of stand down		
External notifications	DSR	DSR	DSR	DSR	DSR	Inform all previously notified contacts of stand down		

Table 12: Flood operations — FODM emergency action								
Activation level	Alert	Lean Forward	Stand Up — greater than moderate flood level	Stand Up — greater than flood of record	Stand Up — overtopping of crest parapet wall	Stand Down		
Activation trigger	 Storage EL 75.46 m and rising (0.1 m below FSL) 	 Storage above FSL 75.56 m 	• Storage above EL 77.06 m	• Storage above EL 82.42 m	 Storage above EL 85.95 m (Top of crest parapet wall concrete section) — risk of dam breach 	 Storage EL 75.86 m and falling with no forecast increase in EL for 48 hours 		
Action	 Record all communication Extract relevant data from available sources Update flood models as per SOP of OC Update and issue flood operations report Liaise with BOM Update DSTDM and IC re: current flood situation and PFRM results 	 As per previous activation level 	• As per previous activation level	• As per previous activation level	• As per previous activation level	 If required, forward all relevant communication, including emails for EER to: Return to routine activities 		
Internal notifications	IC DSTDM	IC DSTDM	IC DSTDM	IC DSTDM	IC DSTDM	Inform all previously notified contacts of stand down		
External notifications	вом	BOM	вом	BOM	вом	Inform all previously notified contacts of stand down		

7. Dam hazard — piping: embankment, foundation, or abutments

7.1 Overview

The emergency action described in this section relates to a potential dam hazard due to a piping condition through the embankment (Main Dam or Saddle Dams), foundations, or dam abutment. An early indicator of a piping condition can be an increase in seepage or a new area of seepage. If the seepage water is cloudy or has become cloudy, this may indicate that material is being transported and a pipe is being established.

If a pipe is established and progresses, then a dam failure may result. If a potential pipe is detected early, remedial repairs may be possible in the form of constructing a filter and weighting zone over the pipe exit if safe to do so.

The flood outlines in Appendix B3 are there to provide indicative outlines of the maximum potentially affected area of a dam hazard caused by piping. The use of these flood outlines is prescribed below:

- Use the Sunny Day Failure (SDF) outline when a dam failure is in progress or likely due to piping and no concurrent flooding or downstream releases are occurring or expected to occur, or
- Use the Probable Maximum Flood (PMF) outline when a dam failure is in progress or likely due to piping and concurrent flooding or downstream releases are occurring or expected to occur.

NOTE: Definitions for Concurrent Flooding and Downstream Releases are provided in section 1.3.

7.1.1 Assessment of circumstances that indicate an increase in the likelihood of piping

An increase in seepage or a new area of seepage is a circumstance that could indicate an occurrence of piping. This circumstance is the trigger for the Alert status for piping.

Cloudy seepage water is a circumstance that could indicate an increased likelihood of piping. This circumstance is the trigger for the Lean Forward status for piping.

7.2 Emergency action roles

Table 13 to Table 17 specify emergency actions for the following roles.

- Dam Duty Officer (DDO)
- Local Event Coordinator (LEC)
- Incident Coordinator (IC)
- Dam Safety Technical Decision Maker (DSTDM).
Figure 2: Piping: embankment, foundation, or abutments flowchart



Table 13: Piping: embankment, foundation, or abutments — DDO emergency action									
Activation level	Alert	Lean Forward	Stand Up — 1	Stand Up — 2	Stand Down				
Activation trigger	 Increasing leakage through an embankment, the foundations, or abutments 	 Increasing leakage through an embankment, the foundations, or abutments WITH cloudy water 	 Piping condition has been established 	 Failure in progress or likely due to piping, AND Sufficient water in storage to create a dam hazard 	 Risk assessment has determined that failure risk has reduced 				
Actions	 Record all communication Monitor flows every 6 hours (or as otherwise instructed by the DSTDM) Photograph/video the piping from a safe point and record using approved forms and send to DSTDM & IC Notify SO Update Dam Logbook as per SOP 12 	 As per previous activation level 	 As per previous activation level, AND Support/supervise remedial works as required Lower the storage if directed Close any affected roads if not already closed by others Maintain surveillance of area immediately downstream of dam (if safe to do so) and move on any members of the public 	 As per previous activation level, AND Vacate the immediate vicinity of the piping condition 	 Inspect the dam for any damage and photograph any damage identified during the event If required, forward all relevant communication including emails, and inspection sheets for EER to: Update Dam Logbook as per SOP 12 Return to routine surveillance activities and frequencies 				
Internal notifications	DSTDM IC SO	DSTDM IC SO	DSTDM IC SO	DSTDM IC SO	Inform all previously notified contacts of stand down				
External notifications	As required	As required	As required	As required	Inform all previously notified contacts of stand down				



ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO e.g., taking photographs/video, dam inspections, instrument readings

Table 14: Piping: embankment, foundation, or abutments — LEC emergency action								
Activation level	Alert	Lean Forward	Stand Up — 1	Stand Up — 2	Stand Down			
Activation trigger	 Increasing leakage through an embankment, the foundations, or abutments 	 Increasing leakage through an embankment, the foundations, or abutments WITH cloudy water 	 Piping condition has been established 	 Failure in progress or likely due to piping, and Sufficient water in storage to create a dam hazard 	 Risk assessment has determined that failure risk has reduced 			
Actions	 Record all communication Liaise with DDO and IC NOTE: IC to carry out LEC actions unless LDMG is stood up 	• As per previous activation level	 As per previous activation level, AND Liaise with relevant council(s) regarding potential road/bridge closures 	 As per previous activation level 	 If required, forward all relevant communication, including emails for EER to: Return to routine activities 			
Internal notifications	DDO IC	DDO IC	DDO IC	DDO IC	Inform all previously notified contacts of stand down			
External notifications	LDMG	LDMG	LDMG	LDMG	Inform all previously notified contacts of stand down			

ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO e.g., taking photographs/video, dam inspections, instrument readings

Table 15: Piping: embankment, foundation, or abutments — IC emergency action									
Activation level	Alert	Lean Forward	Stand Up — 1	Stand Up — 2	Stand Down				
Activation trigger	 Increasing leakage through an embankment, the foundations, or abutments 	 Increasing leakage through an embankment, the foundations, or abutments WITH cloudy water 	 Piping condition has been established 	 Failure in progress or likely due to piping, and Sufficient water in storage to create a dam hazard 	 Risk assessment has determined that failure risk has reduced 				
Actions	 Record all communication Liaise with DSTDM, DDO and LEC Create Incident Report record NOTE: IC to carry out LEC actions unless LDMG is <i>Stood Up</i> 	 As per previous activation level, AND Investigate availability of machinery and materials (if insufficient stockpiles available) Place machinery operators on standby if directed by DSTDM 	 As per previous activation level, AND Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS Mobilise resources to undertake remedial works if directed by DSTDM 	 As per previous activation level, AND Liaise with the DSTDM to confirm that dam failure is in progress Direct remedial works to cease if directed by the DSTDM and plant and personnel to be moved to a safe location Liaise with DDO and DSTDM re: potential for evacuations 	 Deactivate EAP Complete all internal and external notifications Forward all relevant communication, including emails for EER to: Close out Incident Report record Return to routine activities 				
Internal notifications External notifications	DSTDM DDO LEC/ORR SMT SRT As required	DSTDM DDO LEC/ORR SMT SRT LDMG DDMG	DSTDM DDO LEC/ORR SMT SRT D/S Residents SDCC Watch Desk	DSTDM DDO LEC/ORR SMT SRT D/S Residents SDCC Watch Desk	Inform all previously notified contacts of stand down Inform all previously notified				
			ABC Radio LDMG DDMG	ABC Radio LDMG DDMG					

ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO e.g., taking photographs/video, dam inspections, instrument readings

Table 16: Piping: embankment, foundation, or abutments — LEC and IC external communication plan							
Activation level	Trigger for communications	Group to contact	Method	Message text			
Alert	 Increasing leakage through an embankment, the foundations, or abutments 	• LDMG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — piping condition</i>) What is the status? (Unconfirmed piping — Investigation continues) Advise of current storage level Advise any issues you are aware of Standby for further advice			
Lean Forward	 Increasing leakage through an embankment, the foundations, or abutments WITH cloudy water 	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — piping condition</i>) What is the status? (Unconfirmed piping — Investigation continues) Advise of current storage level Advise any issues you are aware of Standby for further advice			
Piping condition has been established •		• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — piping condition</i>). What is the status? (Confirmed piping condition) Advise of current storage level Discuss any potential road/bridge closures Prepare for possible evacuations			
Stand Up — 1		SDCC Watch Desk	• Email & Phone	Complete Emergency Alert Request Form and send to SDCC Watch Desk to send to D/S Residents. Develop messages in consultation with DSTDM — and LDMG if time permits			
		• D/S Residents	 SMS Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS.			
		• ABC Radio	• Phone	To be determined.			

Table 16: Piping: embankment, foundation, or abutments — LEC and IC external communication plan							
Activation level	Trigger for communications	Group to contact	Method	Message text			
	 Failure likely due to piping; AND Sufficient water in storage to create a dam hazard 	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? <i>(Confirmed piping risk)</i> What is the status? (Possible Dam Failure) Advise of current storage level Prepare coordinated evacuations			
		SDCC Watch Desk	• Email & Phone	Complete Emergency Alert Request Form and send to SDCC Watch Desk to send to D/S Residents. Develop messages in consultation with DSTDM — and LDMG if time permits			
		• D/S Residents	 SMS Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS			
		• ABC Radio	• Phone	To be determined.			
Stand Up — 2	• Dam Failure in progress	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? <i>(Confirmed piping risk)</i> What is the status? (Dam Failure in Progress) Advise of current storage level Coordinate evacuations of affected Downstream Residents and move people to higher ground			
		SDCC Watch Desk	• Email & Phone	Complete Emergency Alert Request Form in Appendix A7 and send to SDCC Watch Desk to send to D/S Residents. Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS			
		• D/S Residents	 SMS Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS			
		ABC Radio	• Phone	To be determined.			
Stand Down	 Risk assessment has determined that failure risk has reduced 	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — piping</i>) What is the status? (Dam hazard stood down) Advise risk assessment has determined that piping risk has reduced, and EAP has been deactivated			
		• D/S Residents	 SMS Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS			

Emergency Action Plan

Table 17: Piping: embankment, foundation, or abutments — DSTDM emergency action								
Activation level	Alert	Lean Forward	Stand Up — 1	Stand Up — 2	Stand Down			
Activation trigger	 Increasing leakage through an embankment, the foundations, or abutments 	 Increasing leakage through an embankment, the foundations, or abutments with cloudy water 	 Piping condition has been established 	 Failure in progress or likely due to piping, AND Sufficient water in storage to create a dam hazard 	 Risk assessment has determined that failure risk has reduced 			
Action	 Record all communication Arrange an inspection of the dam to assess its condition as soon as possible, when safe to do so Determine if piping condition has been established Monitor situation and assess risks Liaise with IC and DDO Advise DSR of EAP activation 	As per previous activation level	 As per previous activation level, AND Assess risk and determine if failure likely or in progress Determine if remedial repairs are practical Determine if risks can be reduced by lowering storage (if the storage is required to be drawn down, then the DSTDM needs to assess the maximum rate of drawn down based on latest available data and advise in writing to IC and DDO) Supervise* remedial repairs (if applicable) 	 As per previous activation level, AND Liaise with the IC and advise on need to recommend evacuations 	 If required, forward all relevant communication, including emails for EER to: Return to routine activities 			
Internal notifications	DDO IC	DDO IC	DDO IC	DDO IC	Inform all previously notified contacts of stand down			
External notifications	DSR	DSR	DSR	DSR	Inform all previously notified contacts of stand down			

* Supervise means provide technical oversight to the work. It does not necessarily mean on-site supervision.

ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO e.g., taking photographs/video, dam inspections, instrument readings

8. Dam hazard — earthquake

8.1 Overview

The emergency action described in this section relates to a potential dam hazard due to an earthquake causing damage to the dam embankment (Main Dam or Saddle Dams), foundations, or dam abutment. Damage could take the form of cracking or slumping of the embankment, deformation or land slip, or increased seepage.

If damage does occur, then a dam failure may result. If damage is detected early, remedial repairs may be possible depending on the nature of the damage.

The flood outlines in Appendix B3 are there to provide indicative outlines of the maximum potentially affected area of a dam hazard caused by earthquake damage. The use of these flood outlines is prescribed below:

- Use the SDF outline when a dam failure is in progress or likely due to earthquake damage and no concurrent flooding or downstream releases are occurring or expected to occur, or
- Use the PMF outline when a dam failure is in progress or likely due to earthquake damage and concurrent flooding or downstream releases are occurring or expected to occur.

NOTE: Definitions for *Concurrent Flooding* and *Downstream Releases* are provided in section 1.3.

8.2 Emergency action roles

Table 18 to Table 22 to specify emergency actions for the following roles:

- Dam Duty Officer (DDO)
- Local Event Coordinator (LEC)
- Incident Coordinator (IC)
- Dam Safety Technical Decision Maker (DSTDM).

Earthquake



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Table 18: Earthquake — DDO emergency action									
Activation level	Alert	Lean Forward	Stand Up — 1	Stand Up — 2	Stand Down				
Activation trigger	 Earthquake confirmed (by DSTDM) or felt in the area, AND Intensity less than 5MM~ ~DDO to assess magnitude (MM scale) at dam location 	 Earthquake confirmed (by DSTDM) or felt in the area, AND Intensity greater than or equal to 5MM~ OR Intensity less than 5MM~ and change detected during surveillance inspection 	 Earthquake confirmed (by DSTDM) or felt in the area, AND A possible failure path has been identified 	 Failure in progress or likely due to earthquake, AND Sufficient water in storage to create a dam hazard 	 Risk assessment has been determined that failure risk has reduced 				
Actions	 Record all communication Liaise with DSTDM Inspect the main embankment, spillway structure, abutments, and Saddle Dam in daylight hours (if safe to do so). Photograph/video and record using approved forms and send to DSTDM & IC Check for leaks, deformation, erosion, and concrete damage Notify SO Update Dam Logbook as per SOP 12 	 As per previous activation level, AND Immediately inspect the main embankment, spillway structure, abutments, and Saddle Dam (if safe to do so) Inspect for leakage and evidence of initiation of piping of embankment slips on both upstream and downstream slopes and in the abutments Repeat the inspection as directed 	 As per previous activation level, AND Support/supervise remedial work as required Lower the storage if directed Close any affected roads if not already closed by others Maintain surveillance of area immediately downstream of dam or Saddle Dam (if safe to do so) and move on any members of the public Vacate the immediate vicinity of the embankment and Monduran Pump Station 	• As per previous activation level	 Inspect the dam for any damage and photograph any damage identified during the event If required, forward all relevant communication including emails, and inspection sheets for EER to: Update Dam Logbook as per SOP 12 Return to routine surveillance activities and frequencies 				
Internal notifications	DSTDM IC SO	DSTDM IC SO	DSTDM IC SO	DSTDM IC SO	Inform all previously notified contacts of stand down				
External notifications	As required	As required	As required	As required	Inform all previously notified contacts of stand down				

ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO e.g., taking photographs/video, dam inspections, instrument readings

Table 19: Earthquake — LEC emergency action									
Activation level	Alert	Lean Forward	Stand Up — 1	Stand Up — 2	Stand Down				
Activation trigger	 Earthquake confirmed (by DSTDM) or felt in the area, AND Intensity less than 5MM~ ~DDO to assess magnitude (MM scale) at dam location. 	 Earthquake confirmed (by DSTDM) or felt in the area, AND Intensity greater than or equal to 5MM~ OR Intensity less than 5MM~ and change detected during surveillance inspection 	 Earthquake confirmed (by DSTDM) or felt in the area, AND A possible failure path has been identified 	 Failure in progress or likely due to earthquake, AND Sufficient water in storage to create a dam hazard 	 Risk assessment has been determined that failure risk has reduced 				
Actions	 Record all communication Liaise with DDO and IC NOTE: IC to carry out LEC actions unless LDMG is stood up 	 As per previous activation level 	 As per previous activation level, AND Liaise with DDO and relevant council(s) regarding potential road/bridge closures 	 As per previous activation level 	 If required, forward all relevant communication, including emails for EER to: Return to routine activities 				
Internal notifications	DDO IC	DDO IC	DDO IC	DDO IC	Inform all previously notified contacts of stand down				
External notifications	LDMG	LDMG	LDMG	LDMG	Inform all previously notified contacts of stand down				

Table 20: Earthquake — IC emergency action									
Activation level	Alert	Lean Forward	Stand Up — 1	Stand Up — 2	Stand Down				
Activation trigger	 Earthquake confirmed* or felt in the area, AND Intensity less than 5MM~ ~DDO to assess magnitude (MM scale) at dam location 	 Earthquake confirmed* or felt in the area, AND Intensity greater than or equal to 5MM~ OR Intensity less than 5MM~ and change detected during surveillance inspection 	 Earthquake confirmed* or felt in the area, AND A possible failure path has been identified 	 Failure in progress or likely due to earthquake, AND Sufficient water in storage to create a dam hazard 	 Risk assessment has been determined that failure risk has reduced 				
Actions	 *'Confirmed' is defined as an alert received from Geoscience Australia or other source that advises an earthquake >4.9ML (Richter Scale) has occurred within a 200km radius of the dam. Record all communication Liaise with DDO, LEC and DSTDM Create Incident Report Record NOTE: IC to carry out LEC actions unless LDMG1 is stood up 	 As per previous activation level, AND Investigate availability of machinery and materials (if insufficient stockpiles available) Place machinery operators on standby if directed by DSTDM 	 As per previous activation level, AND Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS Mobilise resources to undertake remedial works if directed by DSTDM 	 As per previous activation level, AND Liaise with the DSTDM to confirm that dam failure is in progress Cease remedial works if directed by the DSTDM and plant and personnel to be moved to a safe location 	 Deactivate EAP Complete all internal and external notifications Forward all relevant communication, including emails for EER to: Close out Incident Report record Return to routine activities 				
Internal notifications	DDO LEC/ORR DSTDM SMT SRT	DDO LEC/ORR DSTDM SMT SRT	DDO LEC/ORR DSTDM SMT SRT	DDO LEC/ORR DSTDM SMT SRT	Inform all previously notified contacts of stand down				
External notifications	As required	DDMG	D/S Residents SDCC Watch Desk ABC Radio DDMG	D/S Residents SDCC Watch Desk ABC Radio DDMG	Inform all previously notified contacts of stand down				

ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO e.g., taking photographs/video, dam inspections, instrument readings

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Table 21: Earthquake — LEC and IC external communication plan							
Activation level	Trigger for communications	Group to contact	Method	Message text			
Alert	 Earthquake confirmed or felt in the area, AND Intensity less than 5MM 	• LDMG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — Earthquake damage</i>) What is the status? (Under investigation) Advise of current storage level Advise EAP has been activated Stand by for further information			
Lean Forward	 Earthquake confirmed or felt in the area, AND Intensity greater than or equal to 5MM, OR Intensity less than 5MM and change detected during surveillance inspection 	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — Earthquake damage</i>) What is the status? (Under investigation) Advise of current storage level Advise EAP has been activated Stand by for further information			
	 Earthquake confirmed or felt in the area, AND A possible failure path has been identified 	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — Earthquake felt or reported in area</i>) What is the status? (Possible earthquake damage to dam) Advise current storage level. Discuss any potential road/ bridge closures Activate emergency response			
Stand Up — 1		SDCC Watch Desk	• Phone & Email	Complete Emergency Alert Request Form and email to SDCC Watch Desk to send to D/S Residents.			
		• D/S Residents	 SMS Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS			
		• ABC Radio	• Phone	To be determined.			

Table 21: Earthquake — LEC and IC external communication plan							
Activation level	Trigger for communications	Group to contact	Method	Message text			
	 Failure likely due to earthquake, AND Sufficient water in storage to create a dam hazard 	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — Earthquake damage</i>) What is the status? (Dam Failure Likely) Advise of current storage level. Discuss any potential road/bridge closures Prepare coordinated evacuation			
		 SDCC Watch Desk 	• Email & Phone	Complete Emergency Alert Request Form and send to SDCC Watch Desk to send to D/S Residents.			
		• D/S Residents	 SMS Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS			
		ABC Radio	• Phone	To be determined.			
Stand Up — 2	• Dam Failure in progress	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — Earthquake damage</i>) What is the status? (Dam Failure in Progress) Advise of current storage level Coordinate evacuation of Downstream Residents and move people to higher ground			
		SDCC Watch Desk	• Email & Phone	Complete Emergency Alert Request Form in Appendix A7 and send to SDCC Watch Desk to send to D/S Residents. Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS			
		• D/S Residents	 SMS Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS.			
		ABC Radio	• Phone	To be determined.			
Stand down	 Risk assessment has been determined that failure risk has reduced 	• LDMG • DDMG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — Earthquake damage</i>) What is the status? (Dam hazard Stood Down) Advise risk assessment has determined that failure risk has reduced and that EAP has been deactivated			
		• D/S Residents	 SMS Phone (for those <u>without</u> mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS			

Table 22: Earthquake — DSTDM emergency action								
Activation level	Alert	Lean Forward	Stand Up — 1	Stand Up — 2	Stand Down			
Activation trigger	 Earthquake confirmed* or felt in the area, AND Intensity less than 5MM~ ~DDO to assess magnitude (MM scale) at dam location 	 Earthquake confirmed* or felt in the area, AND Intensity greater than or equal to 5MM~ OR Intensity less than 5MM~ and change detected during surveillance inspection 	 Earthquake confirmed* or felt in the area, AND A possible failure path has been identified 	 Failure in progress or likely due to earthquake, AND Sufficient water in storage to create a dam hazard 	 Risk assessment has been determined that failure risk has reduced 			
Action	 *'Confirmed' is defined as an alert received from Geoscience Australia or other source that advises an earthquake >4.9ML (Richter Scale) has occurred within a 200km radius of the dam. Record all communication Review surveillance inspection of the dam and assess its condition as soon as possible Review instrumentation data and determine if any additional responses are required Monitor situation and assess risks Liaise with DDO and IC Advise DSR of EAP activation 	 As per previous activation level, AND Determine if there are any possible failure paths from reported damage 	 As per previous activation level, AND Assess risk and determine if failure likely or in progress Determine if remedial repairs are practical Determine if risks can be reduced by lowering storage — if the storage is required to be drawn down, then the DSTDM needs to assess the maximum rate of drawn down based on latest available data and advise in writing to IC and DDO Supervise^ remedial repairs (if applicable) ^Supervise means provide technical oversight to the work. It does not necessarily mean on-site supervision. 	• As per previous activation level	 If required, forward all relevant communication, including emails for EER to: Return to routine activities 			
Internal notifications	DDO IC	DDO IC	DDO IC	DDO IC	Inform all previously notified			
External notifications	DSR	DSR	DSR	DSR	Inform all previously notified contacts of stand down			

ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO e.g., taking photographs/video, dam inspections, instrument readings

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9. Dam hazard — terrorist threat/activity or high energy impact

9.1 Overview

The emergency action described in this section relates to a potential dam hazard due to a terrorist threat or activity or a high energy impact on the dam such as a plane crash or meteorite.

The vulnerability of Fred Haigh Dam to a terrorist attack is low.

The flood outlines in Appendix B3 are there to provide indicative outlines of the maximum potentially affected area of a dam hazard caused by a terrorist attack. The use of these flood outlines is prescribed below:

- Use the SDF outline when a dam failure is in progress or likely due to a terrorist attack and no concurrent flooding or downstream releases are occurring or expected to occur, or
- Use the PMF outline when a dam failure is in progress or likely due to a terrorist attack and concurrent flooding or downstream releases are occurring or expected to occur.

NOTE: Definitions for *Concurrent Flooding* and *Downstream Releases* are in section 1.3.

Assessment of circumstances that indicates an increase in the likelihood of terrorist activity or high energy impact

Advice from authorities of a specific risk to water infrastructure is a circumstance that could indicate increased likelihood of a terrorist threat. If this were specific enough to name a dam, this circumstance would trigger Stand Up -1 activation level.

9.2 Emergency action roles

Table 23 to Table 27 specify emergency actions for the following roles:

- Dam Duty Officer (DDO)
- Local Event Coordinator (LEC)
- Incident Coordinator (IC)
- Dam Safety Technical Decision Maker (DSTDM).

Figure 4: Terrorist threat/activity or high energy impact flowchart



Table 23: Terrorist threat/activity or high energy impact — DDO emergency action					
Activation level	Alert/Lean Forward	Stand Up — 1	Stand Up — 2	Stand Up — 3	Stand Down
Activation trigger	• Not applicable	 THREAT Possible terrorist activity/suspicious behaviour noticed at the dam, OR Threat received 	 EVENT Large explosion heard/observed at dam (e.g., bomb explosion, aircraft hit) 	 RESPONSE Failure in progress or likely due to impact or explosion, AND Sufficient water in storage to create a dam hazard 	 Risk assessment has determined that failure risk has reduced
Actions	• Not applicable	 Record all communication NOTE: If any suspicious behaviour noticed, contact DSTDM for advice, and if instructed or if threat received, complete the following: Notify CTG Inspect dam (if safe) and ensure all security measures are in place (locked gates, etc.) Photograph/video the damage from a safe point and record using the approved forms and send to DSTDM & IC Close any affected roads, if not already closed by others Notify SO Update Dam Logbook as per SOP 12 If Police appoint Incident Manager support and follow instructions 	 As per previous activation level, AND Vacate the immediate vicinity of the affected area 	 As per previous activation level, AND Lower reservoir level, if directed by DSTDM 	 Inspect the dam for any damage and photograph any damage identified during the event If required, forward all relevant communication including emails, and inspection sheets for EER to: Update Dam Logbook as per SOP 12 Return to routine surveillance activities and frequencies
Internal notifications	Not applicable	DSTDM IC	DSTDM IC	DSTDM IC	Inform all previously notified contacts of stand down
External notifications	Not applicable	СТБ	CTG	CTG	Inform all previously notified contacts of stand down

ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO e.g., taking photographs/video, dam inspections, instrument readings

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Table 24: Terrorist threat/activity or high energy impact — LEC emergency action					
Activation level	Alert/Lean Forward	Stand Up — 1	Stand Up — 2	Stand Up — 3	Stand Down
Activation trigger	 Not applicable 	 THREAT Possible terrorist activity/suspicious behaviour noticed at the dam, OR Threat received 	 EVENT Large explosion heard/observed at dam (e.g., bomb explosion, aircraft hit) 	 RESPONSE Failure in progress or likely due to impact or explosion, AND Sufficient water in storage to create a dam hazard 	 Risk assessment has determined that failure risk has reduced
Actions	• Not applicable	 Record all communication Liaise with DDO, IC, and LDMG If Police appoint Incident Manager support and follow instructions Monitor situation and assess risks Liaise with relevant council(s) regarding possible road/bridge closures NOTE: IC to carry out LEC actions unless LDMG is stood up 	• As per previous activation level	 As per previous activation level, AND Liaise with DDO, DSTDM, and LDMG re: potential for evacuations 	 If required, forward all relevant communication, including emails for EER to: Return to routine activities
Internal notifications	Not applicable	DDO IC	DDO IC	DDO IC	As required
External notifications	Not applicable	LDMG	LDMG	LDMG	As required

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ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO e.g., taking photographs/video, dam inspections, instrument readings

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Table 25: Terrorist threat/activity or high energy impact — IC emergency action					
Activation level	Alert/Lean Forward	Stand Up — 1	Stand Up — 2	Stand Up — 3	Stand Down
Activation trigger	• Not applicable	 THREAT Possible terrorist activity/suspicious behaviour noticed at the dam, OR Threat received 	EVENT • Large explosion heard/observed at dam (e.g., bomb explosion, aircraft hit)	 RESPONSE Failure in progress or likely due to impact or explosion, AND Sufficient water in storage to create a dam hazard 	 Risk assessment has determined that failure risk has reduced
Actions	• Not applicable	 Record all communication Liaise with DDO, DSTDM, and LEC If Police appoint incident manager support and follow instructions Monitor situation and assess risks Create Incident Report record NOTE: IC to carry out LEC actions unless LDMG1 is stood up 	 As per previous activation level, AND Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS 	 As per previous activation level, AND Liaise with DDO, DSTDM, and LEC re: potential for evacuations Mobilise resources to undertake remedial works if directed by DSTDM 	 Deactivate EAP Complete all internal and external notifications If required, forward all relevant communication, including emails for EER to: Close out Incident Report Record Return to routine activities
Internal notifications	Not applicable	DDO LEC/ORR DSTDM SMT SRT	DDO LEC/ORR DSTDM SMT SRT	DDO LEC/ORR DSTDM SMT SRT	Inform all previously notified contacts of stand down
External notifications	Not applicable	CTG (if not completed by DDO) DDMG	D/S Residents SDCC Watch Desk ABC Radio CTG DDMG	D/S Residents SDCC Watch Desk ABC Radio CTG DDMG	Inform all previously notified contacts of stand down

ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO e.g., taking photographs/video, dam inspections, instrument readings

Table 26: Terrorist threat/activity or high energy impact — LEC and IC external communication plan					
Activation level	Trigger for communications	Group to contact	Method	Message text	
Alert			ALE	ERT NOT APPLICABLE	
Lean Forward			LEAN FC	RWARD NOT APPLICABLE	
Stand Up — 1	 THREAT Possible terrorist activity/suspicious behaviour noticed at the dam, OR Threat received 	• LDMG • DDMG • CTG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — Security threat/impact/explosion, etc.</i>) What is the status? (Received/noted terrorist threat) Discuss any potential road/bridge closures Activate emergency response	
	EVENT • Large explosion heard/observed at dam (e.g., bomb explosion, aircraft hit)	• LDMG • DDMG • CTG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — Security threat/ impact/explosion, etc.</i>) What is the status? (Under Investigation) Discuss any potential road/bridge closures Prepare coordinated evacuation	
Stand Up — 2		SDCC Watch desk	Phone & Email	Complete Emergency Alert Request Form as per instructions and email to SDCC Watch Desk to send to D/S Residents.	
		• D/S Residents	 SMS Phone (for those <u>without</u> mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS	
		• ABC Radio	• Phone	To be determined.	
	 RESPONSE Failure in progress or likely due to impact or explosion, AND Sufficient water in storage to 	• LDMG • DDMG • CTG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — Security threat/ impact/ explosion, etc.</i>) What is the status? (Dam Failure Likely/In Progress) Initiate evacuations	
Stand Up — 3	create a dam hazard	SDCC Watch Desk	• Email & Phone	Complete Emergency Alert Request Form in Appendix A7 and send to SDCC Watch Desk to send to D/S Residents. Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS	
		• D/S Residents	 SMS Phone (for those <u>without</u> mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS.	
		ABC Radio	• Phone	To be determined.	

Table 26: Terrorist threat/activity or high energy impact — LEC and IC external communication plan					
Activation level	Trigger for communications	Group to contact	Method	Message text	
Stand Down	 Risk assessment has determined that failure risk has reduced 	• LDMG • DDMG • CTG	• Phone	Describe current situation with dam: What is the event? (<i>Dam Safety Risk — Security threat/ impact/explosion, etc.</i>) What is the status? (Dam hazard Stood Down) Advise that failure risk has been reduced and EAP has been deactivated	
		• D/S Residents	 SMS Phone (for those without mobiles) 	Liaise with Sunwater Customer Support and communications to send appropriate messaging via SMS	

Table 27: Terrorist threat/activity or high energy impact — DSTDM emergency action					
Activation level	Alert/Lean Forward	Stand Up — 1	Stand Up — 2	Stand Up — 3	Stand Down
Activation trigger	• Not applicable	 THREAT Possible terrorist activity/suspicious behaviour noticed at the dam, OR Threat received 	EVENT • Large explosion heard/observed at dam (e.g., bomb explosion, aircraft hit)	 RESPONSE Failure in progress or likely due to impact or explosion, AND Sufficient water in storage to create a dam hazard 	 Risk assessment has determined that failure risk has reduced
Action	• Not applicable	 Record all communication Liaise with IC and DDO Liaise with Sunwater Executive Advise DSR of EAP activation 	 As per previous activation level, AND Arrange an inspection of the dam and assess its condition as soon as possible, when safe to do so Monitor situation, assess risks, and determine if failure likely or in progress Determine if remedial repairs are practical Determine if risks can be reduced by lowering storage — if the storage is required to be drawn down, then the DSTDM needs to assess the maximum rate of drawn down based on latest available data and advise in writing to IC and DDO Supervise^ remedial repairs (if applicable) 	 As per previous activation level, AND Liaise with the IC and LEC and advise on need to recommend evacuations ^Supervise means provide technical oversight to the work. It does not necessarily mean on-site supervision. 	 If required, forward all relevant communication, including emails for EER to: Return to routine activities
Internal notifications	Not applicable	IC DDO SRT	IC DDO SRT	IC DDO LEC/ORR SRT	As required
External notifications	Not applicable	DSR	DSR	DSR	As required

ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO e.g., taking photographs/video, dam inspections, instrument readings

10. Other emergency situation — communications failure

10.1 Overview

The emergency action described in this section (Other emergency situation — communications failure) relates to either:

- An emergency situation where all means of communication at the dam site have been lost.
- An emergency situation where all means of communication with the local area have been lost.
- An emergency situation where all means of communication with Brisbane site have been lost.

This section specifies actions and provides guidance for the three situations.

10.2 Emergency actions

Due to the large number of different possible scenarios, the table below only covers the most common or likely conditions.

10.2.1 Activation triggers

Table 28: Communications failure emergency activation trigger summary

Comms Failure – Site	 Unable to communicate to or from dam site (usually affects DDO)
Comms Failure – Local area	 Unable to communicate to or from local area (likely to affect LEC/ORR)
Comms Failure – Brisbane	 Unable to communicate to or from Sunwater Brisbane (could affect DSTDM or FODM & will affect IC)

10.2.2 Emergency action roles

Table 29 to Table 34 specify emergency actions for the following roles.

- Dam Duty Officer (DDO)
- Local Event Coordinator (LEC)
- Incident Coordinator (IC)
- Dam Safety Technical Decision Maker (DSTDM)
- Flood Operations Decision Maker (FODM).

Table 29: Communications failure — DDO emergency action				
Activation level	Comms Failure – Local Area	Comms Failure – Brisbane		
Activation trigger	 Unable to communicate to local area including LEC/ORR 	• Unable to communicate to Sunwater Brisbane including IC or DSTDM or FODM		
Actions	 As much as practicable, assume the role of LEC Continue tasks in accordance with any other current emergency action Every hour, attempt communications noting the following: Mobile phone - try texting instead of voice, much higher probability of success Satellite phone - needs to access open sky unless external antenna fitted Social media - e.g., Facebook (Internet may be available via landline) Record all communication and attempts via Dam Logbook entries as per SOP 12 and communications log if EAP event is current 	 Determine if LEC is in communication and if not, assume the LEC role as much as is practicable Continue tasks in accordance with any other current Emergency Action Every hour, attempt communications noting the following: Mobile phone - try texting instead of voice, much higher probability of success Satellite phone - needs to access open sky unless external antenna fitted Social media - e.g., Facebook (Internet may be available via landline) Record all communication and attempts via Dam Logbook entries as per SOP 12 and communications log if EAP event is current 		
Internal Notifications				
External Notifications	As required	As required		



Table 30: Communications failure — LEC emergency action					
Activation level	Comms Failure – Dam Site	Comms Failure – Brisbane			
Activation trigger	• Unable to communicate to dam site	• Unable to communicate to Sunwater Brisbane including IC, DSTDM or FODM			
Actions	 Every hour, attempt communications noting the following: Mobile phone - try texting instead of voice, much higher probability of success Satellite phone - needs to access open sky unless external antenna fitted Social media - e.g., Facebook (Internet may be available via landline) Record all communication and attempts Assume that the DDO is carrying out LEC role at site as much as practicable Liaise with IC Liaise with DSTDM As much as is practicable, continue other tasks associated with the role in accordance with any other current emergency action 	 Issue Create Incident Report Record Every hour, attempt communications noting the following: Mobile phone - try texting instead of voice, much higher probability of success Satellite phone - needs to access open sky unless external antenna fitted Social media - e.g., Facebook (Internet may be available via landline) Record all communication and attempts Liaise with the DDO and assume IC role As much as is practicable, continue other tasks associated with the role in accordance with any other current emergency action 			
Internal Notifications	IC DSTDM SO – if available	DDO DSTDM – if available SO			
External Notifications	LDMG	LDMG DDMG			



Table 31: Communications failure — IC emergency action				
Activation level	Comms Failure – Dam Site	Comms Failure – Local Area		
Activation trigger	• Unable to communicate to dam site	Unable to communicate to local area including LEC/ORR		
Actions	• Issue Sunwater Incident Alert	Issue Sunwater Incident Alert		
	 Every hour, attempt communications noting the following: 	• Every hour, attempt communications noting the following:		
	o Mobile phone - try texting instead of voice, much higher probability of success	o Mobile phone - try texting instead of voice, much higher probability of success		
	o Satellite phone - needs to access open sky unless external antenna fitted	o Satellite phone - needs to access open sky unless external antenna fitted		
	o Social media - e.g., Facebook (Internet may be available via landline)	o Social media - e.g., Facebook (Internet may be available via landline)		
	 Record all communication and attempts 	 Record all communication and attempts 		
	• Liaise with LEC	• Liaise with the DDO and carry out functions of the LEC as much as practicable		
	Liaise with DSTDM	• As much as is practicable, continue other tasks associated with the role in accordance		
	• As much as is practicable, continue other tasks associated with the role in accordance with any other current emergency action	with any other current emergency action		
Internal Notifications	LEC/ORR	DDO – if available		
	DSTDM	DSTDM		
	SO – if available	SO – if available		
External Notifications	DDMG	LDMG – if available		
		DDMG – if available		



Table 32: Communications failure — LEC and IC communication plan					
Activation level	Trigger for communications	Group to contact	Method	Message text	
Comms Failure – Site	 Unable to communicate to or from dam site, AND DDO is at dam site 	IC/LEC DSTDM SO — if available LDMG DDMG	Phone	Describe current situation with dam communications. What is the status – estimated time to restore communications?	
		IC to create Incident Report record		EAP Alert Notification — Fred Haigh Dam — Site Communications Failure	
Comms Failure – Local Area	 Unable to communicate to or from local area including LEC and ORR 	DDO – if available DSTDM SO – if available LDMG – if available DDMG – if available	Phone	Describe current situation with dam communications. What is the status – estimated time to restore communications?	
		IC to create Incident Repo	ort record	EAP Alert Notification — Fred Haigh Dam — Local Area Communications Failure	
Comms Failure – Brisbane	Unable to communicate to or from Sunwater Brisbane	DSTDM – if available LDMG DDMG	Phone	Describe current situation with dam communications. What is the status – estimated time to restore communications?	
		LEC to create Incident Rep	port record	EAP Alert Notification — Sunwater Brisbane Communications Failure	

Table 33: Communications failure — DSTDM emergency action				
Activation level	Comms Failure – Site	Comms Failure – Local Area		
Activation trigger	• Unable to communicate to dam site	 Unable to communicate to local area including LEC and ORR 		
Actions	 Provide technical advice to IC/LEC on a need's basis 	 Provide technical advice to IC on a need's basis 		
	Record all communication	Record all communication		
	• As much as is practicable, continue other tasks associated with the role in accordance	 Assume that the DDO is assisting IC with LEC role 		
	with any other current emergency action	• As much as is practicable, continue other tasks associated with the role in accordance with any other current emergency action		
Internal Notifications	IC	IC		
	LEC	DDO – if available		
	SRT	SRT		
External Notifications	DSR – if applicable	DSR – if applicable		

Table 34: Communications failure — FODM emergency action						
Activation level	Comms Failure – Site	Comms Failure – Local Area				
Activation trigger	• Unable to communicate to dam site,	• Unable to communicate to local area including LEC and ORR				
Actions	 Liaise with IC Record all communication As much as is practicable, continue other tasks associated with the role in accordance with any other current emergency action 	 Liaise with IC Record all communication Assume that the DDO is assisting IC with LEC role As much as is practicable, continue other tasks associated with the role in accordance with any other current emergency action 				
Internal Notifications	IC LEC DSTDM	IC DDO – if available DSTDM				
External Notifications	Not applicable	Not applicable				

APPENDIX A NOTIFICATION AND COMMUNICATION LISTS

Appendix A1: Sunwater regional notification list

Appendix A2: Sunwater Brisbane notification list

Appendix A3: External notification list

- Appendix A4: D/S residents notification list
- Appendix A5: Other reference contacts
- Appendix A6: Emergency alert polygon
- Appendix A7: Dam failure emergency alert request

Appendix A1 to Appendix A5 have been redacted



Appendix A7: DAM FAILURE EMERGENCY ALERT REQUEST

Queensland emergency alert request guidelines

An Emergency Alert (EA) Request form should be completed, if required (see dam hazard sections for actions) and sent to the SDCC Watch Desk to activate the Fred Haigh Dam Emergency Polygon.

Instructions

- 1. EA Request forms are not to be used for flood UNLESS a flood has triggered an Emergency Event.
- 2. Obtain appropriate MS Word format form from either the Sunwater SharePoint site or the SDCC Disaster Management Portal.
- 3. Telephone the SDCC Watch Desk on
EA for an Emergency Event for Fred Haigh Dam.and tell them your intention to use the
 - a. A polygon for this dam is stored on the Disaster Management Portal. Ask the SDCC operative to locate the polygon. It will be a KML file called
 - b. Give them your phone number, confirm their name, and end the call after advising the form/s will be sent shortly.
- 4. IC and DSTDM will work together to craft a message relevant to the hazard and discuss with the LDMG if there is time. If time does not permit use approved pre-filled form/s.
- Send filled out EA form/s and the Fred Haigh Threat Direction polygon to SDCC watch desk email:
 The form/s MUST be sent from a Sunwater email address and come from the IC, DSTDM, or member of the Sunwater Executive.
- 6. Phone back SDCC to check that the message has been sent and ask for email confirmation.
- 7. Create an Incident Report Record to advise of completion of EA campaign.

The following text is a copy of that contained in the prefilled EA request/s:

Filename:	Voice Message:	SMS:
	FLOOD EMERGENCY WARNING from Sunwater: People downstream of Fred Haigh Dam including Monduran and Bucca must LEAVE IMMEDIATELY. Fred Haigh Dam possible failure/is failing. Major flooding is happening now. Your life is at risk. Go now to a safe place away from the flood. Rosedale, Gin Gin and Bundaberg are safe. Get full warnings and what you should do at Bundaberg Regional Council disaster dot Bundaberg dot que el dee got guv dot aye you.	FLOOD EMERGENCY WARNING from Sunwater: People downstream of Fred Haigh Dam including Monduran and Bucca must LEAVE IMMEDIATELY. Fred Haigh Dam possible failure/is failing. Major flooding is happening now. Your life is at risk. Go now to a safe place away from the flood. Rosedale, Gin Gin and Bundaberg are safe. Get full warnings and what you should do at Bundaberg Regional Council http://disaster.bundaberg.qld.gov.au

The next two pages contain a pre-filled copy of the Template Dam EA Request form and instructions:

to shake a	PHONE THE SDCC WATCH DESK – ADVISE EA IS BEING DEVELOPED					
	EMERGENCY ALERT REQUEST					
<u> SERT</u>	Location of Alert: Fred Haigh Dam (e.g. Suburb, Town)		Date:			
Queensland Government	LGA/Agency requesting:		Time:			
Requesting Officer (e.	g. Disaster Coordinator/Incident Controller)	т	elephone:			
Name: Agency/Position:		(SDCC Watch Desk may telephone you)			
Email:						
Advised LDC/LDMG: YES DDC/DDMG: YES Neighbouring LDMG/LGA: YES N/A						
Send Alert	Immediately: YES	Scheduled: YES Date	e & Time / / : hrs			
	Cyclone Storm	Tide Flash Flood	Flood			
Event Type	Bushfire Fire Incident Smoke / Toxic Plume Chemical Spill					
	Tsunami (Sent as Location Based Text Message ONLY)					
Distributed by:	Voice SMS	– Location Based	SMS – Service Address Based	d		
(Channel)	(Landline only) (Location	of phone at time of distribution)	(Registered billing address)			
Message Severity	Emergency Warning (Activates SEV	/S) Uvatch & Act	Advice			
Threat Direction Requ (e.g. Fire, Dam Spill)	iired? ☐ YES ☐ N/A	Threat location indicated on map?				
EA Messaging Filenar	ne (Doc, Pdf):	Polygon Filename, (Kml, Kmz, Gml, GeoJSON):				
Number of polygons (if multiple, attach list in order of pric						
Supplied via: DM P Other (please specify):	Portal 🗌 Email 🗌 Verbal 🗌 Other	Supplied via: DM Portal Other (please specify):	Email Verbal Other			
Voice: Type or handw	rite, max 4000 characters incls spaces. <mark>(I</mark>	deally message should be < 450	characters)			
FLOOD EMERGENCY WARNING from Sunwater: People downstream of Fred Haigh Dam including Mun doo ran and Bucca must LEAVE IMMEDIATELY. Fred Haigh Dam possible failure/is failing. Major flooding is happening now. Your life is at risk. Go now to a safe place away from the flood. Rosedale, Gin Gin and Bundaberg are safe. Get full warnings and what you should do at Bundaberg Regional Council disaster dot Bundaberg dot que el dee dot guv aye you.						
SMS: Type or handwri	te, use capitals for clarity, max 612 chara	cters incls spaces. (Ideally should	d be < 160 characters incl. spaces)			
FLOOD EMERGENCY WARNING from Sunwater: People downstream of Fred Haigh Dam including Monduran and Bucca must LEAVE IMMEDIATELY. Fred Haigh Dam possible failure/is failing. Major flooding is happening now. Your life is at risk. Go now to a safe place away from the flood. Rosedale, Gin Gin and Bundaberg are safe. Get full warnings and what you should do at Bundaberg Regional Council disaster.bundaberg.qld.gov.au						
Remove EA from	🗌 12 hrs 🗌 24 hrs 🗌 48 hrs	Specify Date & Time:	Check back in 12 hrs:			
websites:	Replace previous EA message	/ / : hrs	Contact #:	_		
Requesting Officer:	Signati	ıre:	Date: / /			
Send	Send to confirm receipt					
FOR USE BY SDCC	pleted by: SDCC Watch Desk	equesting Officer				
Notification of any delays provided to Requestor:						
EA User Name:			Emergency Alert No:			
Signature:		Date: / /				
Authorising Officer Name: EMS EA Campaign Report ID:						
Signature:		Date: / /				
Report provided to Req	Report provided to Requestor on EA outcomes: YES NO					
The EA Man	ual, EA Quick Reference Guide, EA Requ	lest Form Template are available	e at: www.disaster.qld.gov.au			

EA Request Form – F.1.177 Last Updated: 31 October 2022 Version: 3.0

DO NOT SEND THIS PAGE

(Sunwater internal use only)

Emergency Alert (EA) Request instructions

Complete ALL initial fields, especially contact details, and check applicable boxes.

STEP 1.	EA Polygon Area (e.g., detailed description and location reference to allow positive identification of message area, including street names with cross street, areas of interest such as parks, rivers, dams, coastal areas) it is preferable to attach a map identifying the message area. If a Threat Direction has been requested, please clearly indicate it on the map. Check applicable box.	
STEP 2.	Enter the Polygon file name/s.	
STEP 3.	<i>Sunwater Polygons are all in *.kml format.</i> Check applicable box.	
STEP 4.	<i>Sunwater Messaging/spatial data is always supplied via DMportal.</i> Check applicable box. Enter the file name.	

Voice Message: Either type or handwrite the required message in CAPITALS. As the message will be translated by a text-to-speech process it is important that words are not unintelligible when translated e.g., "qld" used in a web site address must be entered as "Q L D", similarly the word "DOT" must be entered into a web address instead of a full stop.

An Emergency Warning message must start with "EMERGENCY EMERGENCY" Do not use special characters.

SMS: Either type the message or handwrite the characters into the boxes. Capitals only required as per normal grammar rules, but an Emergency Warning message must start with "EMERGENCY EMERGENCY" (in capitals). Do not use special characters.

Voice example:

EMERGENCY. EMERGENCY. SUN WATER ADVISE IMMINENT FAILURE OF CANIA DAM. RESIDENTS DOWNSTREAM OF THE DAM NEED TO ACT TO PROTECT LIFE AND LEAVE IMMEDIATELY. FAILURE OF THE DAM WILL RESULT IN EXTREMELY DANGEROUS FLOODING DOWNSTREAM INCLUDING: MOONFORD AND MONTO. DO NOT DELAY. LEAVE NOW. CENTRAL MONTO AND BILOELA ARE SAFE LOCATIONS.

SMS example:

EMERGENCY. EMERGENCY. Sunwater advise imminent failure of Cania Dam. Take action to protect life and leave now. Moonford and Monto are at risk. Info on ABC Radio. Central Monto & Biloela are safe.

If using template EA messages, please provide the appropriate variables that are in the template message guides. Refer to the Queensland EA Manual for copies of the template message guides.

APPENDIX B DRAWINGS AND MAPS

Appendix B1: General Arrangement and Instrumentation drawings

Appendix B2: Downstream Notification area — source, 2017 FIA (ref I)

Appendix B3: Inundation maps — source, 2017 FIA (ref I)

Appendix B4: Access routes during fair and adverse weather conditions

Appendix B5: Locality plan

Appendix B6: Catchment area

NOTE: Actual levels may differ from those shown in flood inundation maps due to variations in assumptions made in the models to actual flood events.






T:\Asset Solutions\SW-Bundaberg WSS\R-WBBB-01-07-01 Fred Haigh Instrumentation\Drawings\AutoCAD\102266-23 Aug 2013 10:00 AM

_	SURF	ACE						
SETTLEMENT INSTALLATIONS								
1	No	х	Y	Z				
3200	5501	3103,168	3068.926	73.842				
*	SS02	OBSCURED	BY LARGE BC	ULDER				
	SS03	3224.966	3069.649	73.958				
I	5504	3287.044	3069.021	73 540				
*	SS06	3041.580	3051.625	84.702				
*	SS07	3103.452	3051.741	84.894	06			
*	SS08	3164.781	3051.710	84.896	20			
*	SS09 SS10	3225.600	3051.683	84.802	ONE			
3100 *	SS11	3331.808	3051.708	84.851	Z			
*	SS12	3041.941	3044.340	84.783	ED			
*	SS13	3102.799	3044.338	84.852	ROY			
*	SS14 SS15	3724 546	3044.383	84.954	EST			
- *	SS16	3286.157	3044.344	84.870				
*	SS17	3331.579	3044.348	84.828				
	SS18	3103.308	3018.956	67.378				
I	SS20	3225.068	3019.339	67.741				
3000	SS21	3285.920	3019.475	68.011				
	SS22	3331.246	3019.192	67.564				
1	<u>5523</u>	3165.685	2993.050	49 888				
	SS25	3285.650	2992.776	50.384				
1	SS306	3040.978	3051.419	85.131				
	SS307	3102.032	3051.379	85.511				
I	55308	3162.967	3051.375	85.502				
	55309	3285.016	3051.404	85.509	900			
	SS311	3330.913	3051.461	85.510	T 20			
2900	SS312	3040.928	3044.575	86.277	SEP.			
	SS313	3101.978	3044.576	86.284	Z			
	55314	3162.931	3044.625	86.253	ED			
	SS316	3284.975	3044.648	86.283	- ALI			
I	SS317	3330.959	3044.660	86.284	INST			
	SS326	2879.196	3044.518	86.230				
	55327	2839.224	3044.486	86.275				
1	55520	2177.151	5044.400	00.755				
2800	CONT	RUI STA	TIONS					
1	101	3056.365	2957.505	74.967	— PM48166 PILLAR			
REPLACED-	BM02	3390.926	3064.796	88.269	PM48167 PILLAR			
Γ.	103	2635.701	3101.585	101.619	MUNDURAN" IRIG			
	104	2923.908	3422.459	79.963	— PILLAR			
	105	3390.936	3064.790	88.622	PILLAR			
		DIC						
	CETTI			<u>лы</u>				
			NJTALLATI					
	No	Х	Y	Z				
	ES01	3195.891	3051.390	84.189	(SEE NOTE 4)			
	HYUR.	AULIL Meter in	CTALL A TIC					
TA								
16	No	DISTANCE	FROM AXIS	ELEVATION	READING			
NG	HP01	3194.30	<u>13.76</u> U/S	34.95	60.33m			
	HP02	"	4.53 U/S	34.97	59.33m			
	HP03	"	4.48 D/S	35.01	55.33m			
T 141	HP05		11.43 U/S	42.64	<u> </u>			
IIAL	HP06	"	3.81 U/S	42.65	60.33m			
	HP07	"	3.81 D/S	42.62	52.33m			
	HP08	210/ //	10.36 D/S	42.67	45.20m			
	HP10	3194.30	0.00	51.75	57.20m			
-R	HP 11	"	7.53 D/S	51.76	52.20m			
	HP12	3194.22	3.80 U/S	59.94	63.70m			
	HP13 HP1/	3194.25	3.03 D/S	59.89 67 92	<u>59.97m</u> 66.70m			
	L UF 14	J174.3V	0.00	01.72	<u> </u>			
DAM SAFETY INV	ESTIGAT	TIONS			CONTRACT NUMBER			
RED HAIGH	DRAWING NUMBER							
	102266							
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					DATE NOV 1999			
					F			





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Appendix B3: INUNDATION MAPS

The following pages contain the Inundation Maps for Fred Haigh Dam — source, 2017 FIA (ref I)

Drawings:

- Key Map (1 of 1)
- Sunny Day Failure (1 to 9)
- Dam Crest Flood (1 to 9)
- Probable Maximum Precipitation Design Flood (1 to 9)

Disclaimer: Every effort has been made to ensure the currency of the flood inundation maps reproduced in this EAP. However, as the maps have been extracted from external sources, their accuracy cannot be guaranteed.

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					- Coordinate System: Geocentric I
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					Failure' flood extent.
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152°4'0"E

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ŝ 24°36 24°38 Document: S:\BW Asset Delivery\SW-BW Se Printed: Friday, 23/11/2018 07:18:13 AM LEGEND 24°40'0"S DCF - Dam Failure AMTD (Markers) • ✓ Local Roads Major Roads

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		151°5	52'0"E	151°54'0	"E 151°56'0"E		151°58
				MAP INFORMATION - Coordinate System: Geocentric Datum of Australia (GDA94) The 'Dam Failure' flood extent also includes the 'No Dam Failure' flood extent.	SCALES (A3 SIZE) 0 500 1,000 1,500 2,000 2,500 m 1:50,000	DRAWN IDH DESIGNED CHECKED CHECKED MGH APPROVED	SunWater
2/11/18 A	ISSUED FOR USE	IDH	MGH	REFERENCE DRAWINGS		M.G. HUGHES	©SUNWATER LIMITED
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Emergency access route information

Route 1 — Bundaberg to Fred Haigh Dam

From Bundaberg travel to Gin Gin on Bundaberg Gin Gin Rd. Head north on the Bruce Hwy for 19km. Turn right onto Monduran Dam Rd, drive a short distance to the Dam.

- Distance: Approx. 72km.
- Road Type: Bitumen.
- Speed Limit: 100km/h generally (drive to suit conditions).

Route 2 — Bundaberg to Fred Haigh Dam

From Bundaberg travel south on Isis Hwy for 19km. Turn right onto Cedars Rd and travel for 9.1km. Turn left onto Bundaberg Gin Gin Rd and travel to Gin Gin. Head north on the Bruce Hwy for 19km. Turn right onto Monduran Dam Rd, drive a short distance to the Dam.

- Distance: Approx. 77km.
- Road Type: Bitumen.
- Speed Limit: 100km/h generally (drive to suit conditions).

Route 3 — Bundaberg to Fred Haigh Dam

From Bundaberg travel south on Isis Hwy for 46km. Turn right onto Bruce Hwy and travel to Gin Gin for 67km. Head north on the Bruce Hwy for 19km. Turn right onto Monduran Dam Rd, drive a short distance to the Dam.

- Distance: Approx. 118km.
- Road Type: Bitumen.
- Speed Limit: 100km/h generally (drive to suit conditions).

Route 4 — Bundaberg to Fred Haigh Dam

From Bundaberg travel west on Bundaberg Gin Gin Rd for 4km. Turn right onto Rosedale Rd and travel for 10km. Turn left onto Bucca Rd and travel for 24km. Turn right onto Bundaberg Gin Gin Rd and travel to Gin Gin. Head north on the Bruce Hwy for 19km. Turn right onto Monduran Dam Rd, drive a short distance to the Dam.

- Distance: Approx. 74km.
- Road Type: Bitumen.
- Speed Limit: 100km/h generally (drive to suit conditions).


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APPENDIX C EQUIPMENT AND TECHNICAL INFORMATION

Appendix C1: List of equipment available during an emergency

Appendix C2: Fred Haigh Dam discharge curve

Appendix C3: Fred Haigh Dam storage curve

Appendix C1 has been redacted



REMARKS

TOP OF RATING CURVE EL 93.00m		
TES:		
ENERAL		
LEVELS DATUM: AUSTRALIAN HEIGHT DATUM (AHD). AHD = KOLAN DATUM (FFFT) x 0.348 - 0.036m BASED ON PM	43780	
EL76.158m (AHD REGISTERED).		
ADWATER RATING		
FOR ABUTMENT (MAIN DAM / SADDLE DAM) OVERTOPPING	07	
FOR STAGE 1 SPILLWAY CAPACITY UPGRADE EMBANKMENT	GREST	
WALL ARRANGEMENT REFER DRAWINGS 225688 TO 225697.	95 _	
"JACOBS – FRED HAIGH DAM CRA – SPILLWAY CAPACITY RE	PORT -	
30 APRIL 2021".		
PERSEDED DRAWING		
THIS DRAWING SOLENSEDES DRAWING 20273.		
RED HAIGH DAM	CONTRACT NUM	BER
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ISCHARGE CURVES	254666	A
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m³/s

220,000 ML/day



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APPENDIX D INTERACTION WITH LOCAL GOVERNMENT AND DISTRICT GROUPS

To be populated when EAP next completes a substantive review

Annexe — Fred Haigh SMS Messages

Advice Stay informed

SMS



Watch and Act Prepare to leave



Emergency Leave immediately To be issued in consultation with council



excess water into Kolan River. People downstream of Fred Haigh Dam should STAY INFORMED and MONITOR CONDITIONS. Water flows from Fred Haigh Dam expected to remain within beds and banks of river / may contribute to Expect increased river flows in 6-12 hours / later widespread/ localised/ overland flooding. Expect increased river flows in 6-12 hours / later today/ overnight/ tomorrow. There is no immediate danger. More information here: bit.ly/RecandSafety

ADVICE from Sunwater. Fred Haigh Dam is spilling FLOOD WATCH AND ACT from Sunwater. Excess water spilling from Fred Haigh Dam into Kolan River has increased significantly. Water flows from Fred Haigh Dam may contribute to dangerous/widespread flooding downstream. today/ overnight/ tomorrow. People downstream Rosedale, Gin Gin and Bundaberg are safe. More of Fred Haigh Dam must PREPARE TO LEAVE in case the flood gets worse. Call Triple Zero (000) if http://disaster.bundaberg.qld.gov.au/ your life is in danger. Call the SES on 132500 for flood help. More information here: bit.ly/RecandSafety

FLOOD EMERGENCY WARNING from Sunwater: People downstream of Fred Haigh Dam including Monduran and Bucca must LEAVE IMMEDIATELY. Fred Haigh Dam possible failure/is failing. Major flooding is happening now. Your life is at risk. Go now to a safe place away from the flood. information here: Bundaberg Regional Council