TRANSMITTAL ADVICE

Date: .....[redacted]

TO:

Attention: [redacted]

PO Box 15536
City East
Q 4002

DESCRIPTION

Emergency Action Plan – Beardmore Dam - [redacted]

Attached is a revised insert for the Emergency Action Plan for the above Dam.
Please:

- **Place the new pages into Sections 1 and 3 and discard the superseded pages**
- **Sign the receipt advice below and return same by mail or Fax**

RECEIPT ADVICE

Received by [redacted].....Date [redacted]..

Designation [redacted]

Return this Transmittal Advice to:

Principal Engineer Dam Safety,
Infrastructure Management
SunWater
PO Box 15536,
City East, Qld 4002

Or Fax to [redacted]

QFCI

JM

Date: 27/05/11

Exhibit Number: 507

SECTION 1

TABLE OF CONTENTS

CONTROLLED COPY DISTRIBUTION

Copy Number	Position	Location
1	Storage Supervisor, Beardmore Dam	SunWater - Beardmore Dam
2	Service Manager/ EEC	SunWater – St George
3	Area Operations Manager - South	SunWater - Toowoomba
4	Manager, Asset Management	SunWater - Brisbane
5	Director, Dam Safety (Water Supply), Water Industry Compliance	DERM (Dept of Environment and Resource Management), Brisbane
6	Executive Officer – LDMG – Ballone Shire Council	St George - Qld
7	Officer in Charge	Police - St George
8	District Disaster Coordinator (Roma)	Police - Roma Qld
9	Director Disaster Management Services, Emergency Management Queensland	State Disaster Coordination Centre - Department of Community Safety, Brisbane
Note: For Phone numbers and addresses of *'Controlled Copy Holders'* - See Section 3.		

DOCUMENT CONTROL SHEET

CONTROLLED COPY NUMBER: 4

AUTHORISATION:

Approved by: [redacted] **Date:** November 10

(Manager, Asset Management, Infrastructure Management)

REVISION STATUS:

Issue-Revision Number	Revision Description	Section	Revision Date
Issue 2-1	Significant changes of the E.J. Beardmore Dam Emergency Action Plan to reflect SunWater Management Structure and other minor changes.		JANUARY 08

Note: Future updates to the Notification and Emergency Communication List (Section 3) as required by the Regulator (See Dam Safety Condition Schedule – Section 10) shall be compiled by the relevant SunWater Area Operations Centres and saved in HB File 08-000388/001. Once updating has been finalised the Area Operations Manager/Service Manager shall notify the Senior Engineer Headworks (SEH) – Brisbane, and the SEH will approve and organise the printing and distribution of this updated information to the '*Controlled Copy Holders*' (see Section 3 for Phone numbers and addresses).

AMENDMENTS:

Amendment Number	Description Note: Any suggestion or comment should be forwarded to Principal Engineer (Dam Safety), Brisbane.	Section	Amendment Date
2A 2B	Amendments to Sections 1, 2, 3, 5, and 10 Controlled Copy Sheet Update	1, P2	November '10

SECTION 2

EMERGENCY EVALUATION PROCEDURES

Incident Level Description

ACTION 1

Localised Incidents / Near Miss
Will generally not escalate to an emergency
Incident managed by routine procedures and existing site resources.

ACTION 2

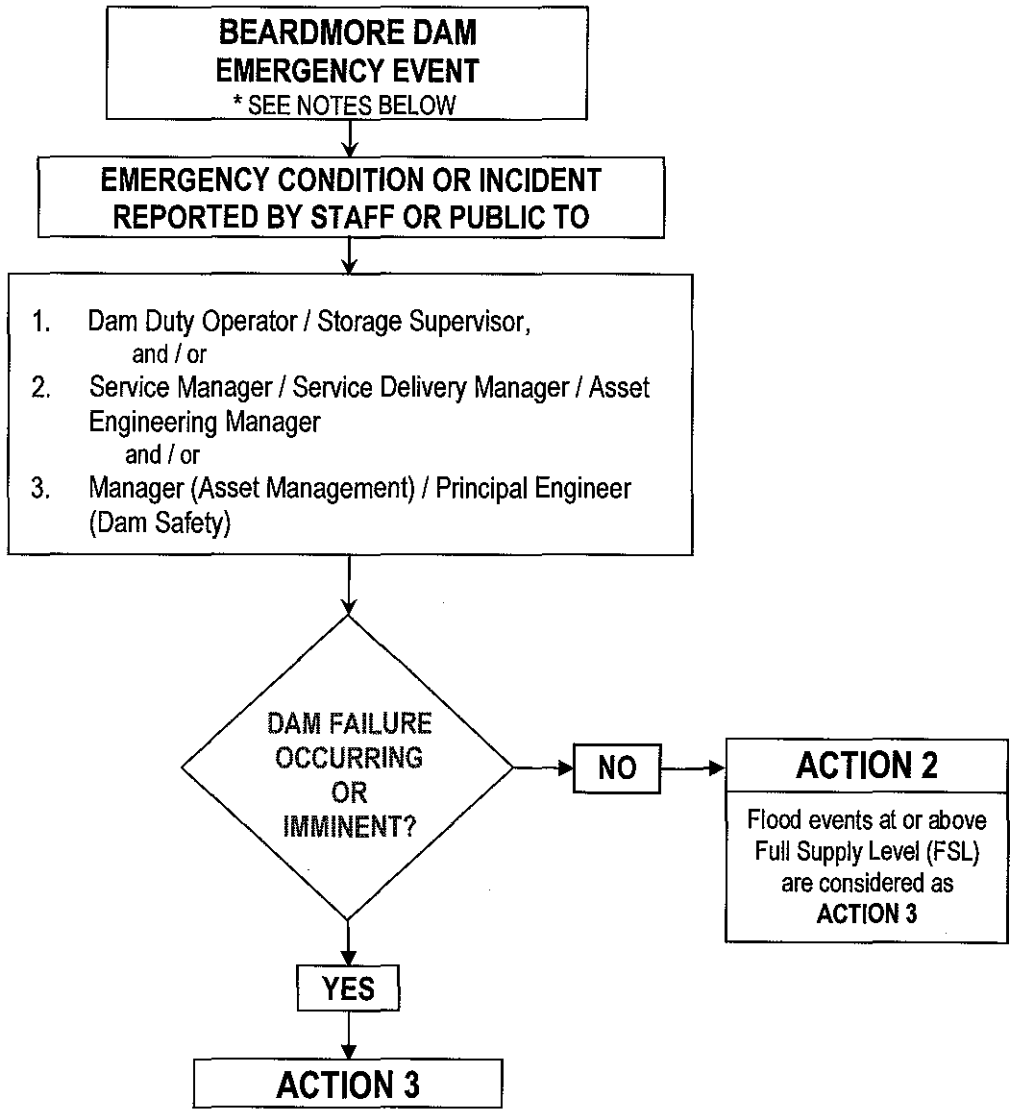
Emergency
May or may not result in activation of Crisis management Plan
Required a coordinated local response together with overview, advice and action from subject matter expert in the Brisbane Office.

ACTION 3

Crisis
Critical / Catastrophic Consequences.
Significant diversion of management attention, time, energy and resources away from normal operation.

EMERGENCY EVALUATION PROCEDURE

FIGURE 1

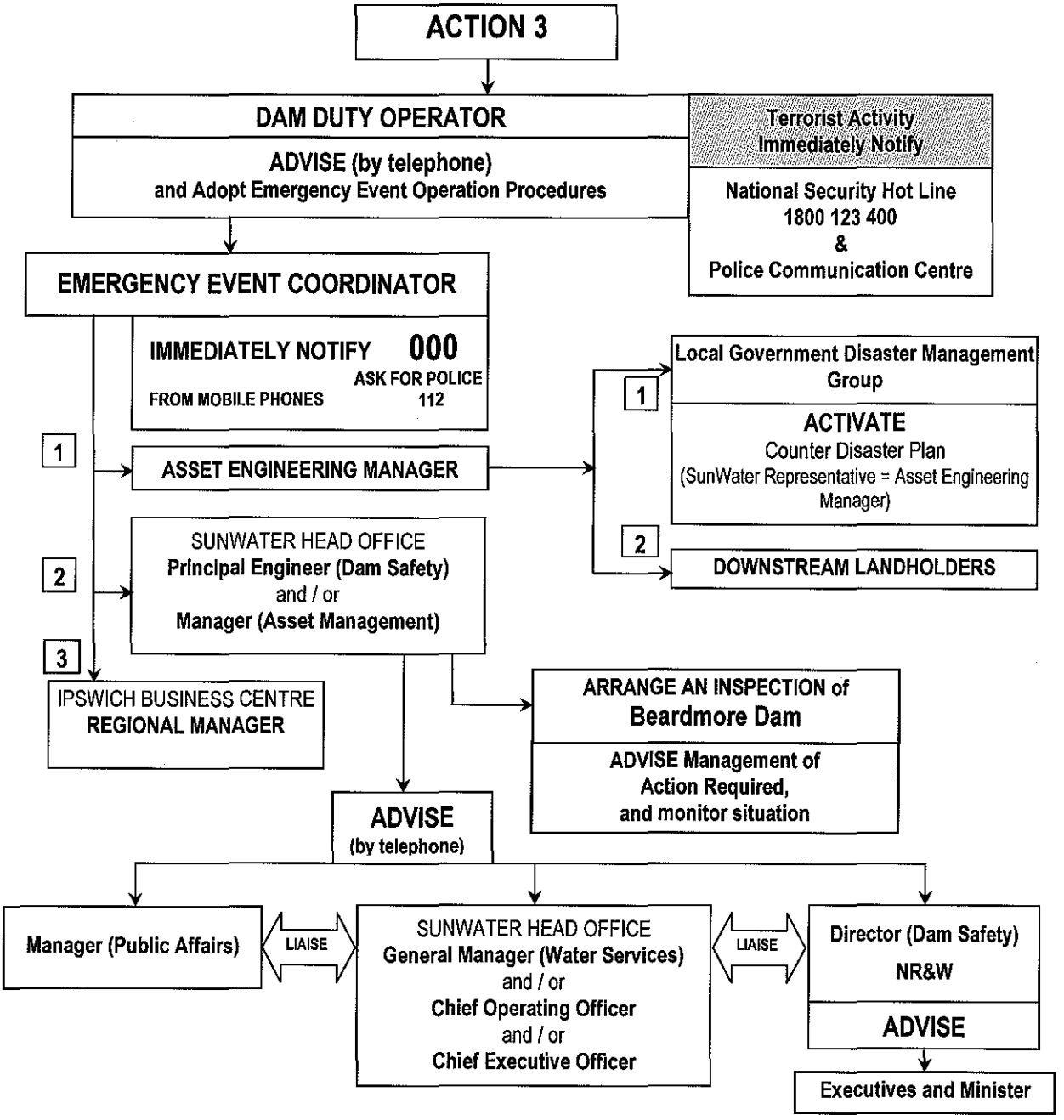


NOTES

1. **All communication (advise) to be conducted in person, or via telephone.**
2. **The Procedure is intended to cover short term Emergency or Dam Safety Incident.**
3. **The Procedure is not intended for activation as a result/outcome of an extended analytical safety review of the dam.**
4. **Telephone numbers are available in the Notification & Emergency Communication List in Section 3.**

EMERGENCY EVALUATION PROCEDURE

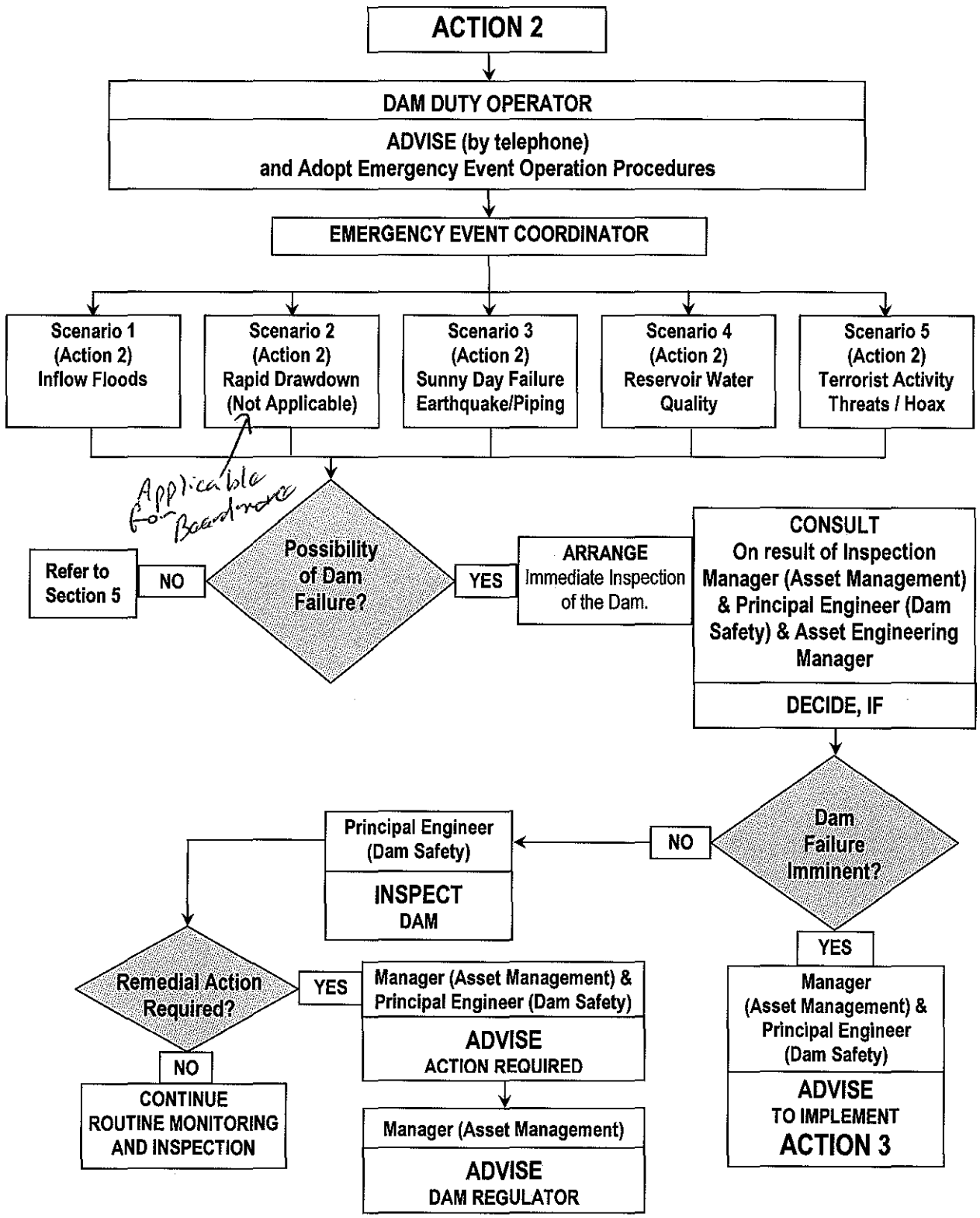
FIGURE 2



Note: Telephone numbers are available in the Telephone Notification List in Section 3.

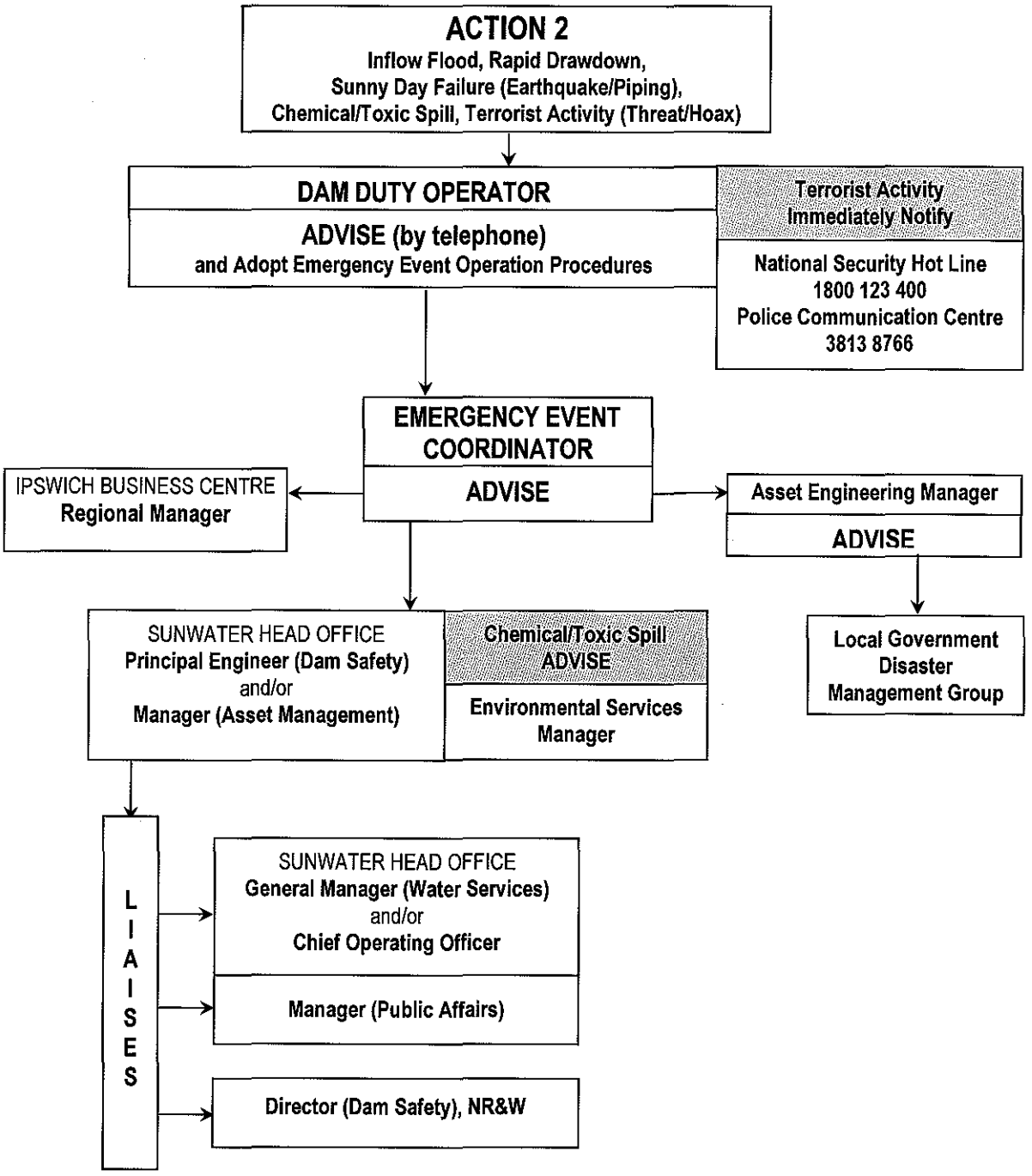
EMERGENCY EVALUATION PROCEDURE

FIGURE 3



EMERGENCY EVALUATION PROCEDURE

FIGURE 4



SECTION 3

NOTIFICATION & EMERGENCY COMMUNICATION LIST

Telephone and Radio Notification List and Emergency Communication List

and

List of Equipment available during an Emergency

(# 593441 in HB File 08-000388/001)

AUTHORISATION:

Approved by:	[redacted]	**Date:**	October 2010
	Senior Engineer Headworks (SEH)		

AMENDMENT STATUS:

Amendment Number	Description	Amendment Date
2F	Issue 2-1 Update Telephone & Radio Notification List	October 2010

TELEPHONE AND RADIO NOTIFICATION LIST

Central Office Management (Brisbane)					
TITLE/NAME	Phone Business	Phone Mobile	Phone A/H	Fax	Controlled Copy Holder Addresses
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Controlled EAP Copy Holders shown numbered (e.g. **2**) and shaded grey

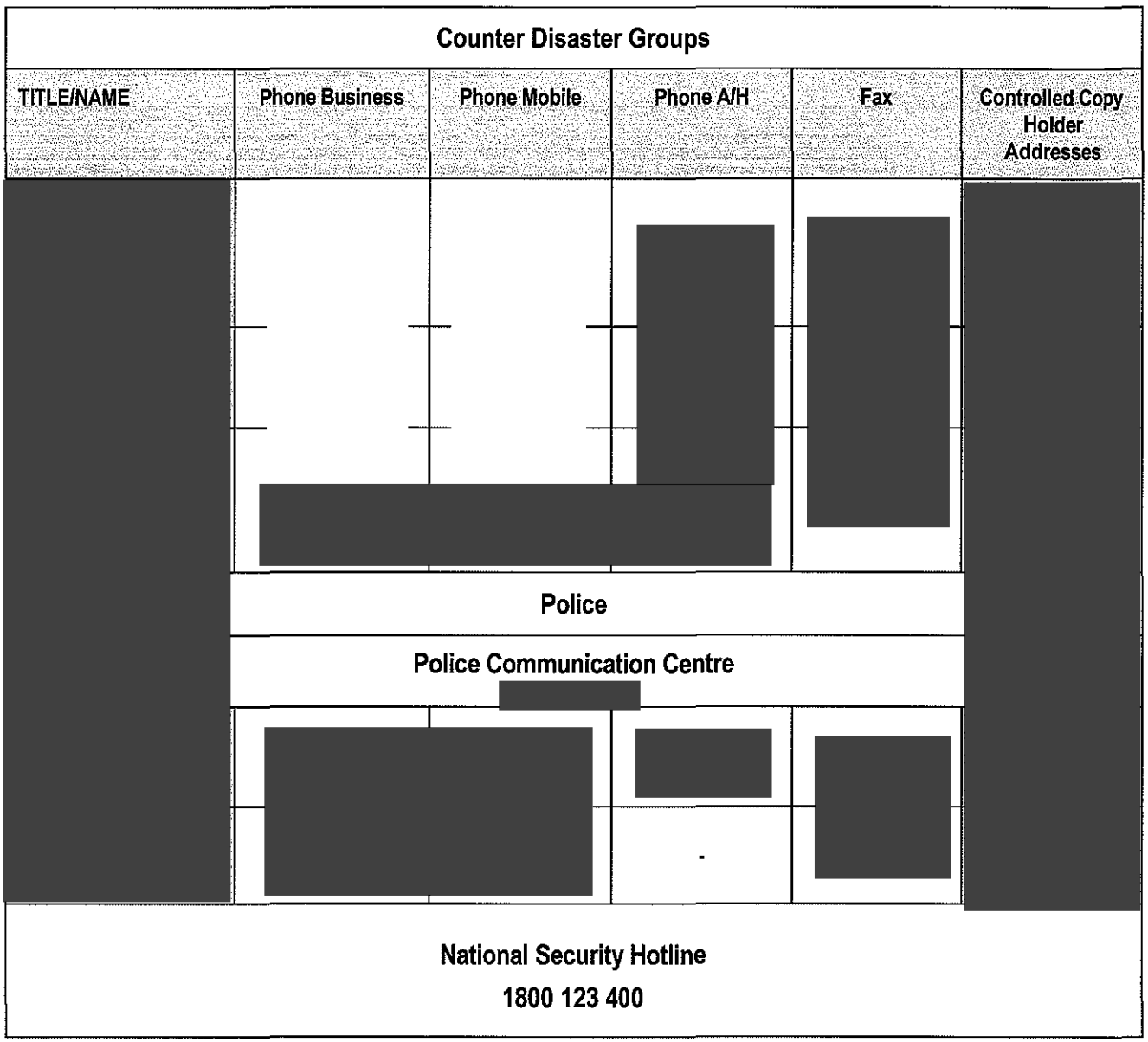
Note: All contacts required by the EAP are expected, in the first instance, to be by voice (phone) with email only used to confirm or provide additional details

Area Operations Centre – South (Toowoomba)					
TITLE/NAME	Phone Business	Phone Mobile	Phone A/H	Fax	Controlled Copy Holder Addresses
[redacted]	[redacted]	[redacted]		[redacted]	[redacted]
		Landline diverted to Duty EEC	Landline diverted to Duty EEC		
		[redacted]			

Department Environment Resource Management (DERM)					
TITLE/NAME	Phone Business	Phone Mobile	Phone A/H	Fax	Controlled Copy Holder Addresses
[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
		[redacted]			

Controlled EAP Copy Holders shown numbered (e.g. **2**) and shaded grey

Note: All contacts required by the EAP are expected, in the first instance, to be by voice (phone) with email only used to confirm or provide additional details



Controlled EAP Copy Holders shown numbered (e.g. **2**) and shaded grey

Note: All contacts required by the EAP are expected, in the first instance, to be by voice (phone) with email only used to confirm or provide additional details

Flood Contacts (Irrigators)				
Jack Taylor Weir	Irrigator	Phone Business	Phone Mobile	Phone A/H
[redacted]		[redacted]	[redacted]	
Group 1	Phone Business	Phone A/H	Phone Mobile	Phone Fax
[redacted]	[redacted]	[redacted]	[redacted]	
Group 2	Phone Business	Phone A/H	Phone Mobile	Phone Fax
[redacted]	[redacted]	[redacted]	[redacted]	

Group 3	Phone Home	Phone A/H	Phone Mobile	Phone Fax
[redacted]	[redacted]	[redacted]	[redacted]	

Group 4	Phone Business	Phone A/H	Phone Mobile	Phone Fax
[redacted]	[redacted]	[redacted]	[redacted] OR [redacted]	[redacted]

Group 5	Phone Business	Phone A/H	Phone Mobile	Phone Fax
[redacted]	[redacted]	[redacted]	[redacted]	

EMERGENCY CONTACTS

Please note: for a **chemical spill emergency** please phone (000) and ask for **Department of Community Safety**.
For general advice regarding chemical spills and hazardous waste please phone **31095099** (Dept of Community Safety)

Queensland Government
Department of Community Safety

PHONE: 000 for emergencies

Hazardous Industries & Chemicals Branch
For advice on large amounts of **chemicals stored**:
Chemical Hazards and Emergency Unit
http://www.deir.qld.gov.au/workplace/chem/index.htm

PHONE: 3109 0811

If you are not sure as to how to treat **poisons** contact Queensland Health

Poisoning

on **13 11 26**

http://www.health.qld.gov.au/PoisonsInformationCentre/default.htm

http://www.dcs.qld.gov.au
Department of Community Safety

Emergency Management EMQ Queensland

Queensland Government State Disaster Management Group

The **State Disaster Management Group** is the principal organisation for disaster management throughout the State. This group is responsible for disaster mitigation and disaster planning and preparation at a state level and for conducting whole of Government response and recovery operations prior to, during and after a disaster impact. This includes accessing interstate and/or Commonwealth assistance when Local and State resources are exhausted or not available.
Emergency Management Queensland (EMQ), a division of the Department of Community Safety, provides the core policy and support staffing for the State Group. This includes the provision of disaster management training, management of the State Disaster Coordination centre, maintenance of the State Disaster Plan as well as training and equipment support to local volunteer SES units.

EMQ has regional staff across the State who assist Local Governments and State agencies in their counter disaster responsibilities.

PHONE: 3247 8943 (State Disaster Coordination Centre – 24 hr number)
Use of this number is to be restricted to emergency use only.
OR **EMQ Regional Duty Officer (Areas and Contact Numbers** shown on the map on the following page).

State Duty Officer – Brisbane: PHONE: 3364 3512
Communications Branch
Level 5 Police Headquarters – 200 Roma St Brisbane 4000

SES FLOOD STORM EMERGENCY 132 500

Emergency Management EMQ Queensland

EMQ Boundaries

(and SunWater owned/ * managed infrastructure within the relevant boundary)

Far Northern Region
Ph [redacted]
Tinaroo Falls Dam

Northern Region
Ph [redacted]
Julius Dam
Burdekin Falls Dam
* Ross River Dam

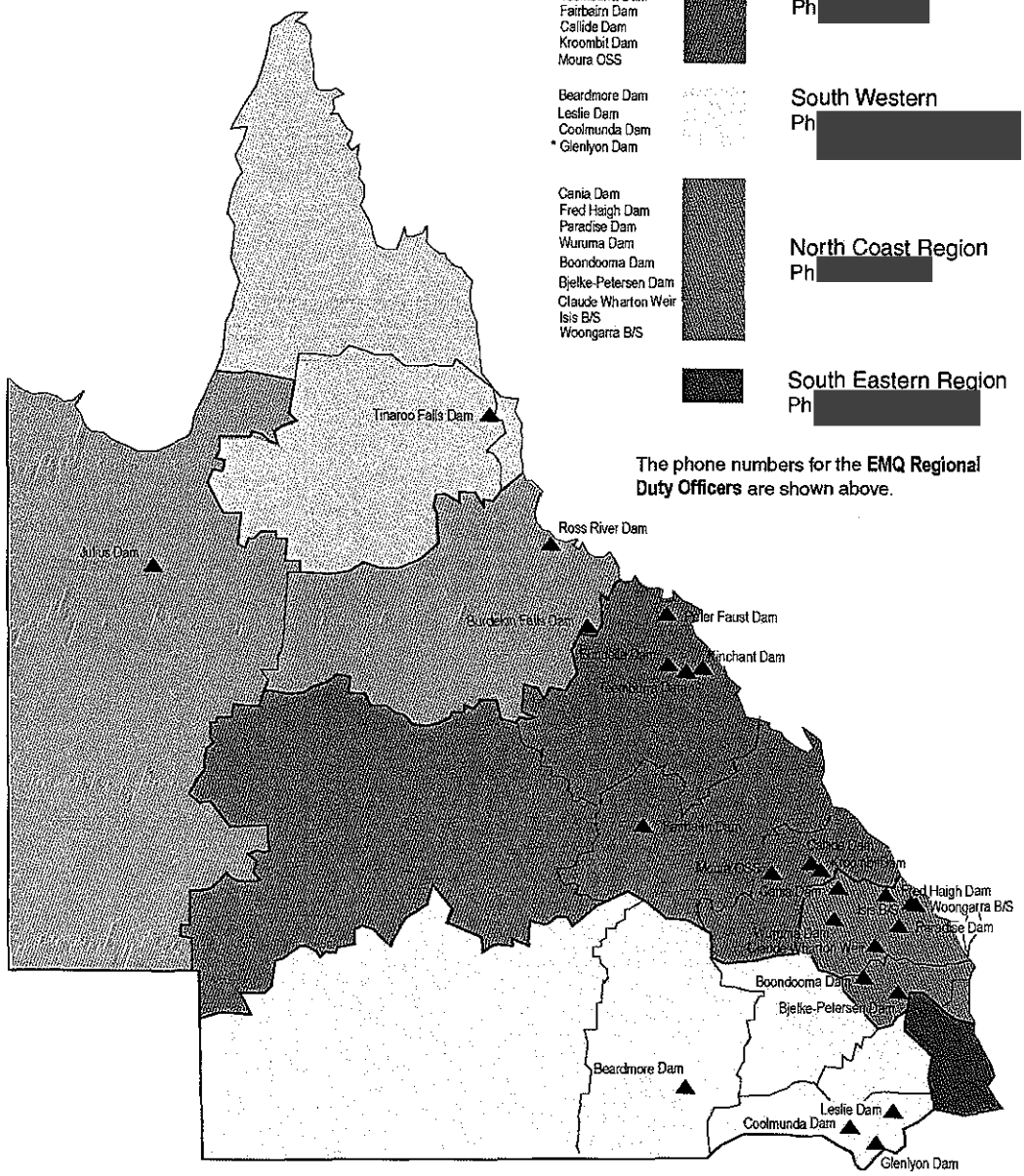
Central Region
Ph [redacted]
Peter Faust Dam
Eungella Dam
Kinchant Dam
Teemburra Dam
Fairbairn Dam
Callide Dam
Kroombit Dam
Moura OSS

South Western
Ph [redacted]
Beardmore Dam
Leslie Dam
Coolmunda Dam
* Glenlyon Dam

North Coast Region
Ph [redacted]
Cania Dam
Fred Haigh Dam
Paradise Dam
Wuruma Dam
Boondooma Dam
Bjelke-Petersen Dam
Claude Wharton Weir
Isis B/S
Woongarra B/S

South Eastern Region
Ph [redacted]

The phone numbers for the **EMQ Regional Duty Officers** are shown above.



LIST OF EQUIPMENT AVAILABLE DURING AN EMERGENCY

Name of Equipment	No's	Owner	Contact Name	Contact Number	Depot
[redacted]					

SECTION 4

INTRODUCTION TO EAP & RESPONSIBILITIES

4.0 INTRODUCTION

4.1 Purpose

This Plan defines responsibilities and procedures designed to identify conditions in time to take remedial action, including those which may endanger Beardmore Dam, and to notify the appropriate authorities, Emergency Agencies and Public Officials of possible, impending, or actual failure of the dam. The location of the dam is provided in Section 7.

The main purpose of the Plan is to ensure that timely warning is provided to the appropriate Authorities and Emergency Agencies in the event of a major incident impacting on the dam, and to provide relevant information for use in the emergency response to the situation.

The Plan identifies emergency conditions at the dam, and describes procedures to be followed by SunWater staff to investigate those conditions and provide warning to appropriate authorities and emergency agencies in the event of a dam failure, so that they can implement measures for protection of the downstream communities and properties. The Plan also provides direction to operating staff for handling unsafe or emergency conditions, where dam failure is unlikely, so that the dam can be returned to a safe operating condition with minimal delay.

4.2 Classification Category

According to Queensland Dam Safety Management Guidelines 2002, Beardmore Dam is classified with Category 2 Failure Impact Rating, having a population in excess of 100 people at risk.

4.3 Role of Emergency Event Coordinator (EEC)

Emergency Event Coordinator (EEC) is a role created in all SunWater Business Centres. The role will be activated during an emergency event (all hours) until the emergency is over. In the event of an emergency, the EEC will implement appropriate emergency procedures for which they have been trained.

Under normal operational conditions, the Asset Engineering Manager, Service Delivery Manager or Service Coordinator/Supervisor will perform this role. During an emergency condition any personnel trained for this role can serve as the Emergency Event Coordinator.

4.4 RESPONSIBILITIES

Organisation	Responsible Position / (s)	General Responsibilities	Emergency Responsibilities
SunWater Business Centre	Regional Manager	• Overall responsibility for water supply in the Business Centre.	➢ Liaison with SunWater Management
	Service Delivery Manager / Coordinator	• Dam Management and Supervision. • **Provide Training for EEC**	➢ Local Media Liaison in conjunction with Manager Public Affairs. ➢ Site management coordination.
	Emergency Event Coordinator (EEC)	• **See Section 4.3**	➢ **Liaison with the internal management of SunWater.**
	Asset Engineering Manager (AEM)	• Delivering of Dam Safety Program in the Business Centre. • **Provide Training for EEC**	➢ Liaison with MAM and PEDS in Brisbane. ➢ Liaison with Emergency Event Coordinator. ➢ Activation of Emergency Response.
	Dam Duty Operator (DDO)	• Dam Maintenance, Surveillance and Operation	➢ Identification & notification of unsafe condition. ➢ Implement preventive measures as directed by EEC or AEM.
Head Office	Manager, Asset Management (MAM)	• Overall responsibility for safe operation & maintenance of SunWater infrastructure in Queensland.	➢ Advice SunWater Management ➢ Advise Dam Regulator ➢ Advice Manager Public Affairs ➢ Liaison with Management & Regulator
	Principal Engineer, Dam Safety (PEDS)	• Formulation and implementation of Dam Safety Management Program & analysis of dam behaviour.	➢ Advise Business Centres on Dam Safety Issues ➢ Warning for dam failure and protective measures. ➢ Analysis of information & recommendations
	Manager, Public Affairs	• Responsible for media relations, communications and public relations activities.	➢ Liaison with Management ➢ Liaison with Regulator ➢ Liaison with Business Centre ➢ Liaison with media

4.3 RESPONSIBILITIES (Cont'd)

Organisation	Responsible Position / (s)	General Responsibilities	Emergency Responsibilities
Police	District Disaster Coordinator	• Preparation of disaster plans and conduct of emergency operations.	➢ Co-ordinate & support to SunWater during a declared emergency at the dam.
	Local Police	• Liaison with relevant organisations.	➢ Evacuation of persons, if required. ➢ Control of essential traffic. ➢ Security of specific area.
State Counter Disaster Organisation	Counter Disaster & Rescue Services	• Liaises in the preparation of disaster plans and conduct emergency operations.	➢ Point of contact for State Government response to emergency situations.
	District Disaster Coordinator	• Preparation of district disaster management plans and coordinates district response.	➢ To provide and coordinate whole-of-government support to disaster stricken communities
	Local Government Disaster Management Group	• Preparation of local disaster management plans and coordinates local response. • Decide what resources are needed, when they are needed and how best to apply such resources so as to minimise hardship and suffering.	➢ Provision and control of Council man-power and equipment as required. ➢ Provision of emergency accommodation.
	Counter Terrorism Liaison Officer	• Identifies area of concern during the preparation of disaster plans.	
Dam Safety, NR&W	Director, Dam Safety	• Oversight of Dam Safety practice at all referable dams in Queensland	➢ Liaison with relevant Minister on necessary actions.

DAM DESCRIPTION SHEET
(Data obtained from *Dam Safety Review, May 2000*)

Dam Type	Earth and Rockfill embankment
Full Supply Level (FSL)	EL. 207.12 m
Storage Capacity (at FSL)	81,800 ML
Storage Area (at FSL)	2,850 Ha
Dam Crest Level	EL. 210.17 m
Max. Height of Dam above Foundation	17 m (approx)
Length across Crest	2,571 m
Spillway Type	Gated Ogee Crest and Roller Bucket
Spillway Crest Level	EL 201.03 m
Spillway Crest Length (incl. Piers)	180.8 m
Spillway Capacity (at DCF)	6,160 m^3/sec 532 224 MLD
Spillway & Right Abutment Capacity (at DCF)	7.650 m3/sec 660,960 MLD
Outlet Works	Irrigation and River Outlets
Outlet Control	Vertical Lift Gates

All levels are to Australian Height Datum, AHD.
Conversion from State Datum is AHD_m = State Datum RL (in feet) x 0.3048 – 0.14 m.

SECTION 5

EMERGENCY IDENTIFICATION, EVALUATION AND ACTIONS

The dam has been designed to conform to the latest accepted design standards, so that its failure is highly unlikely. In order to maintain the dam in a safe condition and detect any emergency condition as soon as it begins to develop or becomes apparent, the following is applicable to Beardmore Dam.

5.1 Inspections

The following inspections are conducted at Beardmore Dam:

- Routine Visual Inspection - Conducted Weekly
- Detailed Inspection - Conducted Annually
- Comprehensive Inspection - Conducted Five-yearly

5.2 Instrumentation and Monitoring

To confirm the structural behaviour and safety of the embankment the following Instrumentation was installed, and are monitored, at Beardmore Dam.

- **Pore Pressure measurement**
  - 22 Hydraulic Piezometers (Twin tube) - are located in three cross-sections within the embankment.
  - 15 Foundation Pressure Gauges - are located in the spillway gallery.

- **Seepage measurement**
  - 5 V-Notch Weirs - 4 are located in the spillway gallery, and one at the spillway right abutment.

The location of instrumentation and monitoring equipment are listed in Section 6C.

5.3 Emergency Identification

Five major possible emergencies have been identified at SunWater Dams, which are:

- Emergency Event due to extreme inflow floods overtopping the Dam.
- Emergency Event due to rapid drawdown of the reservoir.
- Emergency Event due to a rapidly deteriorating structural deficiency such as may be induced by an extreme earthquake or erosion of the foundations and abutments. (This is the so-called "**Sunny Day**" failure, i.e. not induced by an inflow flood).
- Emergency Event due to extreme changes in the chemical/toxic spill.
- Emergency Event due to a terrorist activity.

5.4 EVALUATION OF INCIDENTS

It is considered that **ACTION 1 – Localised Incident/Near Miss**, is to be locally contained, with a short-term impact (generally reported in the Monthly Dam Surveillance Report). Although each emergency condition will be evaluated and responded to individually, the action of most emergencies will be similar and follow procedures outlined below.

5.4.1 Flood Operation

All flood operation, at or above Full Supply Level EL 207.12 m, will require the Dam Duty Operator to notify the Emergency Event Coordinator, who will further activate one of the following Emergency Evaluation Procedures

ACTION 1 – Normal Flood Operation (Spillway discharge < 60,000 MLD)
ACTION 2 – Spillway discharge > 60,000 MLD
ACTION 3 – Spillway discharge > 330,000 MLD (All Gates are fully open, or one gate has malfunctioned)

5.4.2 Imminent Dam Failure

At Beardmore Dam, if a staff member observes evidence of an imminent dam failure, such as water flowing through a breach in the dam, he/she will inform the Dam Duty Officer and/or Emergency Event Coordinator, who will activate the following Emergency Evaluation Procedure **ACTION 3**

5.4.3 Unsafe or Unusual Conditions

If during a routine inspection, or at any other time, an unsafe or unusual condition is detected, the Beardmore Dam staff will immediately notify the Dam Duty Officer and/or Service Manager, St George, who will advice the Principal Engineer (Dam Safety), and/or Manager (Asset Management), so that an evaluation of the situation can be carried out and a determination can be made on the condition of the dam.

If the Asset Engineering Manager, and/or Service Delivery Manager, following an inspection of the dam, and in consultation with Principal Engineer (Dam Safety), and/or Manager (Asset Management), determine that potential for the failure of the dam exists then he/she will activate the following Emergency Evaluation Procedure **ACTION 3**

If the unsafe or unusual condition will not lead to failure of the dam in the short term the Asset Engineering Manager, and/or Service Delivery Manager, will activate the following Emergency Evaluation Procedure **ACTION 2**

Scenario 1: Flood Operation

Under normal conditions, the operation of the storage is controlled by the on site Storage Operator (Dam Duty Operator) on advice from Service Delivery Coordinator.

During flood events, the dam will be continuously manned and will be controlled from the St. George Business Centre. The head office at Brisbane will transmit all information received from Bureau of Meteorology to St. George Business Centre.

The Dam Duty Operator, Beardmore Dam, will keep the Emergency Event Coordinator informed of discharge through the spillway. The Emergency Event Coordinator will inform the Asset Engineering Manager, who will further keep the Local Government Disaster Management Group (LGDMG) informed of the discharge through the spillway. In particular, the following alerts will be sent to the District Disaster Coordinator and Counter Disaster & Rescue Services in Brisbane.

The flood emergency event will start after the storage level has reached Full Supply Level (EL 207.12 m). In all other cases, follow the Operation and Maintenance Manual, and Standing Operating Procedures.

Water Level at Beardmore Dam	**AEP**	**Flood Alert Level Colour Code**	**Discharge volume (MLD)**
Storage at Full Supply Level (EL 207.12 m)			Gates begin to open
Storage EL 207.89 m			Storage at the top of inlet structure Outflow = Inflow
Storage EL 208.65 m	**1:610**		Water starts to flow around right abutment All gates are fully open Discharge = 472,000 MLD
Storage EL 210.0 m (9 m above the Spillway crest) and reaching Dam Crest Level DCL = EL 210.17 m	**1:1300**		All gates are fully open Storage at critical safety level, Discharge = 518,400 MLD

Scenario 1: Flood Operation [STAGE 1]

Stage/Alert Level	ACTION TO BE TAKEN BY			
	Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
	FOR RECORD: Use Sheets from Section 6 and 6A			
	Use Flood Operation Manual in conjunction with EAP			
	• Monitor the gauging station at Beardmore, and forward to EEC • Record all communication • Adjust the gate openings to maintain Full Supply Level, or as directed by the ~~Service Delivery Coordinator, St. George~~ • Log book entries as per SOP 12 & 22 • See note # below	• Monitor the gauging station at Cashmere, and Weribone • Record all communication • Advise the Dam Duty Operator of upstream river flows and direct the spillway discharge rate • See note # below	• Advise the Dam Duty Operator of any inflow flood information obtained from Bureau of Meteorology (Page 7, Section 10) *www.bom.gov.au • Inform spillway discharge to all personnel listed in the table below	ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)
	Table of Personnel to be notified			
	Notify as often as requested • Standby Officer • Emergency Event Coordinator	**Notify as often as requested** • Asset Engineering Manager • Service Delivery Manager, Ipswich	**Notify as often as requested** • Local Government Disaster Management Group • Irrigators in Groups 1 and 2	

After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.

- **IMPORTANT**

When the storage level peaks and begins to fall at a constant rate, the **Asset Engineering Manager** shall notify the Local Government Disaster Management Group, and Dam Duty Operator shall follow the instructions in SOP 25 (Spillway Gate Operations).

Scenario 1: Flood Operation [STAGE 2]

Stage/Alert Level	ACTION TO BE TAKEN BY			
	Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
[redacted]	FOR RECORD: Use Sheets from Section 6 and 6A	**Use Flood Operation Manual in conjunction with EAP**		ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)
	• Monitor the gauging station at Beardmore • Record all communication • Adjust the Gate openings to maintain full supply level in the Storage (EL 207.12 m) or as directed by the Service Delivery Coordinator, St. George • Log book entries as per SOP 12 & 22 • See note # below	• Operate the Jack Taylor Weir gate to pass the flood through the weir and monitor the gauging station at Cashmere and Weribone • Fax the sheet No. 1 from section 6A to all personnel listed in the table below • Record all communication • Advise the Dam Duty Operator of upstream river flows and direct spillway discharge rate • See note # below	• Advise the Dam Duty Operator of any inflow flood information obtained from Bureau of Meteorology (Page 7, Section 10) • Notify Executive Officer, LGDMG at Balonne that at 60,000 MLD, Jack Taylor Weir gates will be raised to the fully opened position and there will be no further control over the downstream flow • Inform spillway discharge to all personnel listed in the table below	
	Note: **At 60,000 MLD, Jack Taylor Weir Gates will be raised to the fully opened position and there will be no further control over the downstream flow.**			
	Table of Personnel to be notified			
	Notify as often as requested • Standby Officer • Emergency Event Coordinator	**Notify as often as requested** • Asset Engineering Manager • Principal Engineer (Dam Safety) • Manager (Asset Management) • Service Delivery Manager, Ipswich	**Notify as often as requested** • Executive Officer Local Disaster Management Group Balonne Shire • ABC Radio Station in Toowoomba & Orange and 2WEB Bourke • Irrigators in Groups 1 and 2	

After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.

- **IMPORTANT**

When the storage level peaks and begins to fall at a constant rate, the **Asset Engineering Manager** shall notify the Local Government Disaster Management Group, and Dam Duty Operator shall follow the instructions in SOP 25 (Spillway Gate Operations).

Scenario 1: Flood Operation [STAGE 3]

Stage/Alert Level	ACTION TO BE TAKEN BY: Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
[redacted]	FOR RECORD: Use Sheets from Section 6 and 6A	**Use Flood Operation Manual in conjunction with EAP**		ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)
		• Monitor the gauging station at Beardmore • Record all communication • Adjust the Gate openings to maintain FSL (EL 207.12 m), or as directed by the Service Coordinator, St. George • Inspect the Embankment • Photograph the spillway discharge area daily, and forward to EEC • Fax record sheet to EEC • Log book entries as per SOP 12 & 22 • See note # below	• Monitor the gauging station at Cashmere, and Weribone • Record all communication • Advise the Dam Operator of upstream river flows and direct spillway discharge rate • Fax the record sheet to all personnel listed in the table below • See note # below	• Advise the Dam Duty Operator of any inflow flood information obtained from Bureau of Meteorology (Page 7, Section 10) • Record all communication • Notify Executive Officer LGDMG and St. George Police that all the approaches to Andrew Nixon Bridge are about to be inundated at approximately 160,000 MLD discharge • Inform spillway discharge to all personnel listed in the table below	
		Note: Jack Taylor Weir Gates are fully opened and there is no further control over the downstream flow. • All the approaches to Andrew Nixon Bridge are about to be inundated at approximately 160,000 MLD discharge.		
		Table of Personnel to be notified		
		Notify as often as requested • Standby Officer • Emergency Event Coordinator	**Notify as often as requested** • Asset Engineering Manager • Principal Engineer (Dam Safety) • Manager, Asset Management • Service Delivery Manage, Ipswich	**Notify as often as requested** • Executive Officer Local Disaster Management Group Balonne Shire • ABC Radio Station in Toowoomba & Orange and 2WEB Bourke • Irrigators in Groups 1 to 5	

After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.

- **IMPORTANT**
  When the storage level peaks and begins to fall at a constant rate, the **Asset Engineering Manager** shall notify the Local Government Disaster Management Group, and Dam Duty Operator shall follow the instruction in SOP 25 (Spillway Gate Operations).

Scenario 1: Flood Operation [STAGE 4]

Stage/Alert Level	ACTION TO BE TAKEN BY: Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
STAGE 4 **Spillway flowing Water Level at FSL EL 207.12 m, and rising** **Discharge between 165,000 ML/D and 330,000 MLD** **ALL GATES WILL BE FULLY OPEN AT 330,000 MLD** **AEP 1 in 50** (Inflow = 307,600 MLD) (Outflow = 307,600 MLD)	**FOR RECORD: Use Sheets from Section 6 and 6A**	**Use Flood Operation Manual in conjunction with EAP**		**ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)**
	• Monitor the gauging station at Beardmore • Record all communication • Adjust the Gate openings to maintain FSL (EL 207.12 m), or as directed by the Service Coordinator [redacted] • Inspect the Embankment • Photograph the spillway discharge area daily • Fax record sheet to EEC • Log book entries as per SOP 12 & 22 • See note # below	• Monitor the gauging station at Cashmere, and Weribone • Record all communication • Advise the Dam Duty Operator of upstream river flows and direct spillway discharge rate • Fax the record sheet to all personnel listed in the table below • See note # below	• Advise the Dam Duty Operator of any inflow flood information obtained from the Bureau of Meteorology (Page 7, Section 10) • Record all communication • Inform spillway discharge to all personnel listed in the table below	
	Note: Jack Taylor Weir Gates are fully raised and there is no further control over the downstream flow and Andrew Nixon Bridge is un-trafficable.			
	Table of Personnel to be notified			
	Notify as often as requested • Standby Officer • Emergency Event Coordinator	**Notify as often as requested** • Asset Engineering Manager • Principal Engineer (Dam Safety) • Manager (Asset Management) • Service Delivery Manager, Ipswich	**Notify as often as requested** • Executive Officer Local Disaster Management Group. • ABC Radio Station in Toowoomba & Orange and 2WEB Bourke • Irrigators in Groups 1 to 5	

After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.

- **IMPORTANT**
  When the storage level peaks and begins to fall at a constant rate, the **Asset Engineering Manager** shall notify the Local Government Disaster Management Group and Dam Duty Operator shall follow the instruction in SOP 25 (Spillway Gate Operations).

Scenario 1: Flood Operation [STAGE 5]

Stage/Alert Level	ACTION TO BE TAKEN BY: Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
STAGE 5 ALL GATES ARE FULLY OPEN Storage level rising from FSL EL 207.12 m - EL 208.65 m Spillway Discharge between 330,000 ML/D and 425,000 MLD At Storage Level EL 208.65 m water will start flowing around the right abutment **AEP 1 in 610** Inflow = 440,000 MLD Outflow = 426,000 MLD	FOR RECORD: Use Sheets from Section 6 and 6A	**Use Flood Operation Manual in conjunction with EAP**		ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)
	• Monitor the gauging station at Beardmore • Record all communication • Inspect the Embankment • Evacuate any plant and vehicles from Office/Workshop/Home area to high ground on the left embankment • Photograph the spillway discharge area daily • Fax record sheet to EEC • Log book entries as per SOP 12 & 22 • See note # below	• Monitor the gauging station at Cashmere, and Weribone • Record all communication • Advise the Dam Duty Operator of upstream river flows and direct spillway discharge rate • Fax the record sheet to all personnel listed in the table below • See note # below	• Advise the Dam Duty Operator of any inflow flood information obtained from the Bureau of Meteorology (Page 7, Section 10) • Record all communication • Inform spillway discharge to all personnel listed in the table below	
	Note: Jack Taylor Weir Gates are fully raised and there is no further control over the downstream flow and Andrew Nixon Bridge is un-trafficable. • When the Storage level rises above the FSL, if any problem area is identified, immediately advise the Emergency Event Coordinator and Principal Engineer (Dam Safety), or Manager (Asset Management). Photograph the problem area.			
	Table of Personnel to be notified			
	Notify as often as requested • Standby Officer • Emergency Event Coordinator	**Notify as often as requested** • Asset Engineering Manager • Principal Engineer (Dam Safety) • Manager (Asset Management) • Service Delivery Manager, Ipswich	**Notify as often as requested** • Executive Officer Local Disaster Management Group. • ABC Radio Station in Toowoomba & Orange and 2WEB Bourke • Irrigators in Groups 1 to 5	

After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.

- **IMPORTANT**
  When the storage level peaks and begins to fall at a constant rate, the **Asset Engineering Manager** shall notify the Local Government Disaster Management Group and Dam Duty Operator shall follow the instruction in SOP 25 (Spillway Gate Operations).

Scenario 2: Rapid Drawdown (Drawdown rate is above 0.66 m/day)

Stages	ACTION TO BE TAKEN BY			
		Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)
STAGE 1 **Water Level at Full Supply Level 207.12m** All gates open suddenly	**FOR RECORD: Use Sheets from Section 6 and 6B**	• Inspect the Embankment • Inspect the upstream slope of the dam • Check for signs of excess seepage, sink holes, bulging or movement of riprap at upstream slope • Record the instrumentation reading • Record the discharge • Fax record sheet to EEC • See note # below	• Fax record sheet to all personnel listed in the table below • If unstable condition is established, Implement **ACTION 2** (Page 3, Section 2) • See note # below	• If unstable condition is established, Implement **ACTION 2** (Page 3, Section 2)
		Table of Personnel to be notified		
		Notify as often as requested • Emergency Event Coordinator	**Notify as often as requested** • Principal Engineer (Dam Safety) and/or Manager (Asset Management) • Service Delivery Manager, Ipswich	**Notify as often as requested** • Executive Officer Local Government Disaster Management Group
# After the Event an Emergency Event Report shall be jointly compiled by Emergency Event Coordinator and Dam Duty Operator and forward unedited copies to the Service Delivery Manager, Ipswich, and the Manager (Asset Management), Brisbane.			• **IMPORTANT** When the storage condition becomes stable, **Asset Engineering Manager** shall notify Local Government Disaster Management Group and Emergency Event Coordinator shall notify Service Delivery Manager, Ipswich, and the Manager (Asset Management), Brisbane.	**ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)**

(Drawdown rate criteria is adopted from Tennessee Valley Authority—Reservoir Operations Study)

Scenario 3A: 'Sunny Day' Failure, due to Earthquake

(Event due to a rapidly deteriorating structural deficiency such as may be induced by an extreme earthquake)

Stages	ACTION TO BE TAKEN BY: Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)
STAGE 1 **Earthquake felt in the area** **Intensity less than 5 MM** (refer to Section 10 for Modified Mercalli Scale) **Use Page 1, Section 6C**	• Inspect the Embankment, Spillway Structure, and Abutments, and fax report to the EEC • Check for springs, deformation, erosion, and concrete damage		Arrange an inspection of the dam and assess its condition
	Notify as often as requested • Standby Officer • Emergency Event Coordinator	**Notify as often as required** • Asset Engineering Manager	**Notify as often as required** • Principal Engineer (Dam Safety) • Manager (Asset Management)
STAGE 2 **Earthquake felt in the area** **Intensity greater than 5 MM** (refer to Section 10 for Modified Mercalli Scale) **Use Page 1, Section 6C**	• Immediately inspect the Embankment, Spillway Structure, and Abutments • Repeat the inspection every 12 hours	• If unstable condition is established, Implement **ACTION 2** (Page 3, Section 2)	• If unstable condition is established, advise the Dam Duty Operator to lower reservoir level
	Notify as often as requested • Standby Officer • Emergency Event Coordinator	**Notify as often as required** • Asset Engineering Manager • Principal Engineer (Dam Safety)	**Notify as often as requested** • Executive Officer Local Disaster Management Group Balonne Shire
STAGE 3 **DAM FAILURE IS IMMINENT** **Water Level at Full Supply Level 207.12 m** **Use Page 1, Section 6C**	• Lower reservoir level • Photograph the damage from a safe point • Vacate the immediate vicinity of the dam	• Implement **ACTION 3** (Page 2, Section 2,) • See note # below.	• Implement **ACTION 3** (Page 2, Section 2)
	Notify as often as required • Standby Officer • Emergency Event Coordinator	**Notify as often as required** • All personnel listed in **ACTION 3** (Page 2, Section 2)	**Notify as often as required** • All personnel listed in **ACTION 3** (Page 2, Section 2)

FOR RECORD: Use Sheets from Section 6 and 6C

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

After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.

• **IMPORTANT**
When the storage level peaks and begins to fall at a constant rate, the **Asset Engineering Manager** shall notify the Local Government Disaster Management Group and Dam Duty Operator.

Scenario 3B: 'Sunny Day' Failure, due to Piping

(Event due to a rapidly deteriorating structural deficiency such as may be induced by piping through the embankment, foundation or abutments)

Stages	ACTION TO BE TAKEN BY: Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)
STAGE 1 **Increasing Leakage through the Embankment.** **Use Page 1, Section 6D**	• Monitor flows until a decreasing trend is observable or as directed by the EEC	• If rapidly increasing trend is observed initiate **ACTION 2** (Page 3, Section 2)	• Arrange an inspection of the dam and assess its condition
	Notify as often as requested • Standby Officer • Emergency Event Coordinator	**Notify as often as required** • Asset Engineering Manager	**Notify as often as required** • Principal Engineer (Dam Safety)
STAGE 2 **Large Increasing Flows through the Embankment with cloudy water** **Use Page 1, Section 6D**	• Monitor flows until a decreasing trend is observable or as directed by the EEC	• If piping condition is established, Implement **ACTION 2** (Page 3, Section 2)	• If piping condition is established, advise the Dam Duty Operator to lower reservoir level
	Notify as often as requested • Standby Officer • Emergency Event Coordinator	**Notify as often as required** • Principal Engineer (Dam Safety)	**Notify as often as requested** • Executive Officer Local Disaster Management Group Warwick Shire
STAGE 3 **DAM FAILURE IS IMMINENT DUE TO PIPING** **Water Level at Full Supply Level 207.12 m** **Use Page 1, Section 6D**	• Lower reservoir level. • Photograph the seepage and piping from a safe point • Vacate the immediate vicinity of the embankment and complete the event report	• Implement **ACTION 3** (Page 2, Section 2) • See note # below.	• Implement **ACTION 3** (Page 2, Section 2)
	Notify as often as required • Standby Officer • Emergency Event Coordinator	**Notify as often as required** • All personnel listed in **ACTION 3** (Page 2, Section 2)	**Notify as often as required** • All personnel listed in **ACTION 3** (Page 2, Section 2)

FOR RECORD: Use Sheets from Section 6 and 6D

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

After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.

• **IMPORTANT**
When the storage level peaks and begins to fall at a constant rate, the **Asset Engineering Manager** shall notify the Local Government Disaster Management Group, and Dam Duty Operator.

Scenario 4: Chemical / Toxic Spill

Stages	ACTION TO BE TAKEN BY: Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
STAGE 1 **Large amount of Chemical / Toxic Spill found in the reservoir/catchment** **Use Page 1, Section 6E**	• Sketch, measure, photograph and locate its position in the reservoir/catchment • Forward event report to EEC			FOR RECORD: Use Sheets from Section 6 and 6E
	Notify as often as required • Emergency Event Coordinator	**Notify as often as required** • Asset Engineering Manager	**Notify as often as required** • Environmental Services Manager Who will then make an assessment on whether to notify the Health Department in accordance with the Hazardous Algal Bloom Response plan (Page 9, Section 10)	
STAGE 2 **Large amount of Chemical / Toxic Spill found in the reservoir/catchment** **Use Page 1, Section 6E**	• Sketch, measure, photograph and locate its position in the reservoir/catchment • Close all outlet structures • Forward event report to EEC (see note # below)	• Inspect the reservoir and assess its water quality for water supply • Coordinate with the Environmental Services Manager, and the Health Department		
	Notify immediately • Mobile Spill Response Unit of the State Government Chemical Hazards and Emergency Unit • and **if it is a very large spill then** also notify the District Disaster Co-ordinator **Notify as often as requested** • Emergency Event Coordinator			ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)

After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.

- **IMPORTANT**
  When the storage level peaks and begins to fall at a constant rate, the **Asset Engineering Manager** shall notify the Local Government Disaster Management Group and Dam Duty Operator.

Scenario 5: Terrorist Activity

[redacted]

SECTION 6

EMERGENCY EVENT OPERATION RECORDING PROCEDURES

- **Emergency Event Recording Sheets**
  - Emergency Event Record ** (**Page 3, this Section**)
  - Record of Communication ** (**Page 4, this Section**)
  - Log of Events / Actions ** (**Page 5, this Section**)

** Note: These sheets must be completed for all Emergency Event Scenarios, and included in the Emergency Event Report.

- **Operating Procedure**
  - Flood Operation **(See Section 6A)**
- **Operating Procedure**
  - Rapid Drawdown (Not applicable at Leslie Dam)
- **Operating Procedure**
  - Sunny Day Failure (Earthquake) **(See Section 6C)**
  - Sunny Day Failure (Excessive Seepage → Piping) **(See Section 6D)**
- **Operating Procedure**
  - Chemical / Toxic Spill **(See Section 6E)**
- **Operating Procedure**
  - Terrorist Activity **(See Section 6F)**

Emergency Event Recording Sheets

- Emergency Event Record sheet
- Record of Communication sheet
- Log of Events / Action sheet

Note: These sheets must be completed for all Emergency Event Scenarios and be included in the Emergency Event Report

EMERGENCY EVENT RECORD

COMPLETE THIS COVER SHEET AND ATTACH RELEVANT RECORDING SHEETS FROM SECTION 6.

1. **NATURE OF THE EVENT** (circle the event)

Spillway discharge **Earthquake** **Piping** **Water Quality** **Terrorist Activity**

Commencing: Time ___:___ am/pm; Date ___/___/_____ **Finishing:** Time ___:___ am/pm; Date ___/___/_____

2. **DESCRIPTION OF THE EVENT**

Attach relevant sheets from Section 6.

3. **STATISTICS**

Total inflow	Megalitres
Total discharge	Megalitres
Capacity of Storage prior to inflow	%
Volume prior to inflow	Megalitres
Maximum inflow	MLD
Maximum discharge	MLD

4. **EVENT PROGRESS**

Attach copies of the Spillway Level versus Time Graph, the Record of Communication, the Log of Events / Actions, and Rainfall during a Flood Event. (Section 6A)

5. **GENERAL COMMENTS**

Include in this section any observations or comments regarding the Event, such as Equipment malfunctions, improved Reporting, Safety issues, or any suggestions which may improve monitoring of the Event

6. **DAMAGE REPORT**

Detail any damage to the Embankment, Spillway, Abutments or Stream bank in the downstream area of the Dam. ***Attach photos.***

Name:.....Signed:.....Designation:.....Date...../...../.....

BEARDMORE DAM - EMERGENCY ACTION PLAN
RECORD OF COMMUNICATION

DATE	TIME	CONTACT PERSON / TELEPHONE NO.	CALL IN / OUT	MESSAGE	RECORDED BY (INITIALS)

BEARDMORE DAM - EMERGENCY ACTION PLAN
LOG OF EVENTS / ACTIONS

DATE	TIME	EVENT / ACTION DESCRIPTION	RECORDED BY (INITIALS)

EJ BEARDMORE DAM EAP — Flood Operation

Visual Inspection and Storage Report
Note: Refer to Page 2 for recording instructions **

Date: .....

	SUN	MON	TUE	WED	THU	FRI	SAT
Stored Water Level FSL **207.12** m							
Tail Water Level m							
Daily Rainfall (mm) Morning 9am							
Evening 3pm							

	STAGE 1 Complete Table 1 (Pg 3 - Record of Gate Operation)	STAGE 2, 3, 4, 5 and 6 Complete Tables 1 & 2 (Pgs 3 & 4) and Visual Inspection section		
	Gauging Station	**Beardmore**	**Cashmere**	**Weribone**
	Morning 9 am			
	Evening 3 pm			

Visual Inspection		First Inspection	Second Inspection (+6 hrs)	Third Inspection (+12 hrs)
Visual Inspection (Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)				
Spillway Gate / Dissipator				
	Erosion, damage to concrete, misalignment of gates			
Irrigation Control Structure				
	Cracks, concrete deterioration			
Embankments				
Left Embankment:	Cracks, subsidence in pavement			
Right Embankment:	Cracks, subsidence in pavement			
Upstream Face:	(Use binoculars)			
	Settlement			
	Displacement of riprap material			
Downstream face:				
	Subsidence, slides, erosion			
	Sign of seepage			
Area Downstream of Dam:				
	Seepage from any location apart from seepage pt:			
Lower Gallery Access: (Inspect if it is safe to do so)				
	Cracks, seepage increase			
Seepage: Seepage water	Clear or Turbid (Tick for clear)			
Jack Taylor Weir	**By St. George Office**	Gate Fully open	Gates ..... % open	
	Erosion, damage to concrete			

Details of significant changes. New occurrences and matter warranting further attention .....

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Inspecting Officer's initials				
Fax to (tick if faxed)		Asset Engineering Manager / Service Delivery Manager [redacted]		
		Principal Engineer (Dam Safety) [redacted]		

** INSTRUCTIONS FOR COMPLETING SHEET - Flood Operation

STAGE 1

Monitor the gauging station at Beardmore, Cashmere and Weribone once a day only.

STAGE 2

Monitor the gauging station at Beardmore, Cashmere and Weribone twice a day and complete full visual inspection sheet.

VISUAL INSPECTION

Frequency of visual inspection required is indicated by

STAGE 2 ONCE A DAY	STAGE 3 TWICE A DAY Col 1 & Col 3	STAGE 4, 5 & 6 THREE TIMES A DAY

Additional Inspections should be made

- When specifically requested

Show results of inspections as follow:-

- New Seepage point. Seepage from any location apart from seepage pt — **NEW**
- Significant increase (> 30%) or change in condition. — **SG-INC**
- Slight increase (> 10%) or change in condition. — **INC**
- NIL change of condition. — **NIL**
- Slight decrease (< 10%) or change in condition. — **DEC**

Significant Changes
Any changes which, in the opinion of the inspecting officer, are more than just slight changes, must be advised to Principal Engineer (Dam Safety). The degree of urgency of this advising varies with the nature of the matter.

LOWER GALLERY

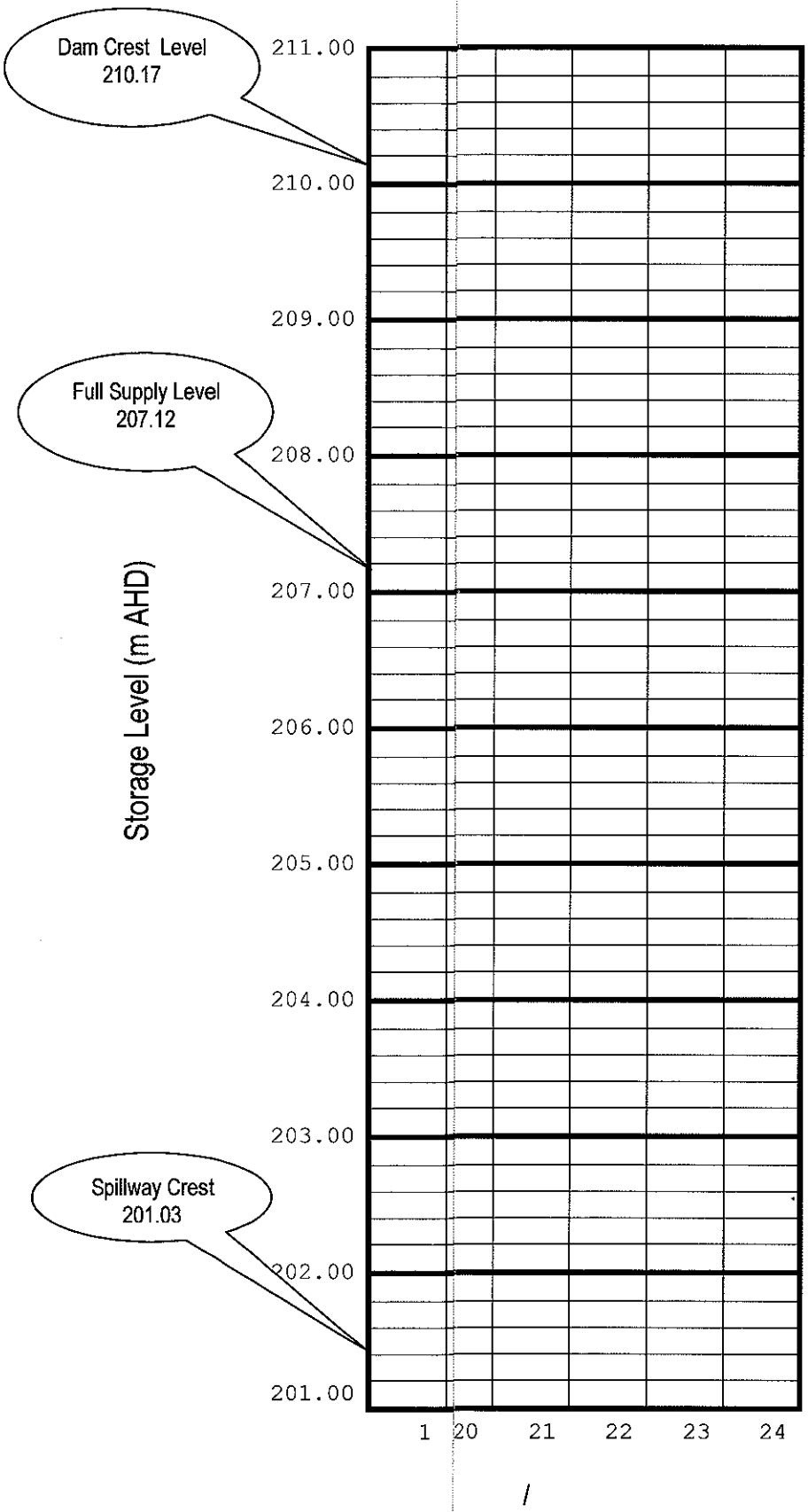
- Inspect the lower gallery if it is safe to do so.

TABLE 1

RECORD OF RAINFALL DURING A FLOOD COMMENCING AT ....../......./.......

Date	Time	Rainfall mm	Daily Total	Comments

Date	Time	Storage Level	Storage Volume in Megalitres	Total Measured Inflow			Dissipator performance / Comments
					1	2	


Dam Crest Level
210.17
Full Supply Level
207.12
Spillway Crest
201.03
Storage Level (m AHD)
211.00
210.00
209.00
208.00
207.00
206.00
205.00
204.00
203.00
202.00
201.00
1
20
21
22
23
24

EJ BEARDMORE DAM EAP — Rapid Drawdown

Visual Inspection and Storage Report
Note: Refer to Page 2 for recording instructions **

Date: .....

	SUN	MON	TUE	WED	THU	FRI	SAT
Stored Water Level FSL **207.12** m							
Tail Water Level (m)							
Daily Rainfall (mm) Morning 9am							
Evening 3pm							

Visual Inspection	First Inspection	Second Inspection (+24 hrs)	Piezometer Readings		
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)			Piezo No.	First Reading	Second Reading (+24hrs)
Left Embankment			11		
Crest Cracks, subsidence			12		
Upstream Face: Settlement			13		
Displacement of riprap material or sink holes			14		
Downstream face: Sloughing			15		
Sign of seepage, Subsidence, slides, erosion			16		
Right Embankment (Write 'W' for walk and 'D' for Drive)			17		
Crest Cracks, subsidence			18		
Upstream Face: Settlement			19		
Displacement of riprap material or sink holes			20		
Downstream face: Sloughing			21		
Sign of seepage, subsidence, slides, erosion			22		
Instrumentation: Piezometer readings (tick if taken)					

Details of significant changes. New occurrences and matter warranting further attention .....

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Inspecting Officer's initials		
Fax to (tick if faxed)		Asset Engineering Manager / Service Delivery Manager [redacted]
		Principal Engineer (Dam Safety) [redacted]

** INSTRUCTIONS FOR COMPLETING SHEET - Rapid Drawdown

VISUAL INSPECTION

Frequency of visual inspection required is indicated by

FIRST INSPECTION IMMEDIATELY	SECOND INSPECTION AFTER +24 hours

Additional Inspections should be made, when:

- Specifically requested

Show results of inspections as follow:-

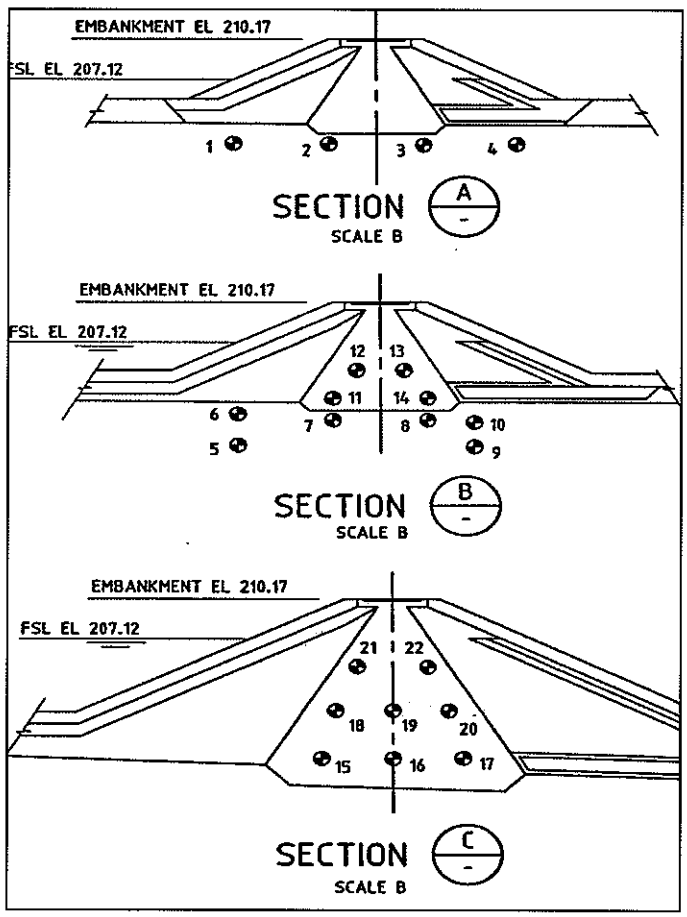
- New Seepage point. Seepage from any location apart from seepage pt — **NEW**
- Significant increase (> 30%) or change in condition. — **SG-INC**
- Slight increase (> 10%) or change in condition. — **INC**
- NIL change of condition. — **NIL**
- Slight decrease (< 10%) or change in condition. — **DEC**

Significant Changes

Any changes which, in the opinion of the Inspecting Officer, are more than just slight changes, must be advised to Principal Engineer (Dam Safety). The degree of urgency of this advising varies with the nature of the matter.

LOWER GALLERY

- Inspect the lower gallery if it is safe to do so.



EJ BEARDMORE DAM EAP — Sunny Day Failure (Earthquake)

Visual Inspection and Storage Report
Note: Refer to Page 2 for recording instructions **

Date: .....

	SUN	MON	TUE	WED	THU	FRI	SAT
Stored Water Level FSL **207.12** m							
Tail Water Level (m)							
Daily Rainfall (mm)							

Earthquake Intensity felt:.....MM **Visual Inspection**	First Inspection	Second Inspection (+12hrs)	Third Inspection (+24hrs)	Fourth Inspection (+36hrs)
Date				
Time				
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)				
Left Embankment				
Crest: Misalignment of guard rail, Cracks, subsidence				
Spillway interface with embankment				
Upstream Face: (Use binoculars or boat)				
Settlement or sink hole				
Displacement of riprap material				
Downstream face: Sloughing				
Subsidence, slides, erosion				
Right Embankment				
Crest: Misalignment of guard rail, Cracks, subsidence				
Spillway interface with embankment				
Upstream Face: (Use binoculars or boat)				
Settlement or sink hole				
Displacement of riprap material				
Downstream face: Sloughing				
Subsidence, slides, erosion				
Area Downstream of Dam: New Seepage				
Outlet Works / Valve Chamber				
Deterioration of valves, dissipators				
Lower Gallery & Access: Cracks, concrete deterioration				
Increase in Seepage:				
Spillway Gate / Dissipator				
Erosion, damage to concrete, misalignment of gates				
Irrigation Control Structure:				
Cracks, concrete deterioration				
Jack Taylor Weir Erosion, damage to concrete				

Details of significant changes. New occurrences and matter warranting further attention .....

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New Cracks or Movements: Sketch, measure, photograph, and locate if possible. Sketch on the Plan (see over)

Inspecting Officer's initials				

Fax to (tick if faxed)		Asset Engineering Manager / Service Delivery Manager [redacted]
		Principal Engineer (Dam Safety) [redacted]

** INSTRUCTIONS FOR COMPLETING SHEET - Sunny Day Failure (Earthquake)

VISUAL INSPECTION

Frequency of visual inspection required is indicated by

Earthquake Less than 5MM	Earthquake greater than 5MM
FILL FIRST VISUAL INSPECTION ONLY	FILL ALL VISUAL INSPECTIONS AND INSTRUMENTATION DATA AS WELL

Additional Inspections should be made, when:

- New cracks, settlements or sinkholes which requires following up
- When specifically requested

Show results of inspections as follow:-

• Significant increase (> 30%) or change in condition.	SG-INC
• New Observation.	NEW
• Slight increase (> 10%) or change in condition.	INC
• NIL change of condition.	NIL
• Slight decrease (< 10%) or change in condition.	DEC

Significant Changes
Any changes which, in the opinion of the inspecting officer, are more than just slight changes, must be advised to Principal Engineer (Dam Safety). The degree of urgency of this advising varies with the nature of the matter.

[redacted]

INSTRUMENTATION READINGS
(REQUIRED IF EARTHQUAKE IS GREATER THAN 5MM)

OBSERVATION BOREHOLES (REQUIRED IF EARTHQUAKE IS GREATER THAN 5MM)				
	First Inspection	Second Inspection	Third Inspection	Fourth Inspection
CH-WL (Top 200.4m)				
OB1 (Top 204.418m)				
OB2 (Top 204.436m)				
OB3 (Top 208.234m)				

FOUNDATION PIEZOMETERS (REQUIRED IF EARTHQUAKE IS GREATER THAN 5MM)				
	First Inspection	Second Inspection	Third Inspection	Fourth Inspection
FP01				
FP02				
FP03				
FP04				
FP05				
FP06				
FPO7				
FP08				
FP09				
FP10				
FP11				
FP12				
FP13				
FP14				
FP15				

HYDRAULIC PIEZOMETERS (REQUIRED IF EARTHQUAKE IS GREATER THAN 5MM)								
	First Inspection		Second Inspection		Third Inspection		Fourth Inspection	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
HP01								
HP02								
HP03								
HP04								
HP05								
HP06								
HP07								
HP08								
HP09								
HP10								
HP11								
HP12								
HP13								
HP14								
HP15								

SEEPAGE MEASUREMENT (REQUIRED IF EARTHQUAKE IS GREATER THAN 5MM)					
		Gallery			
		First Inspection	Second Inspection	Third Inspection	Fourth Inspection
VN No. 1	mm				
VN No. 2	mm				
VN No. 3	mm				
VN No. 4	mm				
Right Bank	mm				

EJ BEARDMORE DAM EAP — Sunny Day Failure (Piping)

Visual Inspection and Storage Report
Note: Refer to Page 2 for recording instructions **

Date: .....

	SUN	MON	TUE	WED	THU	FRI	SAT
Stored Water Level FSL **207.12**m.							
Daily Rainfall (mm)							

Visual Inspection (Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)	First Inspection	Second Inspection (+24hrs)	Third Inspection (+36hrs)	Fourth Inspection (+48hrs)
Date				
Time				
Location of Seepage Describe approximate location in words				
New Seepage point estimated flow				
Clear or Turbid (Tick for clear)				
Old Seepage point estimated flow				
Clear or Turbid (Tick for clear)				
Large increase of seepage (30% or more)				
Downstream face				
Subsidence, sloughing, erosion				
Embankment:				
Signs of erosion, sand boils				
Seepage measurements:				
Clear or Turbid (Tick for clear)				
VN 01 (mm)				
VN 02 (mm)				
VN 03 (mm)				
VN 04 (mm)				
VN Right Bank (mm)				

Details of significant changes. New occurrences and issues warranting further attention, Source of seepage (if known).....

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Sketch, locate, measure and photograph if possible. (sketch the problem area on the General Arrangement Plan)

Inspecting Officer's initial					

Fax to (tick if faxed)		Asset engineering Manager / Service Delivery Manager [redacted]
		Principal Engineer (Dam Safety) [redacted]

** INSTRUCTIONS FOR COMPLETING SHEET - Sunny Day Failure (Piping)

VISUAL INSPECTION

Frequency of visual inspection required is indicated by

STAGE 1 ONCE A DAY	STAGE 2 TWICE A DAY	STAGE 3 AS DIRECTED

Additional Inspections should be made, when:

- New seepage which requires further action
- When specifically requested

Show results of inspections as follow:-

- New Seepage appeared. **NEW**
- Significant increase (> 30%) or change in condition. **SG-INC**
- Slight increase (> 10%) or change in condition. **INC**
- NIL change of condition. **NIL**
- Slight decrease (< 10%) or change in condition. **DEC**

Significant Changes
Any changes which, in the opinion of the inspecting officer, are more than just slight changes must be advised to Principal Engineer (Dam Safety). The degree of urgency of this advice varies with the nature of the issue.

BEARDMORE DAM EAP — Chemical / Toxic Spill

Visual Inspection and Storage Report
Note: Refer to Page 2 for recording instructions **

Date: .....

	SUN	MON	TUE	WED	THU	FRI	SAT
Stored Water Level **FSL 207.12 m**							
Outlet discharge MLD							
Daily Rainfall (mm)							

VISUAL INSPECTION	First Inspection	Second Inspection (+24hrs)	Third Inspection (+48hrs)
Date			
Time			

Reservoir
Location of the chemical/toxic spill (provide as much detail as possible of the extent of the spill, and note changes over time, and areas threatened by the emergency):

	Condition of spill		
Description of the Chemical/Toxic Spill	Approx distance from dam wall		

Location of Spill in the Reservoir/Catchment — OR DEFINE ITS LOCATION AS AN AMTD DISTANCE

Chemical Spill Management (tick if action taken)		DATE	TIME
1. Outlet structures closed			
2. Water Treatment facility closed			
3. Source of spill located & isolated (if safe and possible)?			
4. Area isolated from public/staff access (if possible)?			

Details of significant changes. New occurrences and issues warranting further attention, Source of seepage (if known)

.....

.....

.....

.....

.....

Sketch, measure, photograph and locate if possible. Locate the position of Algal Bloom / Spill on a Plan (if available)

Inspecting Officer's initials				
Fax to (tick if faxed)		Asset Engineering Manager / Service Delivery Manager [redacted]		
		Principal Engineer (Dam Safety) [redacted]		

** INSTRUCTIONS FOR COMPLETING SHEET - Chemical/Toxic Spill

VISUAL INSPECTION

Frequency of visual inspection required is indicated by **ONCE A DAY**

Additional Inspections should be made, when

- Large developments of Algal Bloom are evident which require further action
- When specifically requested

Show results of inspections as follow:-

- New Seepage appeared **NEW**
- Significant increase (> 30%) or change in condition. **SG-INC**
- Slight increase (> 10%) or change in condition. **INC**
- NIL change of condition. **NIL**
- Slight decrease (< 10%) or change in condition. **DEC**

Significant Changes

Any changes which, in the opinion of the inspecting officer, are more than just slight changes must be advised to the Principal Engineer (Dam Safety). The degree of urgency of this advice varies with the nature of the issue.

EJ BEARDMORE DAM EAP — Terrorist Activity

Visual Inspection and Storage Report

Note: Refer to Page 2 for recording instructions **

Date: .....

	SUN	MON	TUE	WED	THU	FRI	SAT
Stored Water Level F.S.L **207.12** m							
Tail Water Level (m)							
Daily Rainfall (mm)							

Visual Inspection	Initial Inspection	Interim Inspection (as directed)	Final Inspection (as directed)
Date			
Time			
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)			
Left Embankment (W or D)			
Crest Any damage observed			
Cracks, subsidence in pavement			
Movement between spillway interface & embankment			
Upstream Face (Use binoculars or boat)			
Displacement of riprap material, sink holes			
Downstream face			
Breaching of dam or possibility of piping			
Right Embankment (W or D)			
Crest Any damage observed			
Cracks, subsidence in pavement			
Movement between spillway interface & embankment			
Upstream Face (Use binoculars or boat)			
Displacement of riprap material, sink holes			
Downstream face			
Breaching of dam or possibility of piping			
Low Level Outlet Works (W or D)			
Damage to concrete			
Lower Gallery and Access (Walk)			
Cracks			
Increase in Seepage			
Spillway Gates (W or D)			
Misalignment of gates			
Damage to concrete			
Irrigation Control Structure (W or D)			
Damage to concrete			
Channel bank erosion			
Jack Taylor Weir (W or D)			
Damage to concrete or misalignment of gates			

Details of significant changes. New occurrences and matter warranting further attention .....

.....

.....

.....

New Cracks or Damage to the structure: Sketch, measure, photograph, and locate if possible. Sketch on the Plan (see over)

Inspecting Officer's initials			
Fax to (tick if faxed)		Asset Engineering Manager / Service Delivery Manager [redacted]	
		Principal Engineer (Dam Safety) [redacted]	

** INSTRUCTIONS FOR COMPLETING SHEET - Terrorist Activity

VISUAL INSPECTION

Frequency of visual inspection required is indicated by **AS DIRECTED**

Additional Inspections should be made, when

- New Cracks or breaching of dam which requires following up
- When specifically requested

Show results of inspections as follow:-

- New observation **NEW**
- Slight increase (> 10%) or change in condition. **INC**
- NIL change of condition. **NIL**
- Slight decrease (< 10%) or change in condition. **DEC**

Significant Changes

Any changes which, in the opinion of the Inspecting Officer, are more than just slight changes, must be advised to Principal Engineer (Dam Safety). The degree of urgency of this advising varies with the nature of the matter.

SECTION 7

EMERGENCY ACCESS ROUTES & PREVENTATIVE ACTIONS

7. EMERGENCY ACCESS ROUTES

Locality plan and alternative access routes are shown on page 3 and 4 of this section.

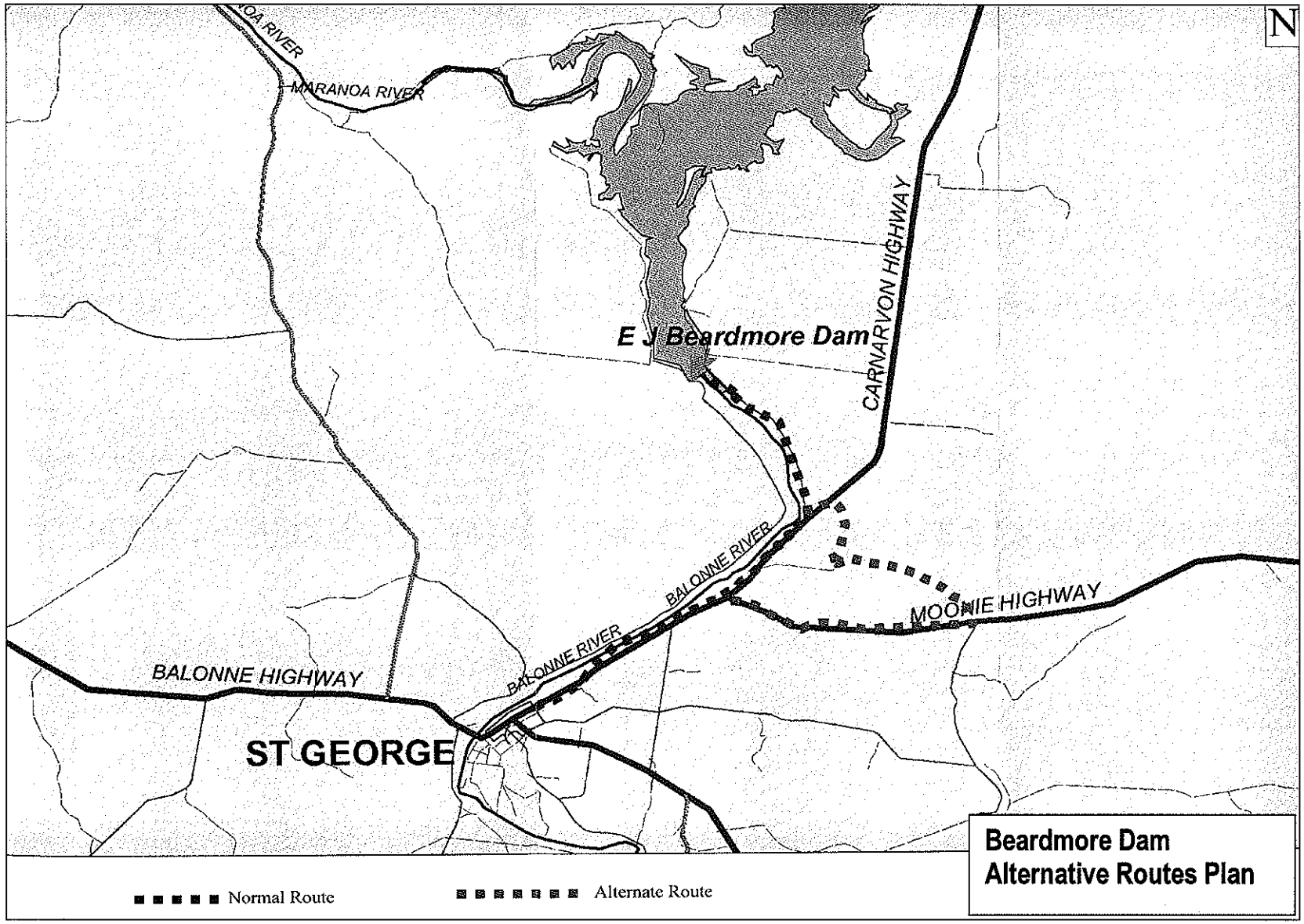
7.1 PREVENTATIVE ACTIONS

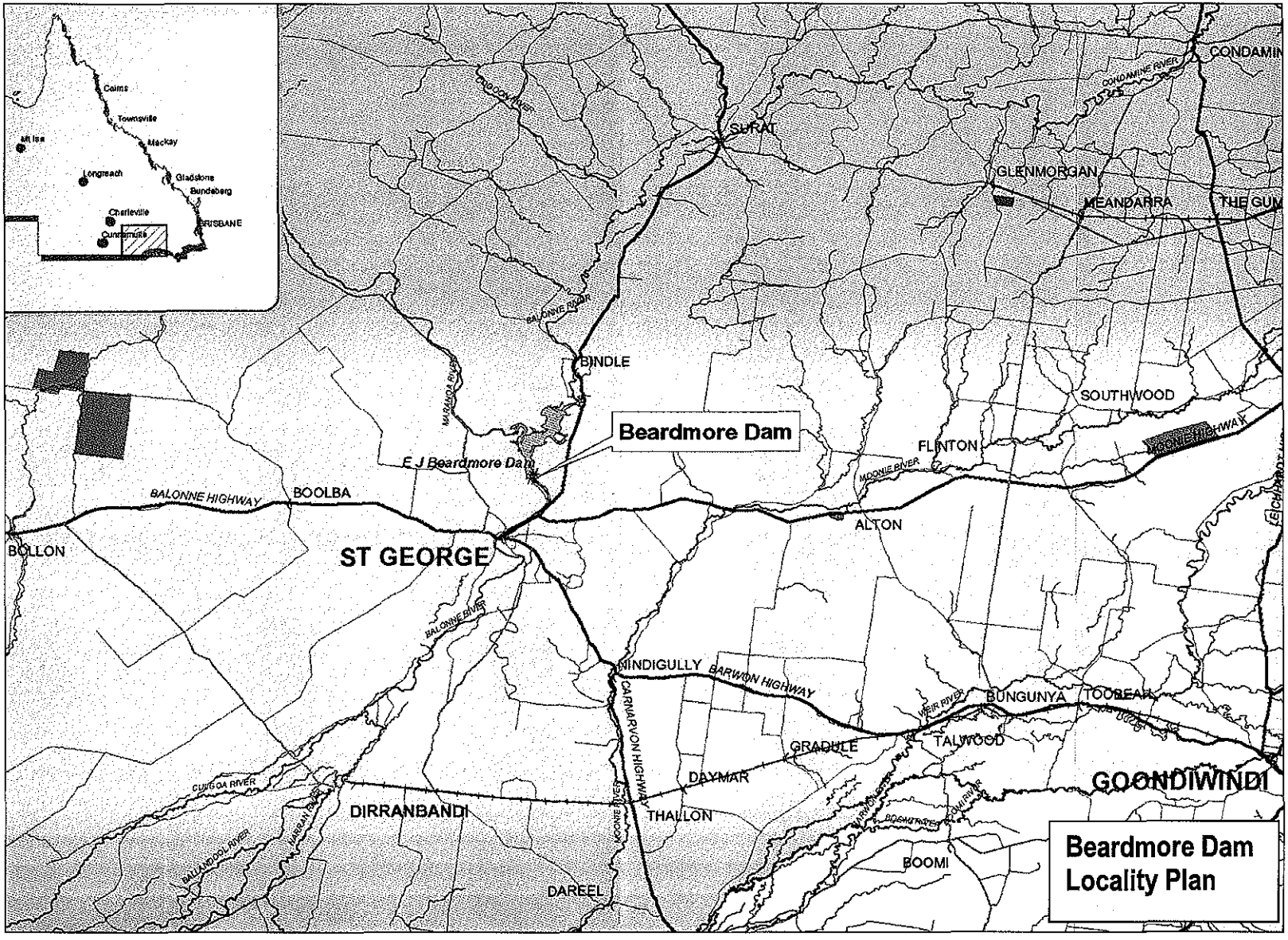
In the event of a rapidly deteriorating structural deficiency which is likely to threaten the security of the dam (for example due to internal erosion or following a major earthquake), the Dam Duty Operator or Standby Officer, having reported a potential emergency situation, should follow the preventive actions set out below:-

1. Ensure that a responsible person with portable communication is left in a safe position at the dam to monitor the emergency condition.
2. Restrict access to the dam area.
3. Liaise with Emergency Event Coordinator and Asset Engineering Manager who will liaise with Emergency Management Authorities.
4. If possible, document the emergency condition with photographs and or video camera.
5. Update Emergency Event Coordinator from time to time of any change in the emergency condition.
6. Do not take any unnecessary risks in undertaking the above actions.

Since the most likely scenario for a dam failure at Beardmore Dam is from earthquake activity, the stability may be increased by using available earth and rockfill material as a stabilising berm. A list of equipment (earthmoving), available during an emergency, is provided in Section 3.

It may become necessary during an emergency to lower the reservoir level of the dam to decrease seepage and/or loading on the structure, and to minimise the impact of any failure. This would only be an option where an emergency condition was identified in the early stages. Instructions for operation of spillway and outlet works are given in Section 2.7 of the Operation and Maintenance manual for the dam. A full description of the dam is provided on the following page.


MARANOA RIVER
E J Beardmore Dam
CARNARVON HIGHWAY
BALONNE RIVER
BALONNE RIVER
MOONIE HIGHWAY
BALONNE HIGHWAY
ST GEORGE
N
Normal Route
Alternate Route
Beardmore Dam
Alternative Routes Plan


Cairns
Townsville
Mackay
Longreach
Gladstone
Bundaberg
Charleville
BRISBANE
Cunnamulla
SURAT
CONDAMINE RIVER
GLENMORGAN
MEANDARRA
BALONNE RIVER
BINDLE
MARAGOA RIVER
Beardmore Dam
E J Beardmore Dam
SOUTHWOOD
FLINTON
MOONIE HIGHWAY
MOONIE RIVER
BALONNE HIGHWAY
BOOLBA
ALTON
BOLLON
ST GEORGE
NINDIGULLY
BARWON HIGHWAY
CARNARVON HIGHWAY
BUNGUNYA
TOOBEAH
TALWOOD
GRADULE
DAYMAR
GOONDIWINDI
CULGOA RIVER
DIRRANBANDI
THALLON
BALLANDOOL RIVER
BOOMI
DAREEL
Beardmore Dam
Locality Plan

SECTION 8

LOWERING STORAGE LEVEL AND SPILLWAY GATE OPERATIONS

8.0 LOWERING THE STORAGE LEVEL

It may become necessary during an emergency to lower the Beardmore Dam storage level to decrease seepage and/or loading on the structure to minimise the impact of any failure. This would only be an option when an emergency condition was identified in its early stages.

8.1 Beardmore Dam Constraints

There are two constraints that need to be considered when examining lowering the storage level. These are:

1. Maximum possible releases from Beardmore reservoir; and

2. Flooding impacts downstream.

8.1.1 Maximum possible releases from Beardmore Dam

The release rate from the storage may be governed by the storage level at the time of drawdown. Beardmore Dam has two possible mechanisms, which can be operated simultaneously. They are:

1. Spillway Sector Gates : Top of the gate level EL 207.58 m
   Spillway Crest Level EL 201.33 m
2. Low Level Outlet Invert Level EL 199.50 m

The following table indicates the total number of days required to dewater Beardmore Dam from Full Supply Level with and without any of the above 2 options. A spillway discharge curve is given on Page 3.

Dewatering Options	Inflow	Number of Days required
a) Option 1 • (Spillway + Low level Outlet) Option 2 • Low Level outlet (below spillway crest)	No Inflow	Option 1: 5 days to RL 201.33m Option 2: 100 days to RL 199.5m
b) Option 1 • (Spillway + Low level Outlet)	Mean Average 63500 MLD	1 days to RL 203.5m At RL 203.5m (Inflow = Outflow)

8.2 Spillway Gate - Routine and Emergency Operation

The spillway has twelve identical 13.1 x 6.7 m^2 vertical gates. The gates hang from twin 32mm equalised hoisting ropes; one each side of the gate, wound onto the hoisting drum located on the platform at the top of the spillway pier.

8.2.1 Routine Gate Operation

- Follow SOP 25 and
- Follow Operation & Maintenance Manual Section 2.7 (page 71).

8.2.2 Failure of Mains Supply: Alternative means of operating gates

(i) Standby Generator

- Follow Operation & Maintenance Manual Section 2.7.5 (page 83).

(ii) Air motors

- Follow Operation & Maintenance Manual Section 2.7.5.3 (page 84).

Alternatives (i) and (ii) would normally be attempted in the order shown.

8.2.3 Failure of Power Cable

It should be noted that the power to all 12 gates is provided by a single ring main and damage to this cable may prevent the electrical operation of any or all 12 gates.

Try (ii) above, if unsuccessful, electrician should attempt to locate and rectify fault.

SECTION 9

FLOOD IMPACT DOWNSTREAM & INUNDATION MAPS

Flooding impacts downstream

The flooding impact of Beardmore Dam releases may be assessed by the flooding effects at following key locations along the Balonne River (Table 9.1). The Probable Maximum Precipitation with Dam Failure (PMPDF) scenario causes highest flood levels in the Balonne River. Table 9.1 to 9.8 below shows the summarised information of Dam Break Study conducted by SunWater in September 2005.

Table 9.1: Key Locations along the Balonne River

Description	AMTD (Km)	Model Chainage (Km)	Stream Bed Elevation (m AHD)
Dam Tailwater	251.8	0.00	195.24
Moonie and Carnarvon Highway Intersection (EL 203 m AHD)	239.0	12.80	188.27
St. George Town (EL 201 m AHD.)	232.0	19.80	186.04
Jack Taylor Weir Bridge (Deck EL 197.07 m AHD)	229.5	22.3	185.00

Table 9.2: Peak Flood Flows from Beardmore Dam

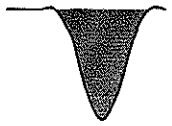
Scenario	Peak Flows (m^3/s)	Time to Peak Flows (Day:Hr:Min)
Sunny Day-Embankment Failure	5,510	00:02:00 (After initiation of breach)
DCF-No Failure	6,310	07:00:00 (After the onset of storm)
PMPDF- Embankment Failure	14,470	08:00:00(After the onset of storm) 04:11:00 (After the initiation of breach)
PMPDF-Monolith Failure	13,310	08:18:00 (After the onset of storm) 04:22:00 (After the initiation of breach)

Table 9.3: Flood Levels and Flood Depths at Key Locations

[redacted]

Table 9.4: Flood Peak Discharges and River Capacity at Key Locations

	AEP	Moonie/Carnarvon intersection	St George Township	Jack Taylor Weir	
Minor Flood Level Sunny Day failure		255,744 MLD	216000 MLD	216000 MLD	
Moderate Flood Level Dam Crest Flood (No-Failure)	**610**	442,370 MLD	422500 MLD	427700 MLD	
Major Flood Level Dam Crest Flood (Embankment-Failure)	**1300**	587500 MLD	492500 MLD	672200 MLD	

	Moonie/Carnarvon intersection	St George Township	Jack Taylor Weir	
River Capacity	1,590,000 MLD	No over flow 262,000 MLD Right bank overflow 351, 650 MLD	1,242,000 MLD	
AEP River Bank Full Discharge	**1:1300**	**1:50** Left bank over flow **1:100** Right bank overflow	**1:5000**	

Elapsed time of flow from Dam

From the simulated dam break flood hydrographs, the elapsed time of flood wave at the key locations has been estimated. In Table 9.5 to 9.8, the estimated timings are summarised.

Table 9.5: Timing of Floods for SDF-Embankment Failure Scenario

AMTD (Km)	Location	Time to Flood Rise (d:hr:min[1])	Time Flooding Starts (d:hr:min[1])	Time to Peak Flood (d:hr:min[1])	Time Flooding Stops (d:hr:min[1])
251.8	Dam Tailwater	Instant	Not flooded	00:02:00	Not flooded
239.0	Moonie-Carnarvon Highway Intersection (EL 203 m AHD)	00:01:30	Not flooded	00:05:30	Not flooded
232.0	St. George Township (EL 201 m AHD)	00:02:0	Not flooded	00:06:00	Not flooded
229.6	Jack Taylor Weir (Deck EL 197.07 m AHD)	00:02:30	00:04:15	00:06:00	00:10:00

Table 9.6: Timing of Floods for DCF-No Failure Scenario

AMTD (Km)	Location	Time to Flood Rise (d:hr:min[1])	Time Flooding Starts (d:hr:min[1])	Time to Peak Flood (d:hr:min[1])	Time Flooding Stops (d:hr:min[1])
251.8	Dam TW	Instant	_	07:00:00	
239.0	Moonie-Carnarvon Highway Intersection (EL 203.0 m AHD)	00:05:00	04:06:00	07:04:00	12:15:00
232.0	St. George Town (EL 201 m AHD)	00:05:00	04:10:00	07:14:00	10:05:00
229.6	Jack Taylor Weir (Deck EL 197.07 m AHD)	00:05:30	01:21:00	07:16:00	23:06:00

Table 9.7: Timing of Floods for PMPDF-Embankment Failure Scenario

AMTD (Km)	Location	Time to Flood Rise (d:hr:min[1])	Time Flooding Starts (d:hr:min[1])	Time to Peak Flood (d:hr:min[1])	Time Flooding Stops (d:hr:min[1])
251.8	Dam Tailwater	00:03:00	–	08:05:00 *(03:10:00)*	–
239.0	Moonie-Carnarvon Highway Intersection (EL 203 m AHD)	00:07:00	02:11:00	08:07:30 *(03:12:30)*	27:03:00 *(22:08:00)*
232.0	St. George Town (EL 201 m AHD)	00:08:00	02:21:00	08:09:30 *(03:14:30)*	26:20:00 *(22:01:00)*
229.5	Jack Taylor Weir (Deck EL 197.07 m AHD)	00:08:00	01:12:00	08:10:00 *(03:16:00)*	28:10:00 *(24:02:00)*

Table 9.8: Timing of Floods for PMPDF-Monolith Failure Scenario

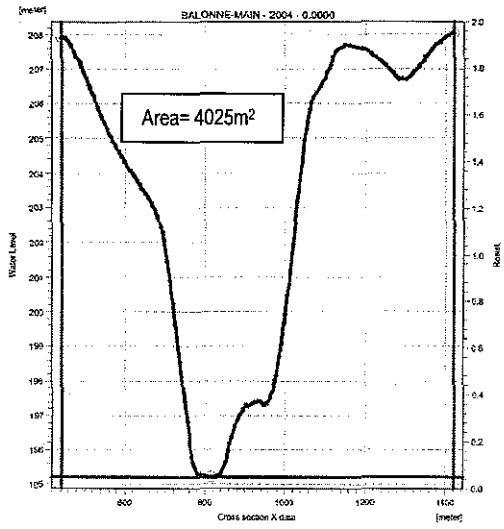
AMTD (Km)	Location	Time to Flood Rise (d:hr:min[1])	Time Flooding Starts (d:hr:min[1])	Time to Peak Flood (d:hr:min[1])	Time Flooding Stops (d:hr:min[1])
251.8	Dam Tailwater	00:03:00	–	09:18:00 *(04:19:30)*	–
239.0	Moonie-Carnarvon Highway Intersection (EL-203 m AHD)	00:07:00	02:11:00	09:21:30 *(04:23:00)*	26:00:00 *(21:01:30)*
232.0	St. George Township (EL-201 m AHD)	00:08:00	02:21:00	09:22:30 *(05:00:00)*	25:21:00 *(20:22:30)*
229.5	Jack Taylor Weir (Deck EL-197.07 m AHD)	00:08:00	01:12:00	09:23:30 *(05:01:00)*	28:03:00 *(23:04:30)*

River Cross-sections & Inundation Maps

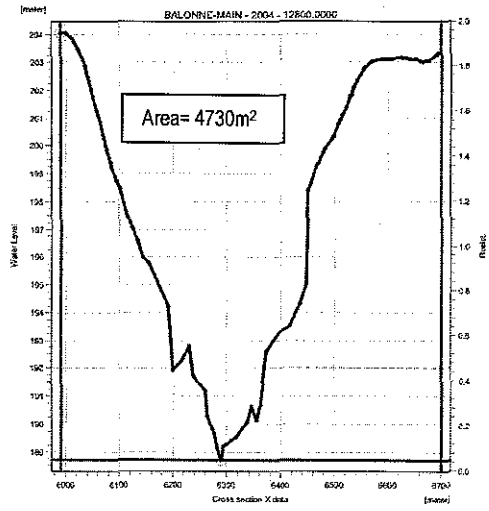
Comprehensive hydrologic and hydraulic modelling has simulated flood inundation that would occur for the following scenarios.

(i) **"Failure due to flood"**:- The inflow of an extreme flood into the storage causes overtopping leading to erosion failure of abutment or foundations.

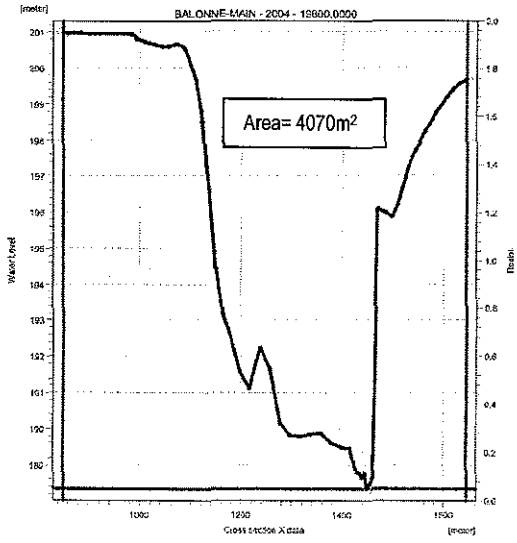
(ii) **"Sunny Dam failure"**:- In which the dam fails under a normal inflow situation. Any flood inundation would result from water held in the storage.



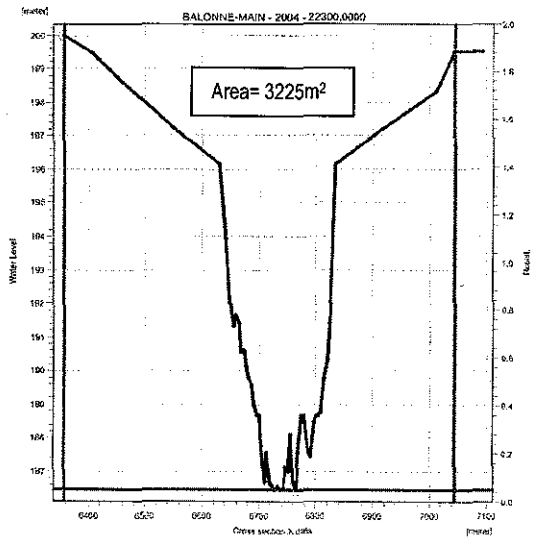
River x-section at Dam Tailwater



River x-section at Moonie/Carnarvon Intersection



River x-section at St. George Township



River x-section at Jack Taylor Weir

SECTION 10

Definitions & Analysis

- Incident, Emergency Response, Crisis and Business Continuity Management Manual
- Flood Event Definitions and Abbreviations
- Earthquake Assessment (Modified Mercalli Scale)
- Queensland Disaster Management System
- Weather Information (Flood Warning)

INCIDENT, EMERGENCY RESPONSE, CRISIS AND BUSINESS CONTINUITY MANAGEMENT MANUAL

PURPOSE

The purpose of the Manual is to provide a description of the framework that SunWater applies in managing various levels of incidents, from locally managed incidents through to emergency, crisis and business continuity management. It includes:

- definitions for the terminology used in incident management
- a description of the documentation for the different levels of an Incident / Emergency / Crisis
- a roadmap of the different levels of incident within SunWater and how they are to be managed, including a description of the escalation process when an Emergency worsens to become a Crisis
- a description of the phases of management of the different levels of incident, and how these may interrelate.

The Incident/Near Miss Management Plan (IMP), Emergency Management Plan (EMP), Crisis Management Plan (CMP) and Business Continuity Plan (BCP) must be read in conjunction with the Manual.

FLOOD EVENT DEFINITIONS AND ABBREVIATIONS

FLOODING EVENT DEFINITIONS

- **"DCF"** or
  "Dam Crest Flood" (Formerly IFF or Impending Failure Flood)
  The flood Event which when routed through the Reservoir just threatens failure of the Dam. The Reservoir is assumed to be initially at Full Storage Level
- **"PMF"** or
  "Probable Maximum Flood"
  The flood resulting from the Probable Maximum Precipitation, coupled with the worst flood producing catchment conditions that can be realistically expected in the prevailing meteorological conditions
- **"PMP"** or
  "Probable Maximum Precipitation"
  The theoretical greatest depth of precipitation for a given duration that is physically possible over a particular drainage system.
- **"SUNNY DAY BREAK"**
  Unexpected failure of a dam not associated with flooding or natural disaster.

State of Emergency

As defined by the State Emergency and Rescue Management Act (1989)
OR As defined by the Dams Safety Act (1978)

ABBREVIATIONS

ANCOLD	Australian National Committee on Large Dams
DEMO	District Emergency Management Officer
DEOCON	District Emergency Operations Controller
DFL	Design Flood Level
DLWC	Department of Land and Water Conservation, NSW
DSU	Dam Safety Unit, Department of Land & Water Conservation, NSW
FSL	Full Supply Level
IFF	Imminent Failure Flood
LEOCON	Local Emergency Operations Controller
MDBC	Murray Darling Basin Commission
MLD	Megalitres per Day
MRMW	Manager, River Murray Works
OIC	Officer-In-Charge, Hume Dam
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
SES	State Emergency Service
UHF	Ultra High Frequency
VHF	Very High Frequency

THE MODIFIED MERCALLI SCALE

MM 1 Not felt by humans, except in especially favourable circumstances, but birds and animals may be disturbed.
Reported mainly from the upper floors of buildings more than 10 storeys high.
Dizziness or nausea may be experienced.
Branches of trees, chandeliers, doors and other suspended systems of long natural period may be seen to move slowly.
Water in ponds, lakes reservoirs, etc. may be set into seiche oscillation.

MM 2 Felt by a few persons at rest indoors, especially by those on upper floors or otherwise favourably placed.
The long-period effects listed under MM 1 may be more noticeable.

MM 3 Felt indoors, but not identified as an earthquake by everyone.
Vibration may be likened to passing of light traffic.
It may be possible to estimate the duration, but not the direction.
Hanging objects may swing slightly.
Standing motorcars may rock slightly.

MM 4 **Generally noticed indoors, but not outside.**
Very light sleepers may be wakened.
Vibration may be likened to the passing of heavy traffic, or to the jolt of a heavy object falling or striking the building.
Walls and frame of buildings are heard to creak.
Doors and windows rattle.
Glassware and crockery rattles.
Liquids in open vessels may be slightly disturbed.
Standing motorcars may rock, and the shock can be felt by their occupants.

MM 5 **Generally felt outside, and by almost everyone indoors.**
Most sleepers awakened. A few people frightened.
Direction of motion can be estimated.
Small unstable objects are displaced or upset.
Some glassware and crockery may be broken. Some windows cracked.
A few earthenware toilet fixtures cracked.
Hanging pictures move. Doors and shutters swing.
Pendulum clocks stop, start, or change rate.

MM 6 **Felt by all.**
People and animals alarmed.
Many run outside.
Difficulty experienced in walking steadily.
Some plaster cracks or falls. Isolated cases of chimney damage.
Windows, glassware, and crockery broken.
Objects fall from shelves, and pictures from walls.
Heavy furniture moved. Unstable furniture overturned.
Small church and school bells ring.
Trees and bushes shake, or are heard to rustle.
Loose material may dislodge from existing slips, talus slopes, or shingle slides.

MM 7 **General alarm.**

Difficulty experienced in standing.
Noticed by drivers of motorcars.
Trees and bushes strongly shaken. Large bells ring.
A few instances of damage to Masonry.
Loose brickwork and tiles dislodged.
Unbraced parapets and architectural ornaments may fall.
Stone walls cracked. Weak chimneys broken, usually at the roof-line.
Domestic water tanks burst.
Concrete irrigation ditches damaged.
Waves seen on ponds and lakes.
Water made turbid by stirred-up mud.
Small slips, and caving-in of sand and gravel banks.

MM 8 **Alarm may approach panic.**
Steering of motorcars affected.
Masonry damaged, with partial collapse.
Chimneys, factory stacks, monuments, towers, and elevated tanks twisted or brought down.
Panel walls thrown out of frame structures.
Some brick veneers damaged.
Decayed wooden piles broken.
Frame houses not secured to the foundation may move.
Cracks appear on steep slopes and in wet ground.
Landslips in roadside cuttings and unsupported excavations.
Some branches may be broken off.
Changes in the flow or temperature of springs and wells may occur.
Small earthquake fountains.

MM 9 **General Panic.**
Masonry heavily damaged, sometimes collapsing completely.
Frame structures racked and distorted.
Damage to foundations general.
Frame houses not secured to the foundations shifted off.
Brick veneers fall and expose frames.
Cracking of the ground conspicuous.
Minor damage to paths and roadways.
Sand and mud ejected in alluviated areas, with the formation of earthquake fountains and sand craters.
Underground pipes broken.
Serious damage to reservoirs.

MM 10 **Most masonry structures destroyed, together with their foundations.**
Some well built wooden buildings and bridges seriously damaged.
Dams, dykes and embankments seriously damaged.
Railway lines slightly bent.
Concrete and asphalt roads and pavements badly cracked or thrown into waves.
Large landslides on river banks and steep coasts.
Sand and mud on beaches and flat land moved horizontally.
Large and spectacular sand and mud fountains.
Water from rivers, lakes, and canals thrown up on the banks.

The Queensland Disaster Management System

The Queensland Disaster Management System operates on three distinct levels. These are:

- Local Government
- Disaster District
- State Government

A fourth level, The Commonwealth, is also included in our Disaster Management System recognising that Queensland may need to seek Commonwealth support in times of disaster.

Each of these levels within the State Disaster Management System has as its basis a committee structure supported by a disaster coordination centre. These committees and coordination centres are activated when required to manage and coordinate support for disaster stricken communities. When not activated, these committees meet to prepare for and practice their role within the Disaster Management System.

Figure 1 depicts the Queensland Disaster Management System including the link to the Commonwealth for National-level support when required.

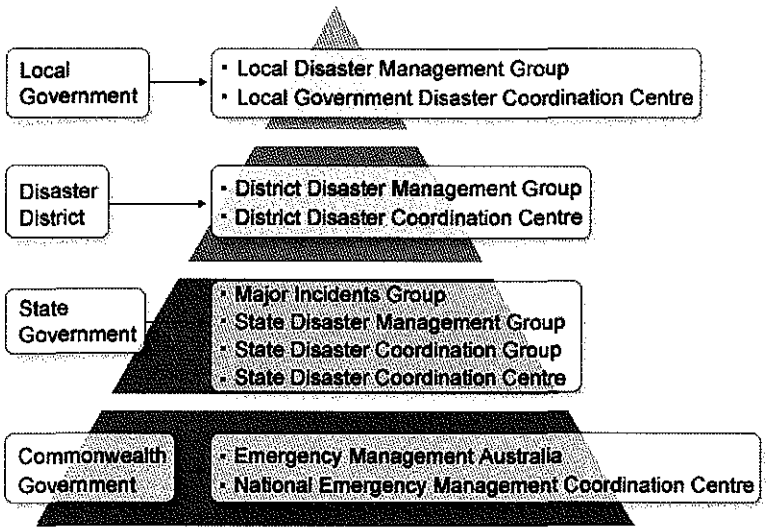


Figure 1 - The Queensland Disaster Management System

Description of the System

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WEATHER INFORMATION (FLOOD WARNING)

Using the Internet
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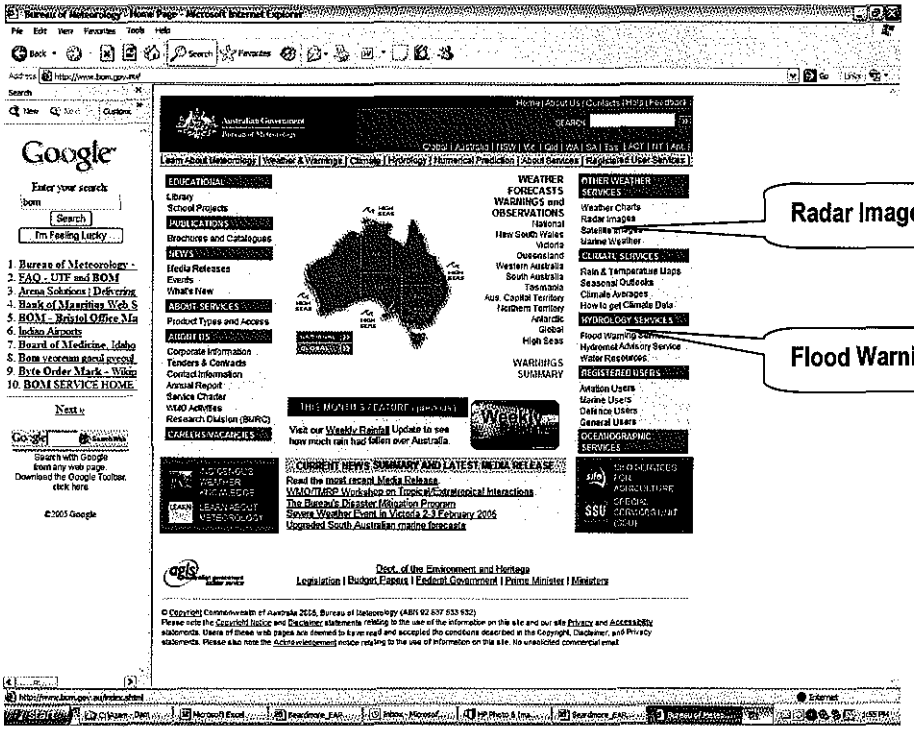

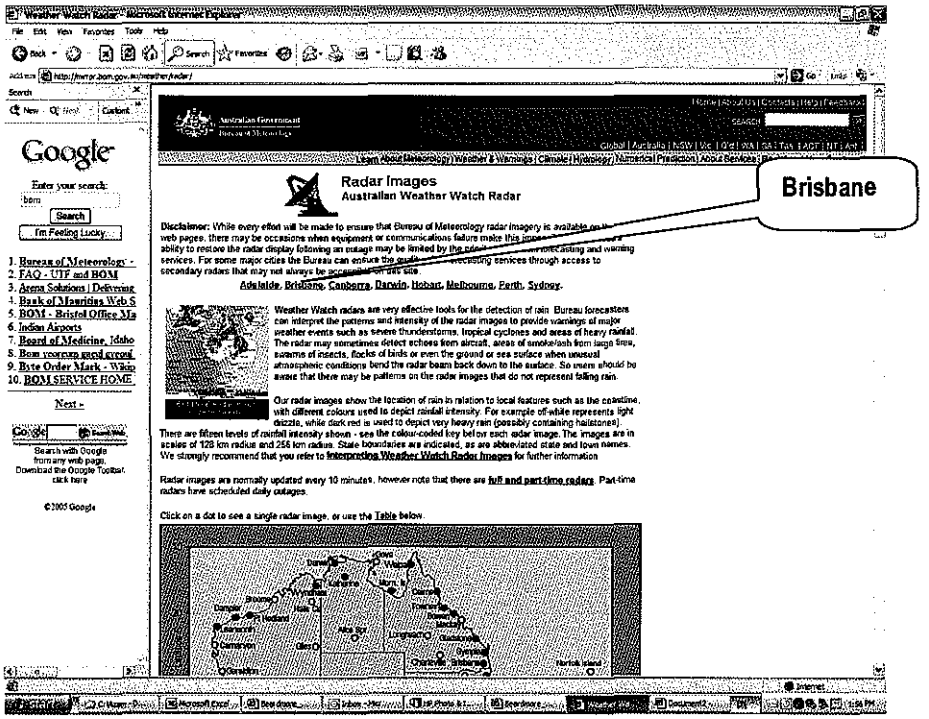

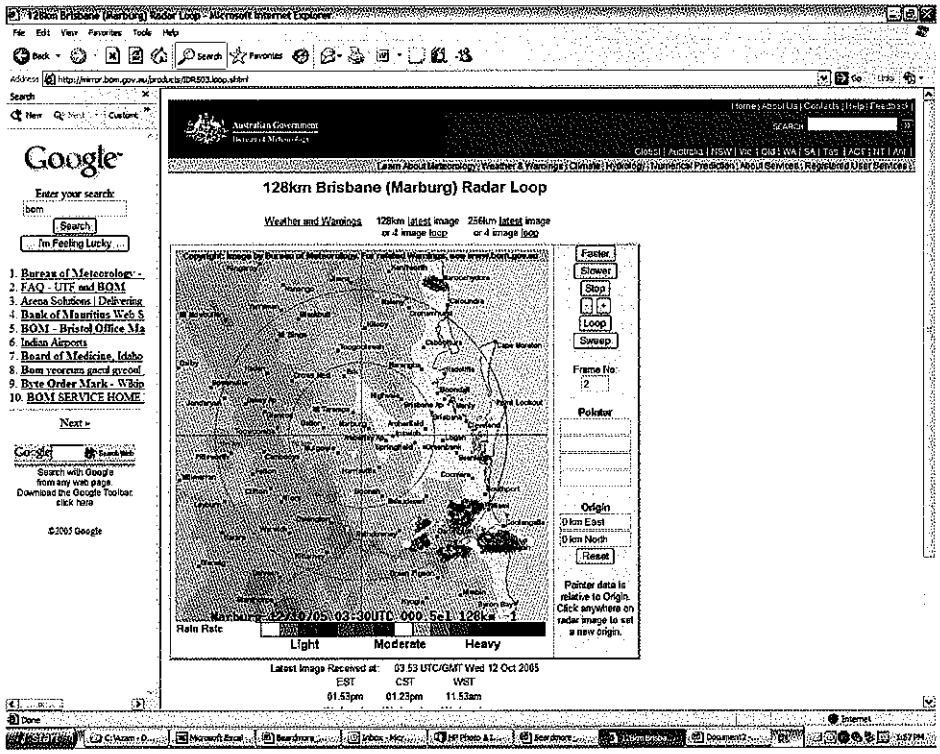
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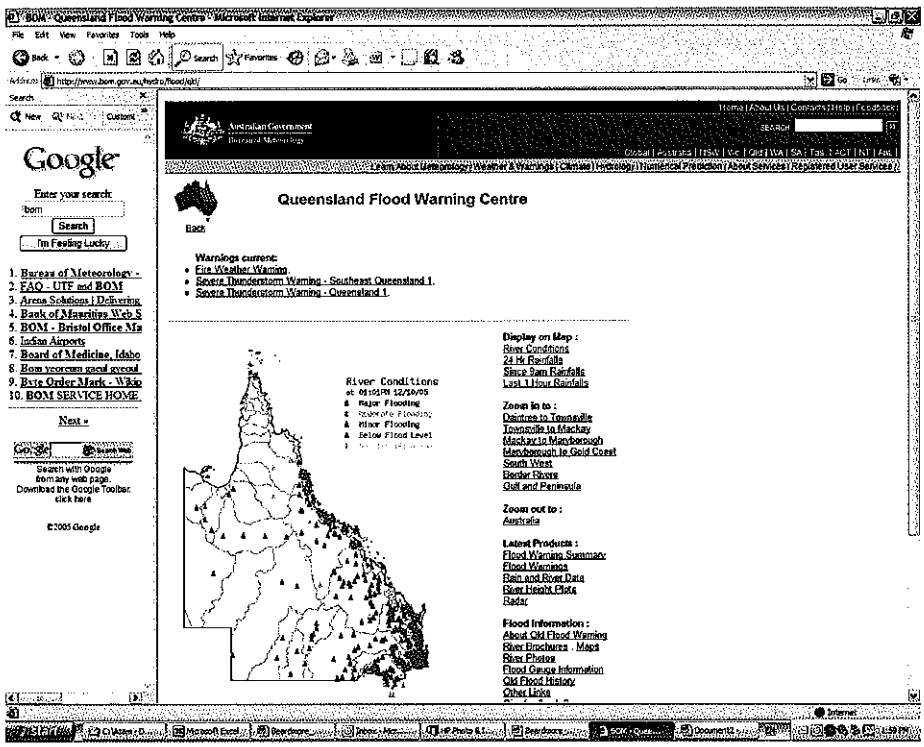
Weather and Warnings
Rain Rate
Light
Moderate
Heavy


Queensland Flood Warning Centre
Warnings current:
Fire Weather Warning
Severe Thunderstorm Warning - Southeast Queensland 1
Severe Thunderstorm Warning - Queensland 1
River Conditions
Display on Map :
Zoom in to :
Zoom out to :
Latest Products :
Flood Information :

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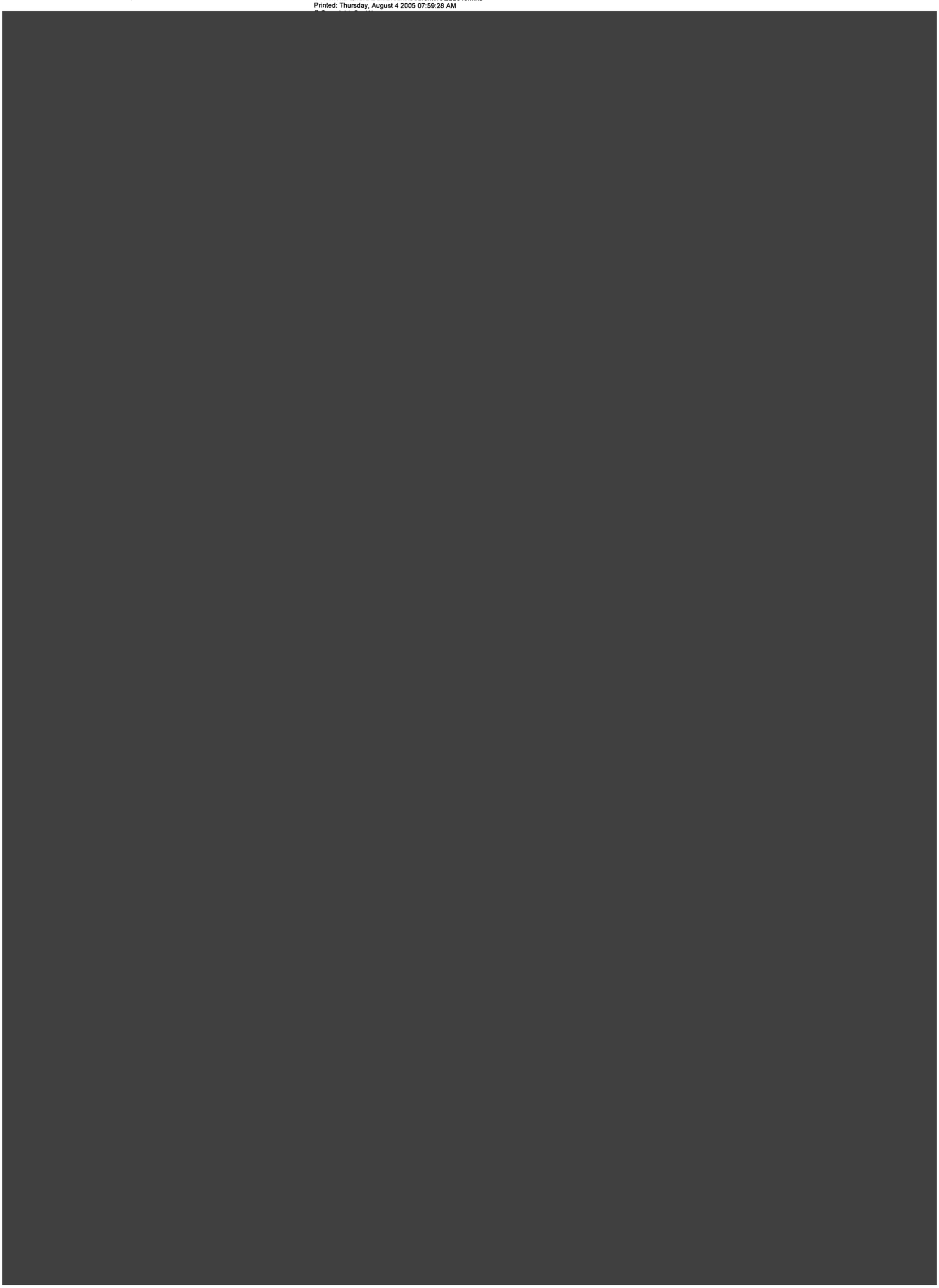

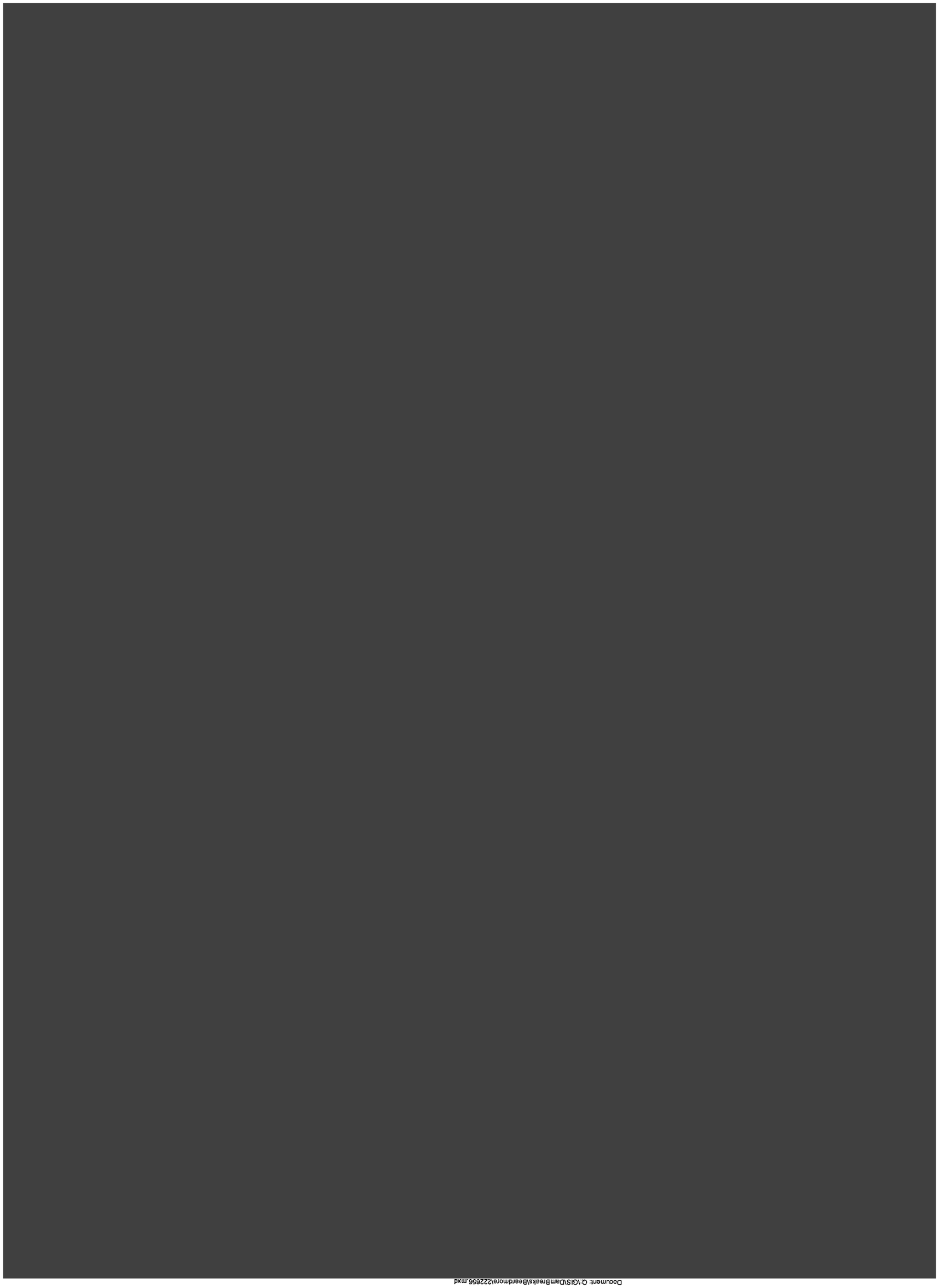

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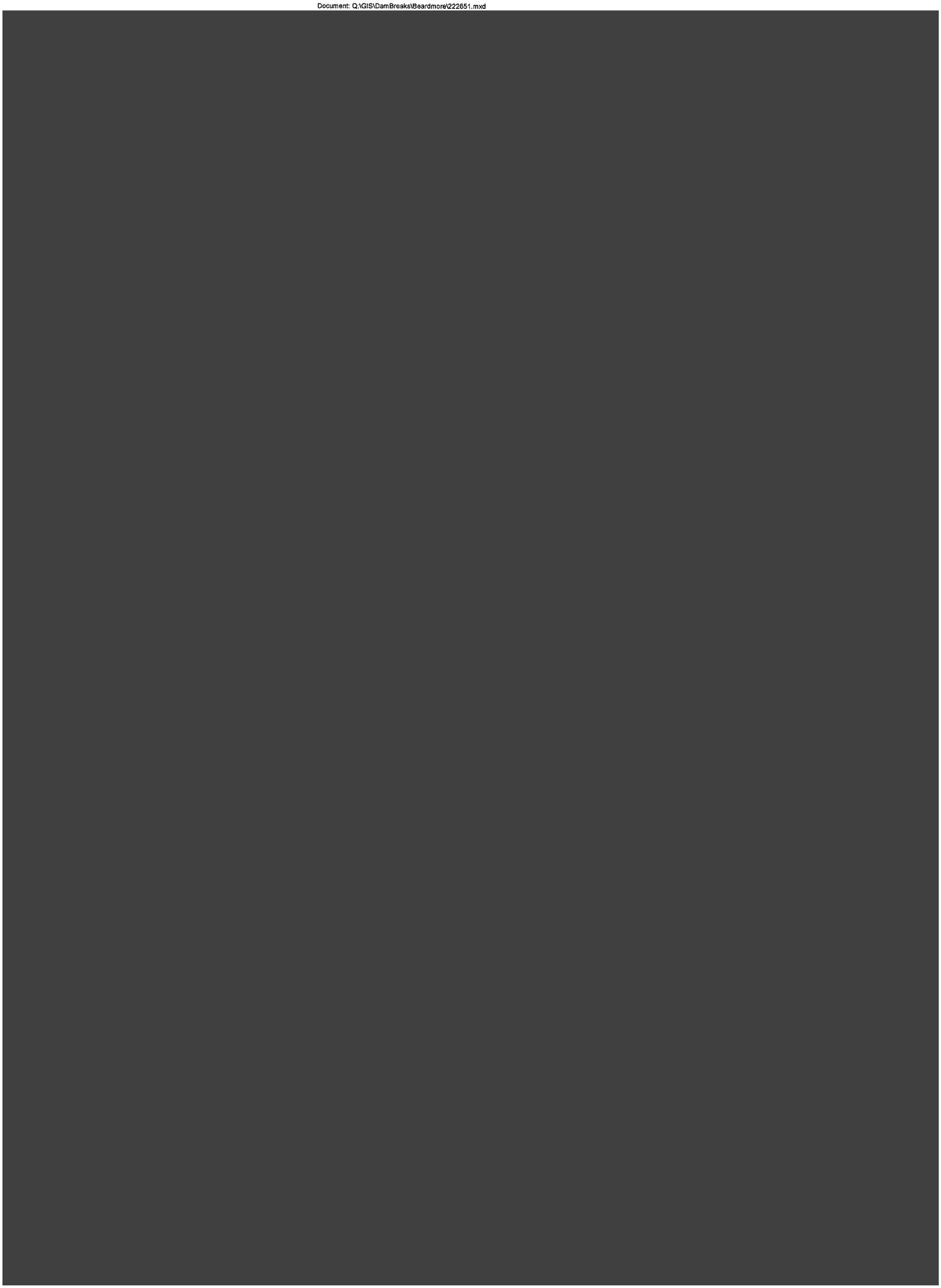

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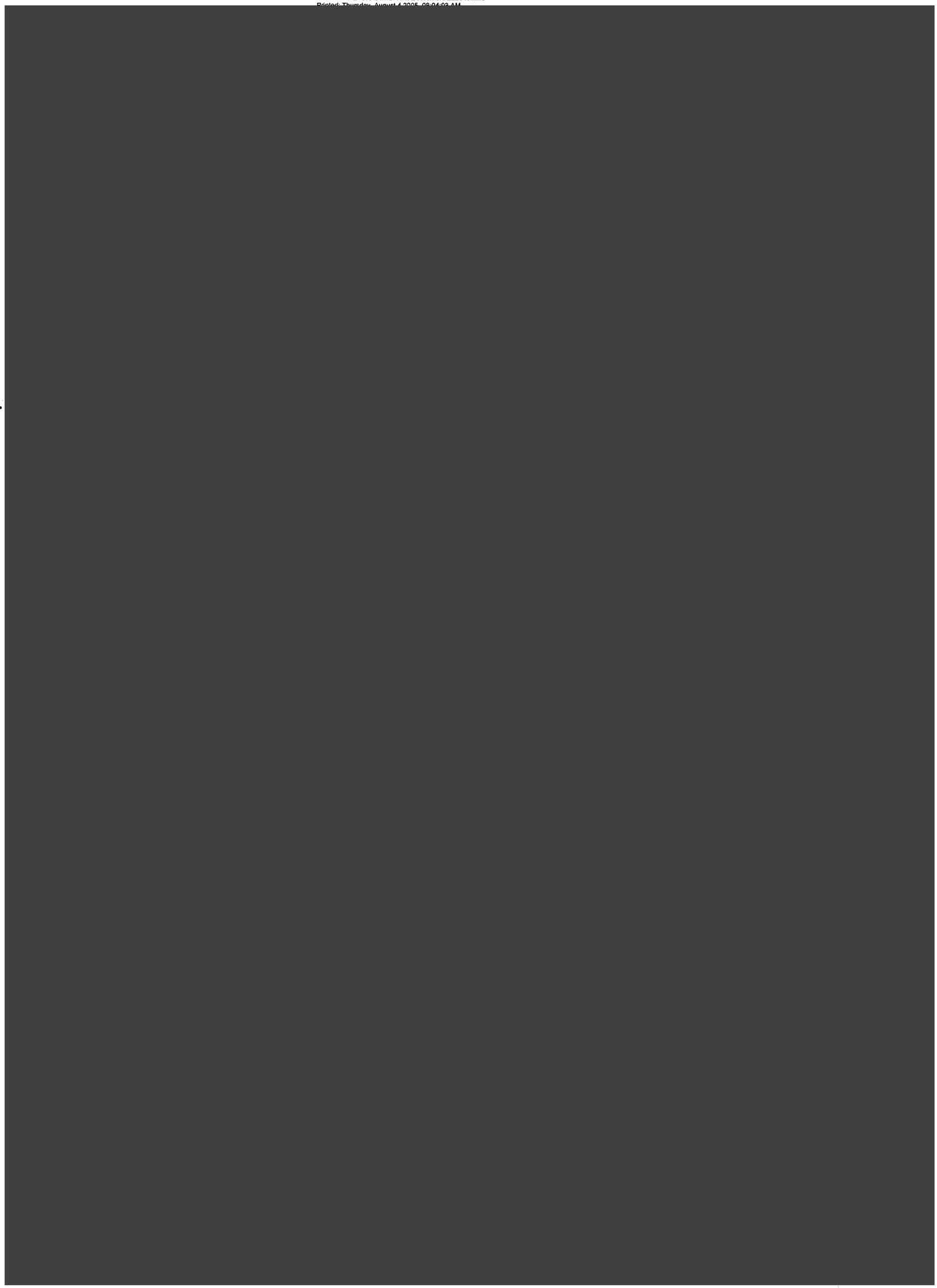

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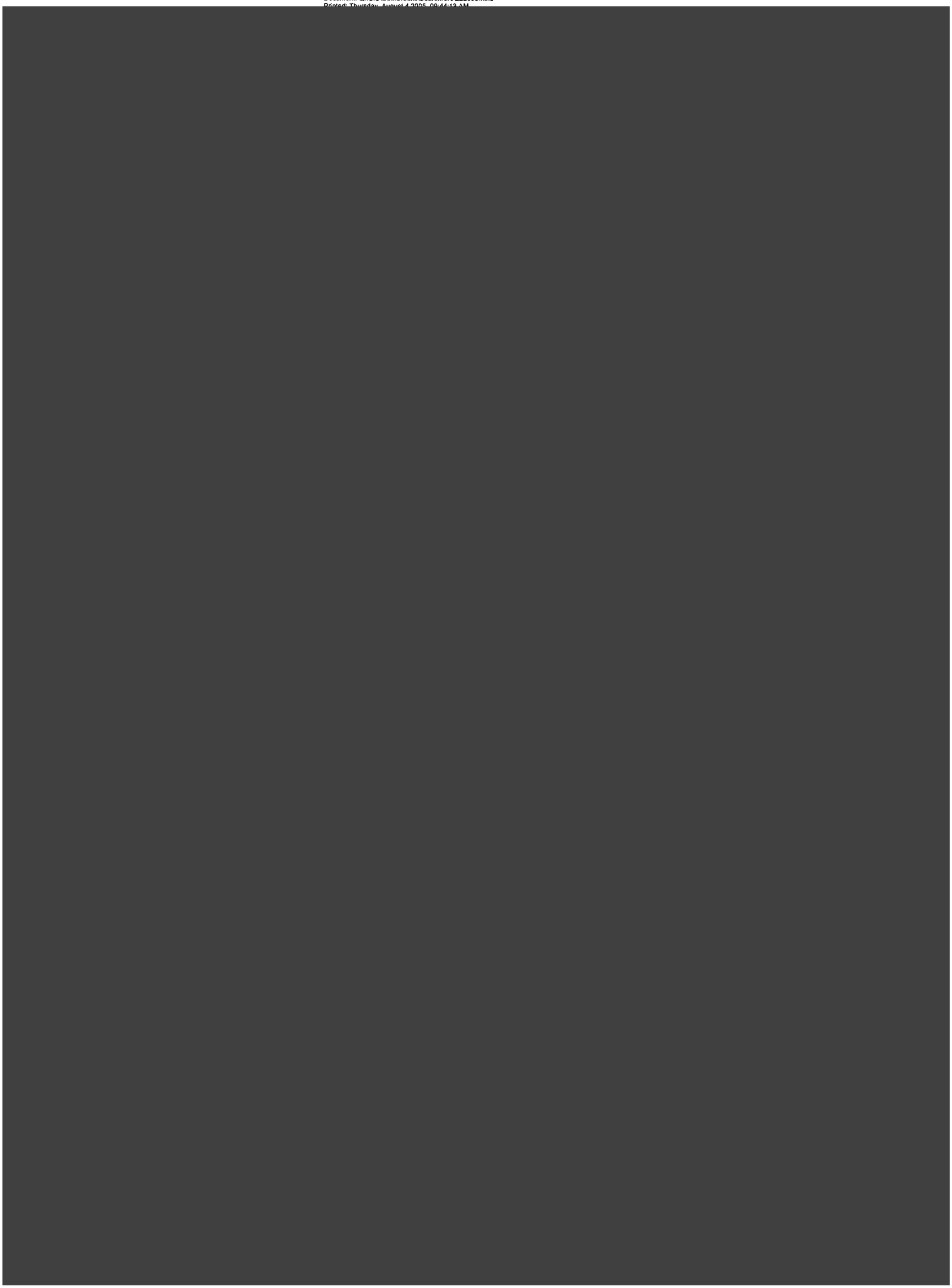


SECTION 10

Definitions & Analysis

- Incident, Emergency Response, Crisis and Business Continuity Management Manual
- Flood Event Definitions and Abbreviations
- Earthquake Assessment (Modified Mercalli Scale)
- Queensland Disaster Management System
- Weather Information (Flood Warning)

INCIDENT, EMERGENCY RESPONSE, CRISIS AND BUSINESS CONTINUITY MANAGEMENT MANUAL

PURPOSE

The purpose of the Manual is to provide a description of the framework that SunWater applies in managing various levels of incidents, from locally managed incidents through to emergency, crisis and business continuity management. It includes:

- definitions for the terminology used in incident management
- a description of the documentation for the different levels of an Incident / Emergency / Crisis
- a roadmap of the different levels of incident within SunWater and how they are to be managed, including a description of the escalation process when an Emergency worsens to become a Crisis
- a description of the phases of management of the different levels of incident, and how these may interrelate.

The Incident/Near Miss Management Plan (IMP), Emergency Management Plan (EMP), Crisis Management Plan (CMP) and Business Continuity Plan (BCP) must be read in conjunction with the Manual.

FLOOD EVENT DEFINITIONS AND ABBREVIATIONS

FLOODING EVENT DEFINITIONS

- **"DCF"** or
  "Dam Crest Flood" (Formerly IFF or Impending Failure Flood)
  The flood Event which when routed through the Reservoir just threatens failure of the Dam. The Reservoir is assumed to be initially at Full Storage Level
- **"PMF"** or
  "Probable Maximum Flood"
  The flood resulting from the Probable Maximum Precipitation, coupled with the worst flood producing catchment conditions that can be realistically expected in the prevailing meteorological conditions
- **"PMP"** or
  "Probable Maximum Precipitation"
  The theoretical greatest depth of precipitation for a given duration that is physically possible over a particular drainage system.
- **"SUNNY DAY BREAK"**
  Unexpected failure of a dam not associated with flooding or natural disaster.

State of Emergency

As defined by the State Emergency and Rescue Management Act (1989)
OR As defined by the Dams Safety Act (1978)

ABBREVIATIONS

ANCOLD	Australian National Committee on Large Dams
DEMO	District Emergency Management Officer
DEOCON	District Emergency Operations Controller
DFL	Design Flood Level
DLWC	Department of Land and Water Conservation, NSW
DSU	Dam Safety Unit, Department of Land & Water Conservation, NSW
FSL	Full Supply Level
IFF	Imminent Failure Flood
LEOCON	Local Emergency Operations Controller
MDBC	Murray Darling Basin Commission
MLD	Megalitres per Day
MRMW	Manager, River Murray Works
OIC	Officer-In-Charge, Hume Dam
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
SES	State Emergency Service
UHF	Ultra High Frequency
VHF	Very High Frequency

THE MODIFIED MERCALLI SCALE

MM 1 Not felt by humans, except in especially favourable circumstances, but birds and animals may be disturbed.
Reported mainly from the upper floors of buildings more than 10 storeys high.
Dizziness or nausea may be experienced.
Branches of trees, chandeliers, doors and other suspended systems of long natural period may be seen to move slowly.
Water in ponds, lakes reservoirs, etc. may be set into seiche oscillation.

MM 2 Felt by a few persons at rest indoors, especially by those on upper floors or otherwise favourably placed.
The long-period effects listed under MM 1 may be more noticeable.

MM 3 Felt indoors, but not identified as an earthquake by everyone.
Vibration may be likened to passing of light traffic.
It may be possible to estimate the duration, but not the direction.
Hanging objects may swing slightly.
Standing motorcars may rock slightly.

MM 4 **Generally noticed indoors, but not outside.**
Very light sleepers may be wakened.
Vibration may be likened to the passing of heavy traffic, or to the jolt of a heavy object falling or striking the building.
Walls and frame of buildings are heard to creak.
Doors and windows rattle.
Glassware and crockery rattles.
Liquids in open vessels may be slightly disturbed.
Standing motorcars may rock, and the shock can be felt by their occupants.

MM 5 **Generally felt outside, and by almost everyone indoors.**
Most sleepers awakened. A few people frightened.
Direction of motion can be estimated.
Small unstable objects are displaced or upset.
Some glassware and crockery may be broken. Some windows cracked.
A few earthenware toilet fixtures cracked.
Hanging pictures move. Doors and shutters swing.
Pendulum clocks stop, start, or change rate.

MM 6 **Felt by all.**
People and animals alarmed.
Many run outside.
Difficulty experienced in walking steadily.
Some plaster cracks or falls. Isolated cases of chimney damage.
Windows, glassware, and crockery broken.
Objects fall from shelves, and pictures from walls.
Heavy furniture moved. Unstable furniture overturned.
Small church and school bells ring.
Trees and bushes shake, or are heard to rustle.
Loose material may dislodge from existing slips, talus slopes, or shingle slides.

MM 7 **General alarm.**

Difficulty experienced in standing.
Noticed by drivers of motorcars.
Trees and bushes strongly shaken. Large bells ring.
A few instances of damage to Masonry.
Loose brickwork and tiles dislodged.
Unbraced parapets and architectural ornaments may fall.
Stone walls cracked. Weak chimneys broken, usually at the roof-line.
Domestic water tanks burst.
Concrete irrigation ditches damaged.
Waves seen on ponds and lakes.
Water made turbid by stirred-up mud.
Small slips, and caving-in of sand and gravel banks.

MM 8 **Alarm may approach panic.**
Steering of motorcars affected.
Masonry damaged, with partial collapse.
Chimneys, factory stacks, monuments, towers, and elevated tanks twisted or brought down.
Panel walls thrown out of frame structures.
Some brick veneers damaged.
Decayed wooden piles broken.
Frame houses not secured to the foundation may move.
Cracks appear on steep slopes and in wet ground.
Landslips in roadside cuttings and unsupported excavations.
Some branches may be broken off.
Changes in the flow or temperature of springs and wells may occur.
Small earthquake fountains.

MM 9 **General Panic.**
Masonry heavily damaged, sometimes collapsing completely.
Frame structures racked and distorted.
Damage to foundations general.
Frame houses not secured to the foundations shifted off.
Brick veneers fall and expose frames.
Cracking of the ground conspicuous.
Minor damage to paths and roadways.
Sand and mud ejected in alluviated areas, with the formation of earthquake fountains and sand craters.
Underground pipes broken.
Serious damage to reservoirs.

MM 10 **Most masonry structures destroyed, together with their foundations.**
Some well built wooden buildings and bridges seriously damaged.
Dams, dykes and embankments seriously damaged.
Railway lines slightly bent.
Concrete and asphalt roads and pavements badly cracked or thrown into waves.
Large landslides on river banks and steep coasts.
Sand and mud on beaches and flat land moved horizontally.
Large and spectacular sand and mud fountains.
Water from rivers, lakes, and canals thrown up on the banks.

Earthquake Effects

Earthquake Intensity

The effects of earthquake waves at a particular point is assigned using an intensity scale. This is an arbitrary scale based on observations of phenomena such as:

- the type and extent of damage,
- whether sleeping people were woken,
- whether items fell from shelves,
- whether the event was felt or heard.

The most common intensity scale used in Australia is the 12-point Modified Mercalli (MMI) scale. On this scale, intensities up to 5 are felt but cause no damage, while intensities from 6 to 12 cause increasing amounts of damage.

Modified Mercalli Intensity (MMI) Scale	
1	Not felt. Recorded by seismographs.
2	Rarely felt, usually only on top floors of high buildings.
3	Felt indoors, like a passing light truck.
4	Windows, dishes, doors rattle. Like passing train.
5	Felt by all. Small objects upset.
6	Books off shelves. Trees shake. Isolated damage.
7	Difficult to stand. Many poor buildings damaged.
8	Significant damage. Branches broken from trees.
9	General panic. Serious damage. Ground cracking.
10	Most buildings destroyed. Rails bent slightly.
11	Rails bent greatly. Pipelines destroyed.
12	Near total damage. Objects thrown into the air.

Other intensity scales have been defined; the RF (Rossi-Forel) scale was introduced in the late 19th century, the JMA (Japan Meteorological Agency) scale is used in Japan and Taiwan; and the MSK and the more recent EMS (European Macroseismic Scale) are used in Europe. Most of these scales have twelve degrees of intensity which can be roughly (but not exactly) correlated between scales.

While all intensity scales are semi-qualitative they can be most useful for assessing historic earthquakes for which no seismic records exist.

Intensity Variability

An earthquake has a single magnitude, but intensity varies with distance. Maximum intensity normally occurs near the earthquake epicentre, with intensity values generally decreasing with distance.

Many factors affect surface ground motion, including topography and near-surface geology, especially soft surface sediments. These variations can be considerable, even over short distances. It is common to find intensities ranging by ±1 unit in a neighbourhood, and not unusual to find values ±2 or more.

The Queensland Disaster Management System

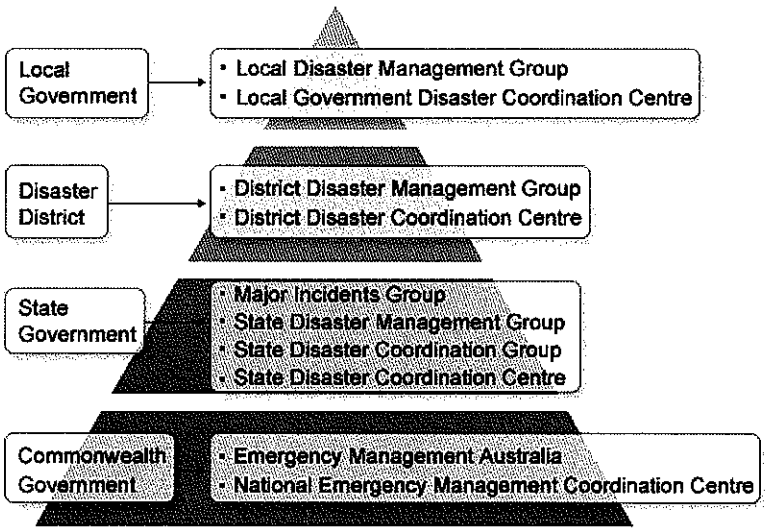
The Queensland Disaster Management System operates on three distinct levels. These are:

- Local Government
- Disaster District
- State Government

A fourth level, The Commonwealth, is also included in our Disaster Management System recognising that Queensland may need to seek Commonwealth support in times of disaster.

Each of these levels within the State Disaster Management System has as its basis a committee structure supported by a disaster coordination centre. These committees and coordination centres are activated when required to manage and coordinate support for disaster stricken communities. When not activated, these committees meet to prepare for and practice their role within the Disaster Management System.

Figure 1 depicts the Queensland Disaster Management System including the link to the Commonwealth for National-level support when required.



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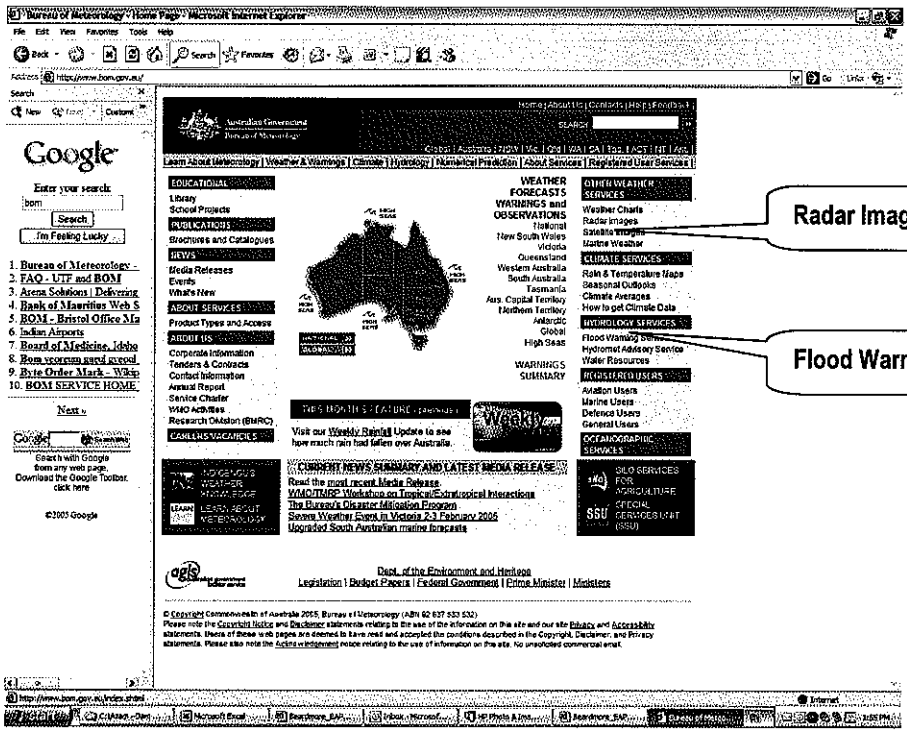

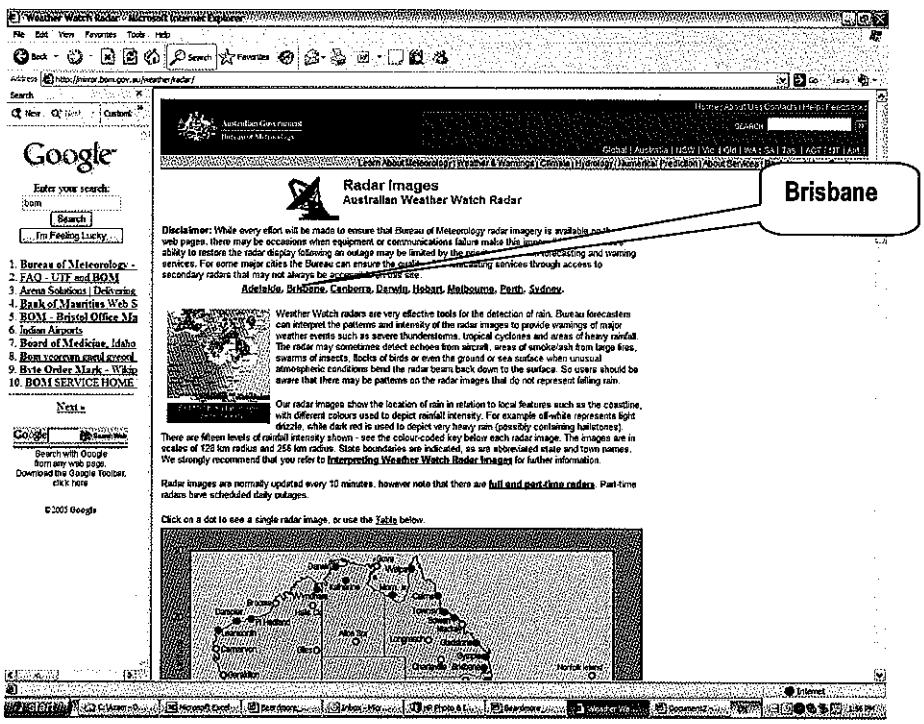

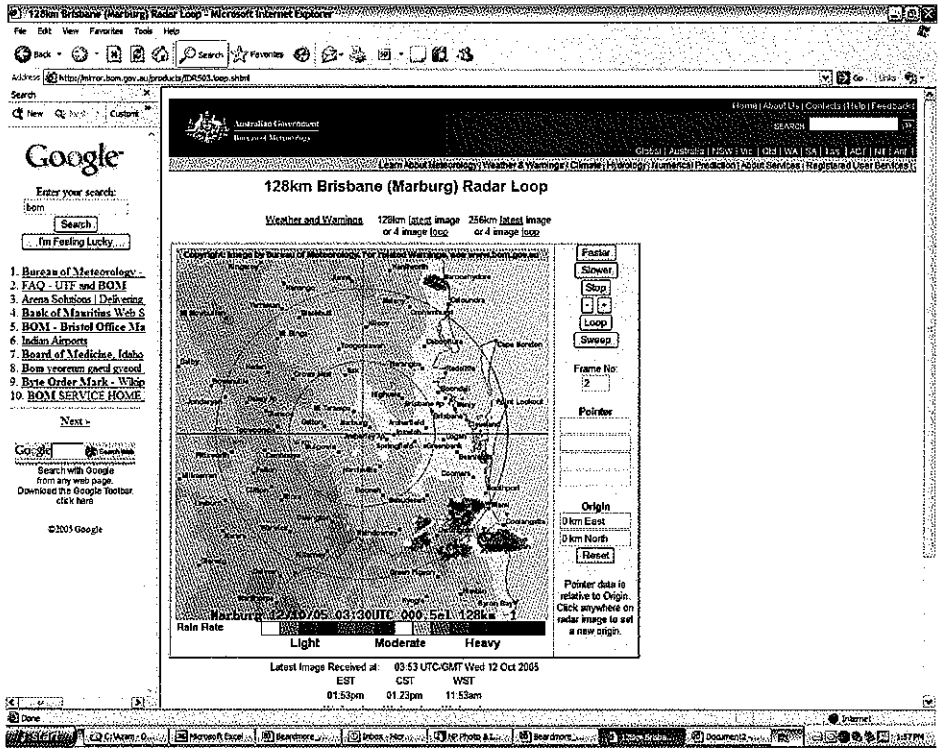
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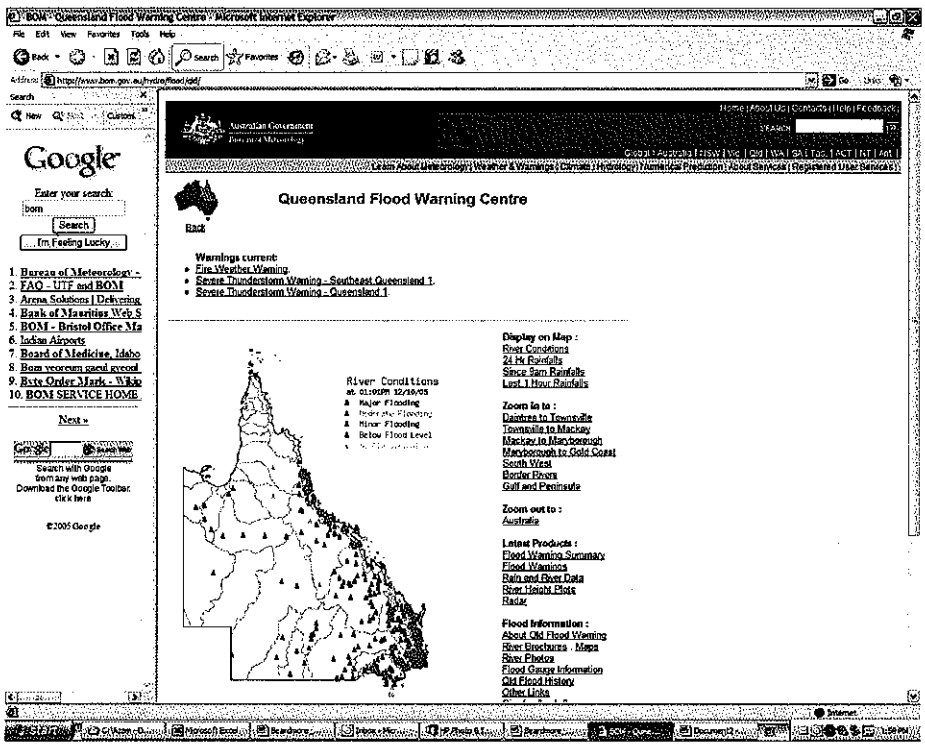
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