SECTION 1

QFCI

JM

Date: 27/05/11

Exhibit Number: 513

TABLE OF CONTENTS

CONTROLLED COPY DISTRIBUTION

Copy Number	Position	Location
1	Storage Supervisor, Fairbairn Dam	SunWater – Fairbairn Dam
2	Service Manager/ EEC	SunWater – Emerald Depot
3	Area Operations Manager	SunWater - Area Operations Centre – North (Eton)
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 – Local Disaster Management Group	Central Highlands Regional Council - Emerald
7	Coordinator – Disaster Management Local Disaster Management Group	Central Highlands Regional Council - Emerald
8	Duty Officer - Police	Police, Emerald
9	District Disaster Coordinator (Rockhampton)	Police, Rockhampton
10	Regional Director Emergency Management Queensland	Department of Community Safety, Rockhampton
11	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: **Date:** November 2010

(Manager, Asset Management, Water Services)

ISSUE 2 of this EAP was prepared by Dam Safety Unit, Water Services, Brisbane.

REVISION STATUS:

Issue-Revision Number	Revision Description	Section	Revision Date
Issue 2-0	Substantial review of Fairbairn Dam Emergency Action Plan to reflect SunWater Management Structure and updated inundation maps.		JANUARY 2008

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 / SUGGESTIONS:

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

SECTION 2

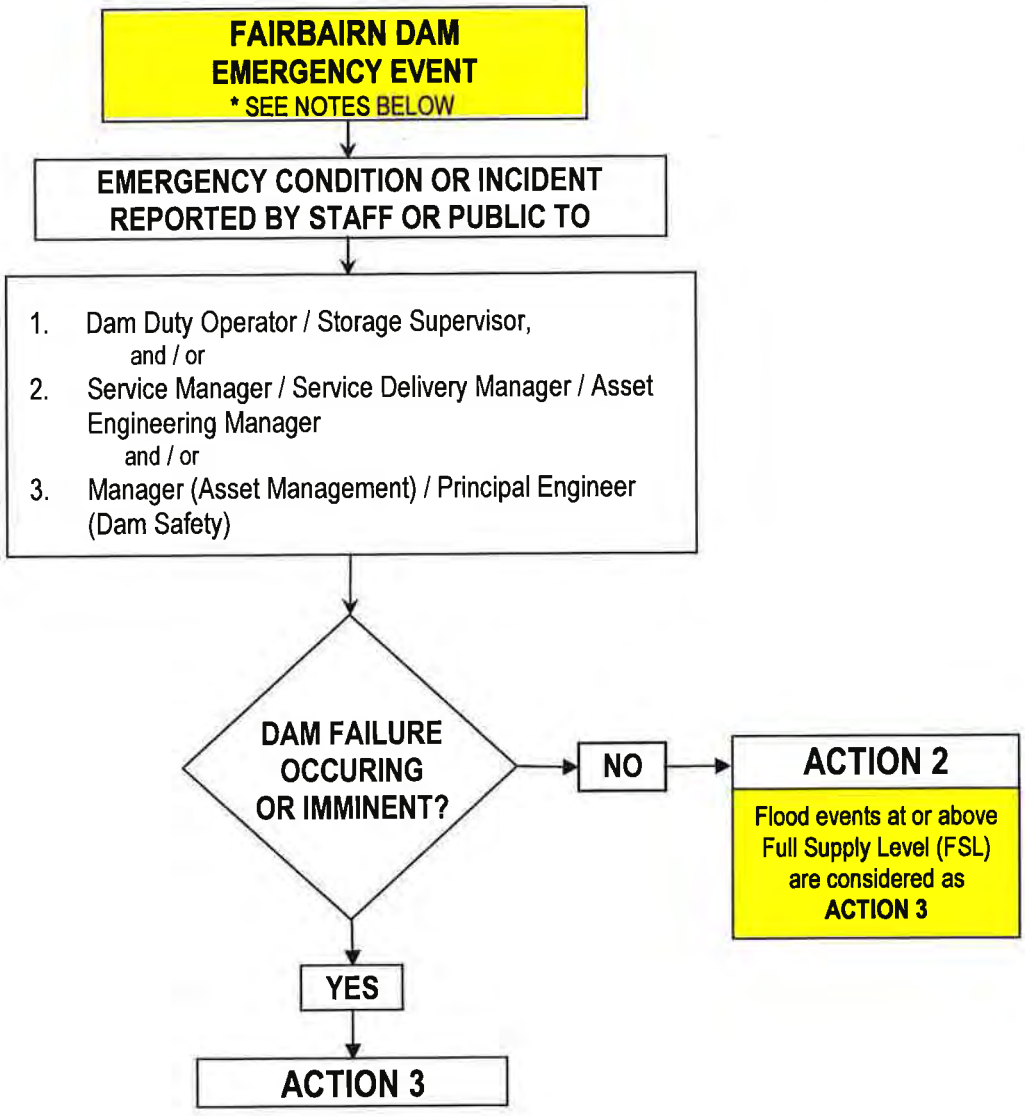
EMERGENCY EVALUATION PROCEDURES

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

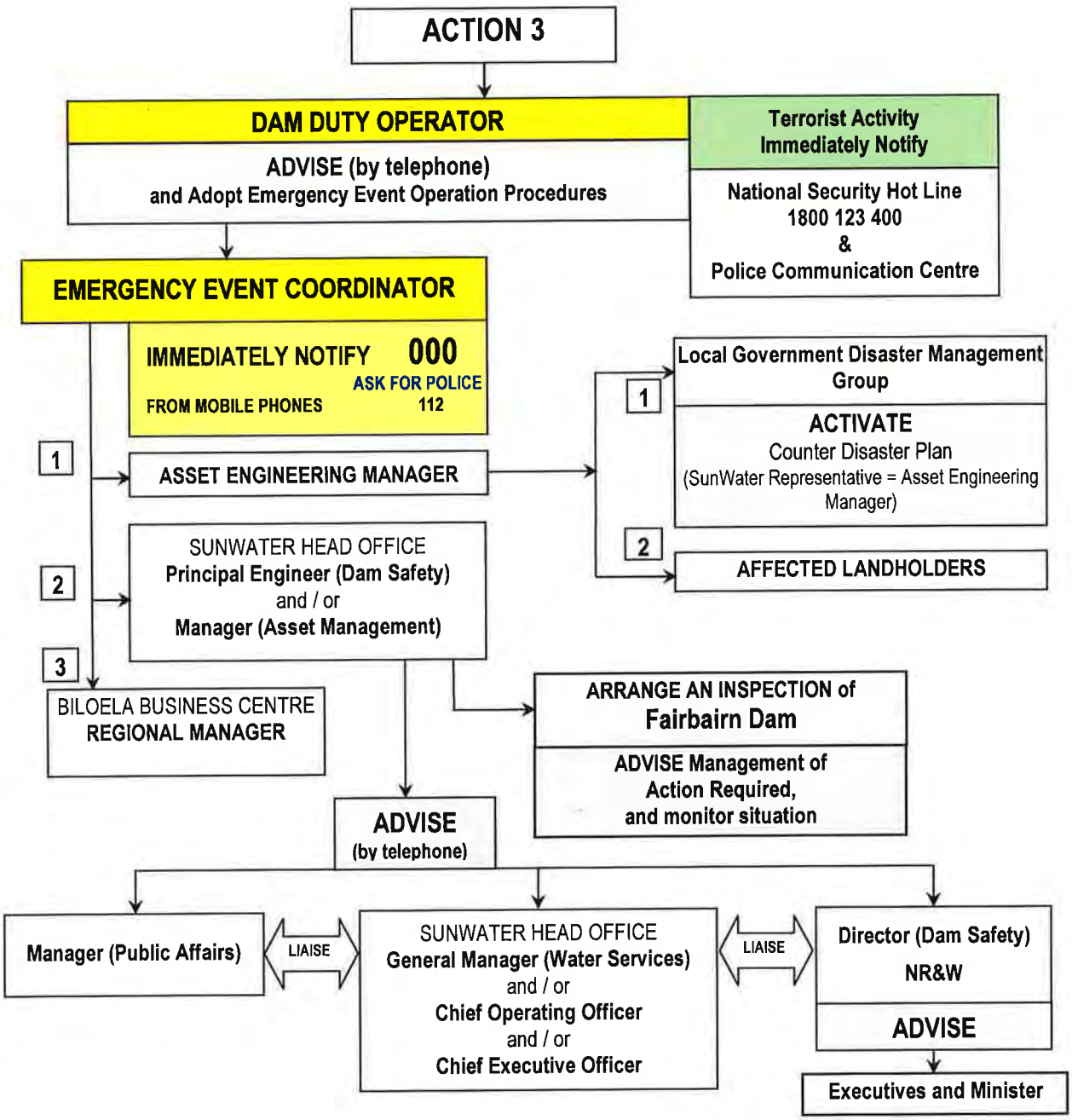


NOTES

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.**

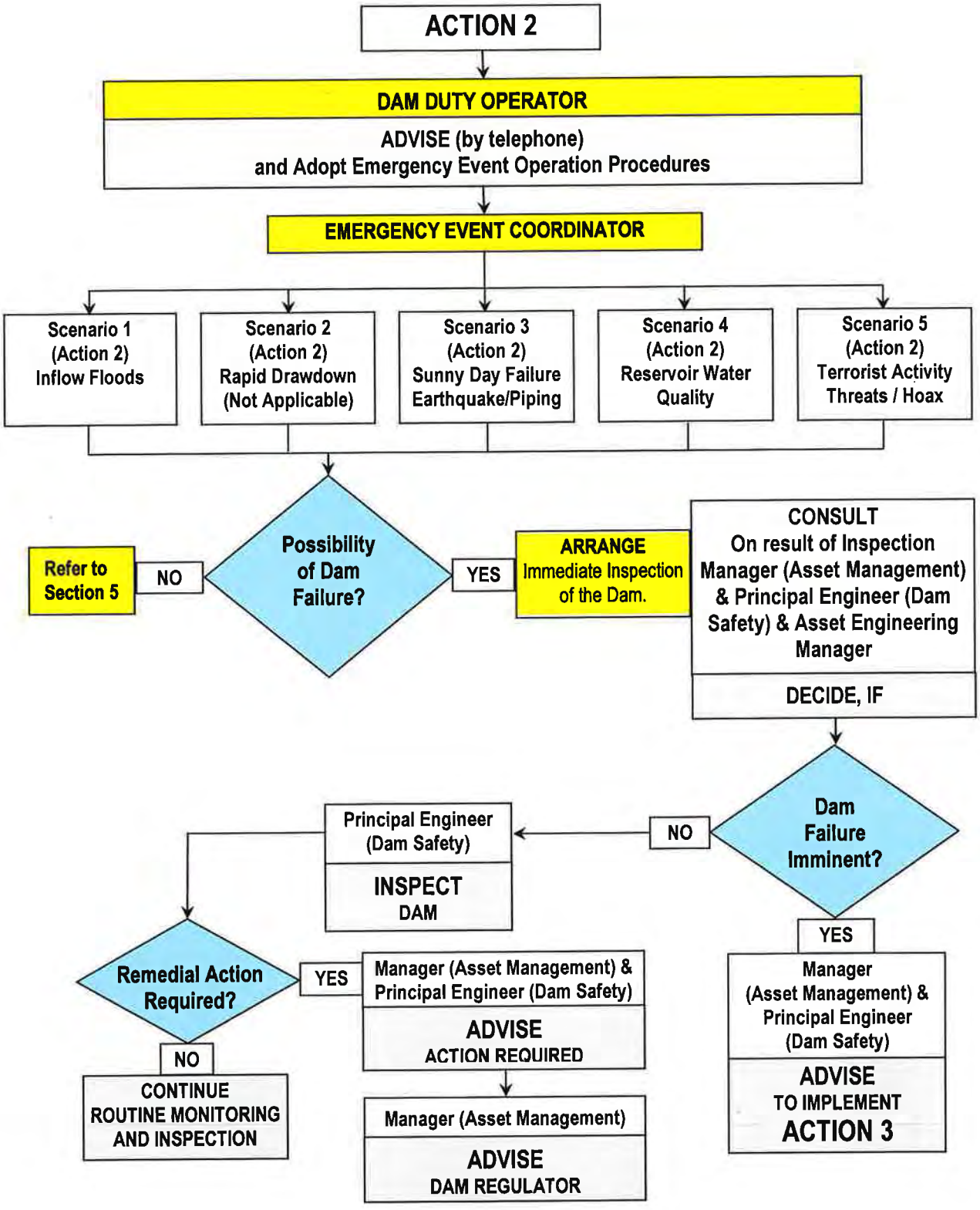
EMERGENCY EVALUATION PROCEDURE

FIGURE 2



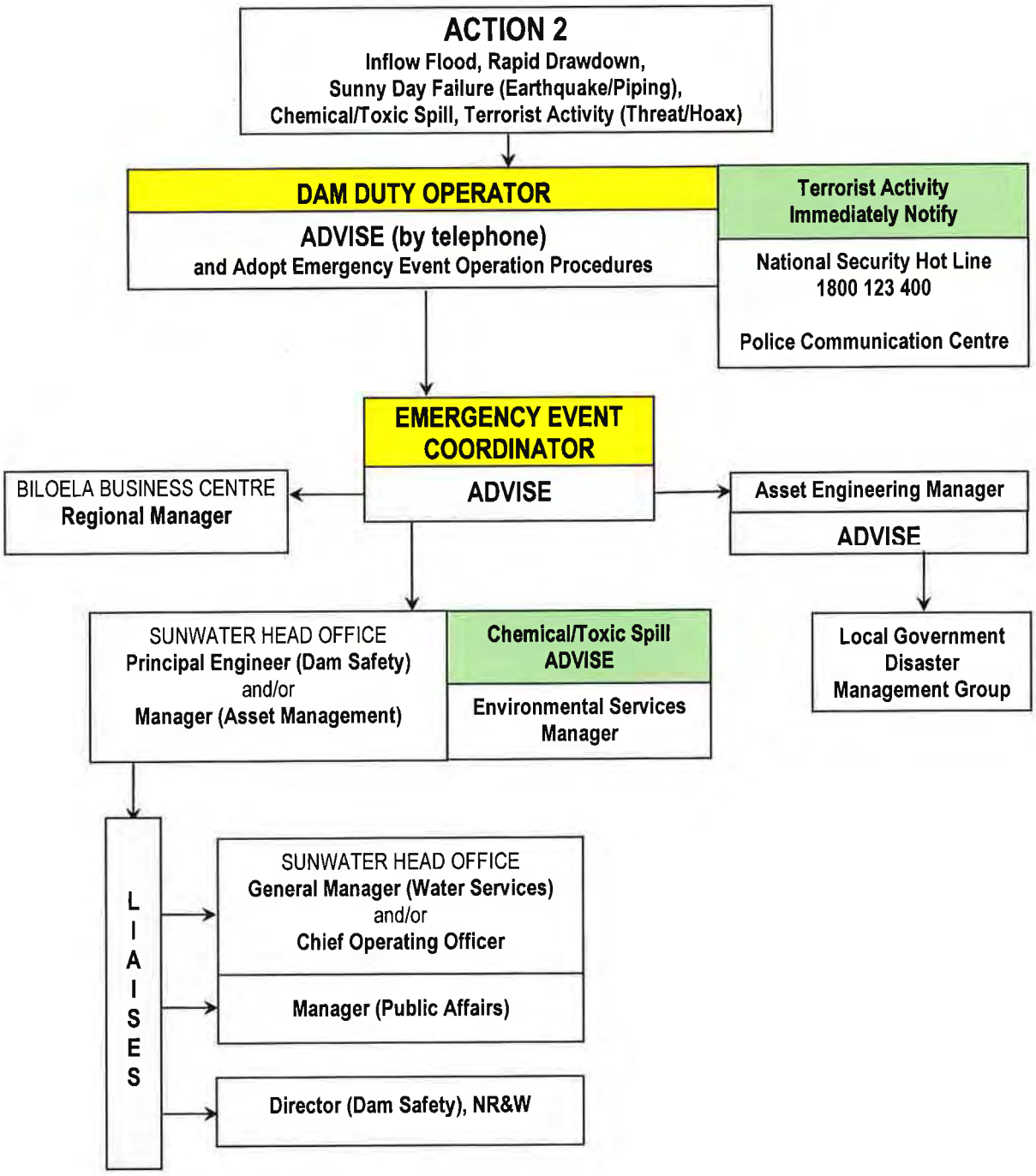
EMERGENCY EVALUATION PROCEDURE

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

(# 593459 in HB File 08-000388/001)

AUTHORISATION:

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

AMENDMENT STATUS:

Amendment Number	Description	Amendment Date
	Issue 2	June 2008
2	Update Telephone & Radio Notification List	November 2009
2A	Update Telephone & Radio Notification List	November 2010

TELEPHONE & RADIO NOTIFICATION LIST

Central Office Management (Brisbane)					
TITLE/NAME	**Phone Business**	**Phone Mobile**	**Phone A/H**	**Fax**	**Controlled Copy Holder Addresses**
Chief Executive Officer [redacted]					
Manager, Asset Management [redacted] 4					[redacted]
Principal Engineer Dam Safety [redacted]					
Corporate Relations Manager [redacted]					
Media Advisor (Glenn Pfluger)					
A/Environmental Manager [redacted]					
Flood Operations Centre Duty Engineer/Senior Engineer					
Senior Engineer Headworks [redacted]					
Chief Civil Engineer [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 – North (Eton) and Emerald Depot					
TITLE/NAME	**Phone Business**	**Phone Mobile**	**Phone A/H**	**Fax**	**Controlled Copy Holder Addresses**
Area Operations Manager [redacted] **3**					
Service Manager Emerald **2**					
Emergency Event Coordinator (EEC)					
Operations Supervisor-Emerald					
Civil Supervisor –Emerald					
Storage Operator – Fairbairn Dam **1**					
Standby Storage Operator - Fairbairn Dam					

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

Counter Disaster Groups					
TITLE/NAME	**Phone Business**	**Phone Mobile**	**Phone A/H**	**Fax**	**Controlled Copy Holder Addresses**
Disaster management group chairman - Central Highlands regional Council. [redacted] **6**	[redacted]				[redacted]
Coordinator – Disaster Management Central Highlands Regional Council [redacted] **7**					
Emergency Management Queensland State Disaster Management Group **11**					
Regional Director Emergency Management Queensland (Duty Officer) **10**					
Chemical Hazards Local Fire Brigade Unit					
Police					
Police Communication Centre – [redacted] (24 hrs)					
District Disaster Coordinator (Rockhampton) **9**	[redacted]				[redacted]
Emerald Police **8**					
State Emergency service Emerald					
State Emergency Service Blackwater					

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

Department of Environment and Resource Management (DERM)					
TITLE/NAME	**Phone Business**	**Phone Mobile**	**Phone A/H**	**Fax**	**Controlled Copy Holder Addresses**
Director Dam Safety (Water Supply) - DERM, (Peter Allen) **5**	[redacted]	-	[redacted]	-	[redacted]
Principal Engineer Dam Safety,(Ron Guppy)		-		-	
National Security Hotline – [redacted]					
Stream Gauging Stations					
Headwater (Storage)Level Recorder	No Phone Connection (Computer Link only)	-	-	-	SunWater Station-
Craigmore	No Phone Connection (Computer Link only)	-	-	-	SunWater Station-
Theresa Ck	No Phone Connection (Computer Link only)	-	-	-	SunWater Station-
		-	-	-	
2 Way Radio					
[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

Affected Property Owners – Weemah Side					
TITLE/NAME	Phone Business	Mobile Phone	Home Phone	Fax	Address Lot/Plan
[redacted]		[redacted]	[redacted]		[redacted]

Affected Property Owners – Selma Side					
TITLE/NAME	Phone Business	Mobile Phone	Home Phone	Fax	Address Lot/Plan
[redacted]		[redacted]	[redacted]		[redacted]

Affected Property Owners – Selma Side - Continued					
TITLE/NAME	Phone Business	Mobile Phone	Home Phone	Fax	Address Lot/Plan
[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** (Central Region – [redacted])

State Duty Officer – Brisbane: PHONE: [redacted]
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)

Tinaroo Falls Dam

Far Northern Region
Ph [redacted]

Julius Dam
Burdekin Falls Dam
* Ross River Dam

Northern Region
Ph [redacted]

Peter Faust Dam
Eungella Dam
Kinchant Dam
Teemburra Dam
Fairbairn Dam
Callide Dam
Kroombit Dam
Moura OSS

Central Region
Ph [redacted]

Beardmore Dam
Leslie Dam
Coolmunda Dam
* Glenlyon Dam

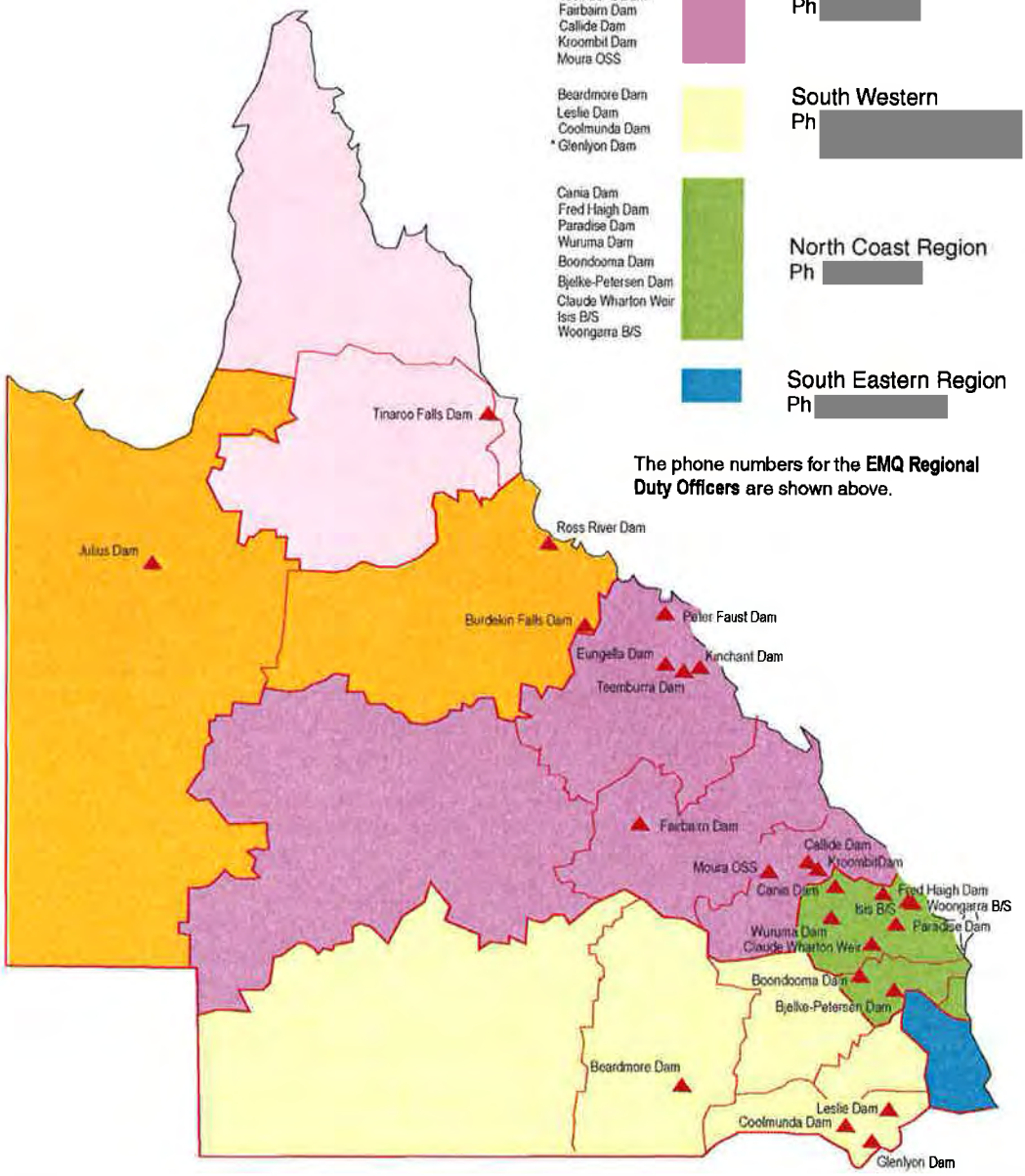
South Western
Ph [redacted]

Cania Dam
Fred Haigh Dam
Paradise Dam
Wuruma Dam
Boondooma Dam
Bjelke-Petersen Dam
Claude Wharton Weir
Isis B/S
Woongarra B/S

North Coast Region
Ph [redacted]

South Eastern Region
Ph [redacted]

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



LIST OF EQUIPMENT AVAILABLE DURING AN EMERGENCY

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 Fairbairn 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, Fairbairn 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 TSE.
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

4.4 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.

4.5 DAM DESCRIPTION SHEET

(Data obtained from *Dam Safety Review, September 1999*)

Main Dam

Type	Central Clay Core with Outer Rockfill Zones
Full Supply Level (FSL)[1]	EL 204.23 m AHD
Storage Capacity at FSL	1,301,133 ML
Storage Area at FSL	15,000 ha
Embankment Crest Level	218.86 m AHD
Height of Dam above Foundation	46.33 m (approx)
Length Across Crest	823 m

Spillway

Spillway Crest Level	EL 204.23 m AHD
Spillway Capacity at DCL	21,400 cumecs (through Spillway only)
Spillway Type	Chute with Uncontrolled Ogee Crest
Crest Length	163.07 m,(excl. width of bridge piers)

Outlet Works

Number of Outlets	2 (on either Side of Abutment)

Saddle Dams

Number of Saddle Dams	6
Saddle Dams Type	Homogeneous Earth Fill

[1]All levels are to Australian Height Datum, AHD. Conversion for Fairbairn Dam is AHD=(State Datum in feet x 0.3048)-0.293) 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 conditions, as soon as it begins to develop, or becomes apparent, the following is applicable to Fairbairn Dam.

5.1 Inspections

The following inspections are conducted at Fairbairn 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 Fairbairn Dam.

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 a chemical/toxic spill.
- Emergency Event due to a terrorist activity (threat/hoax).

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.

5.5.1 Flood Operation

All flood events, at or above Full Supply Level EL 204.23 m, will require the Dam Duty Operator to inform the Emergency Event Coordinator, who will further activate the following Emergency Evaluation Procedure **ACTION 2**

5.4.2 Imminent Dam Failure

At Fairbairn 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 Fairbairn Dam staff will immediately notify the Dam Duty Officer and/or Service Delivery Coordinator, Emerald, 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 Dam Duty Operator on advice from the Service Delivery Coordinator.

During flood events, the dam will be continuously manned and will be controlled from the Regional Centre, Biloela. The Dam Duty Operator will keep the Emergency Event Coordinator informed of discharge through the spillway. The Emergency Event Coordinator will then 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 204.23 m). In all other cases, follow the Operation and Maintenance Manual/s, and Standing Operating Procedures.

Water Level at Fairbairn Dam	AEP	Flood Alert Level Colour Code	Discharge volume (MLD)
Storage at Full Supply Level (EL 204.23 m and Rising)	-		
Storage above 204.23m and, approaching EL 206.67 m	-		Discharge 95,700 MLD
Storage above EL 206.67 m, approaching EL 207.4 m	-		Discharge = 147,000 MLD
Storage above EL 207.4 m, approaching EL 211 m	**1:50**		Discharge = 500,000 MLD
Storage above EL 211 m, approaching EL 217.83 m	**PMF**		Discharge = 1,496,448 MLD

Scenario 1: Flood Operation [STAGE 1]

Stages		ACTION TO BE TAKEN BY Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
STAGE 1 **Storage level at EL 204.23 m and Rising Slowly** (General heavy rainfall and/or storms over the catchment)	**FOR RECORD: Use Sheets from Section 6 and 6A**	• Record all events and communication • Monitor and record the rainfall - daily • Monitor storage level - 12 hourly • Log book entries as per SOP 12 & 22 • See note # below	• Record all communication • Monitor catchment inflow advisory network daily or as required and advise the Dam Duty Operator of upstream river flows • Notify the Flood Warning Centre, Brisbane of rainfall at dam and the storage height daily or as required • See note # below	• Customer Council members of Nogoa Mackenzie water supply scheme • Advice the Dam Duty Operator of any inflow flood information obtained from the Bureau of Meteorology (Section 10, Page 7) *www.bom.gov.au	**ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)**
		Contact local Radio Stations 4HI and ABC radio for spillway discharge warning to the irrigators			
		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 • Principal Engineer, Dam Safety	**Notify as often as requested**	

After the Event an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator and forward unedited copies to the Service Delivery Manager Biloela and the 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 1: Flood Operation [STAGE 2]

Stages		ACTION TO BE TAKEN BY Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	TO	DO	SO
STAGE 2 Water Level is above EL 204.23 m and approaching EL 206.67 m Spillway Flow up to 95,700 MLD	FOR RECORD: Use Sheets from Section 6 and 6A	• Record all events and communication • Monitor Fairbairn Dam Gauging Station - 12 hourly • Photograph spillway at downstream face - regularly • Monitor and record the rainfall - daily • Monitor storage level - 12 hourly • Plot Storage Level vs. Time graph - twice a day • Log book entries as per SOP 12 & 22 • See note # below	• Record all communication • Monitor catchment inflow advisory network daily or as required and Advise the Dam Duty Operator of upstream river flows. • Notify the Flood Warning Centre, Brisbane of rainfall at dam and the storage height daily or as required • Fax the sheet 'Flood Operation' 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. (Section 10, Page 7) *www.bom.gov.au • Record all communication • Inform spillway discharge to all personnel listed in the table below.			
		At storage level EL 206.2m AHD, access problems with St Helens Creek and LN3 Bridge on Selma Road and Old Nogoa River Bridge at Emerald					
		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 • Regional Manager • Principal Engineer, Dam Safety	**Notify as often as requested** • Counter Disaster Executive Officer, Emerald Shire • Police - Emerald Shire			•

After the Event an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator and forward unedited copies to the Service Delivery Manager Biloela and the 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 1: Flood Operation [STAGE 3]

Stages	ACTION TO BE TAKEN BY			
		Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)
STAGE 3 Water Level is above **EL 206.67 m** and approaching **EL 207.4 m** Spillway Flow up to 147,000 MLD	FOR RECORD: Use Sheets from Section 6 and 6A	• Record all events and communication • Monitor Fairbairn Dam Gauging Station - 12 hourly • Monitor flow at Spillway, and storage level - 6 hourly on chart • Photograph Spillway at downstream face regularly. • Monitor and record the rainfall • Inspect the Embankment and read Instrumentation, as per the 'Flood Operation' sheet, and fax to EEC • Log book entries as per SOP 12 & 22 • See note # below	• Record all communication • Monitor catchment inflow advisory network 6 hourly and advise the Dam Duty Operator of upstream river flows • Notify the Flood Warning Centre, Brisbane of rainfall at dam and the storage height daily or as required • Fax the sheet 'Flood Operation' 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 (Section 10, Page 7) *www.bom.gov.au • Record all communication • Inform spillway discharge to all personnel listed in the table below.
		Keep Fairbairn Dam residents, Tourists, Lake Maraboon Holiday Village Management, Camp Fairbairn Administration and others informed during the flood event		
		Table of Personnel to be notified		
		Notify as often as requested • Standby Officer • Emergency Event Coordinator	**Notify as often as requested** • Asset Engineering Manager • Regional Manager • Service Delivery Manager • Principal Engineer, Dam Safety	**Notify as often as requested** • Counter Disaster Executive Officer, Emerald Shire • Police - Emerald Shire.
	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 forward unedited copies to the Service Delivery Manager Biloela and the 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 1: Flood Operation [STAGE 4]

Stages	ACTION TO BE TAKEN BY: Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
STAGE 4 Water Level is above **EL 207.4 m** and approaching **EL 211 m** Spillway Flow upto 500,000 MLD	**FOR RECORD: Use Sheets from Section 6 and 6A** • Record all events and communication ✓ • Monitor flow at Spillway - 4 hourly ✓ • Photograph Spillway, Main Embankment and Saddle Dam # 5 at downstream face - regularly • Monitor and record the rainfall • Record storage level on Storage vs Time graph - 2 hourly, or as required • Inspect the main embankment, saddle dams and Instrumentation readings regularly, as per the 'Flood Operation' sheet, and fax to EEC • Log book entries as per SOP 12 & 22 • See note # below	• Record all communication • Monitor catchment inflow advisory network 4 hourly and advise the Dam Duty Operator of upstream river flows • Notify the Flood Warning Centre, Brisbane of rainfall at dam and the storage height daily or as required • Fax the sheet 'Flood Operation' 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 (Section 10, Page 7) *www.bom.gov.au • Record all communication • 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)**
	Keep Fairbairn Dam residents, Tourists, Lake Maraboon Holiday Village Management, Camp Fairbairn Administration and others informed during the flood event			
	Table of Personnel to be notified			
	Notify as often as requested • Standby Officer • Emergency Event Coordinator	**Notify as often as requested** • Asset Engineering Manager • Regional Manager • Service Delivery Manager • Principal Engineer, Dam Safety	**Notify as often as requested** • Counter Disaster Executive Officer, Emerald Shire • Police - Emerald Shire.	

After the Event an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator and forward unedited copies to the Service Delivery Manager Biloela and the 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 1: Flood Operation [STAGE 5]

Stages	ACTION TO BE TAKEN BY: Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
STAGE 5 Water Level is above **EL 211 m** and approaching **EL 217.83 m** Spillway Flow upto 1,496,448 MLD	**FOR RECORD: Use Sheets from Section 6 and 6A** • Record all events and communication • Monitor flow at Spillway - 4 hourly, or as required • Photograph Spillway, Tailwater at downstream face, and Saddle Dams - regularly • Monitor and record the rainfall - 6 hourly • Record storage level on Storage vs Time graph – hourly, or as required • Inspect the dam regularly (hourly if reservoir level is within 0.5 m of the crests), as per the 'Flood Operation' sheet, and fax to EEC • Immediately report any damage observed • Log book entries as per SOP 12 & 22 • See note # below	• Record all communication • Monitor catchment inflow advisory network 4 hourly and advise the Dam Duty Operator of upstream river flows • Notify the Flood Warning Centre, Brisbane of rainfall at dam and the storage height daily or as required • Fax the sheet 'Flood Operation' 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. (Section 10, Page 7) *www.bom.gov.au • Record all communication • Inform all personnel listed below of the spillway discharge when the depth of water passing through the spillway exceeds 1.5m, 3m and 4.5m, or as often as requested	**ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)**
	Keep Fairbairn Dam residents, Tourists, Lake Maraboon Holiday Village Management, Camp Fairbairn Administration and others informed during the flood event			
	Table of Personnel to be notified			
	Notify as often as requested • Standby Officer • Emergency Event Coordinator	**Notify as often as requested** • Asset Engineering Manager • Regional Manager • Service Delivery Manager • Principal Engineer, Dam Safety	**Notify as often as requested** • Counter Disaster Executive Officer, Emerald Shire • Police - Emerald Shire.	

After the Event an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator and forward unedited copies to the Service Delivery Manager Biloela and the 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 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 experienced in the area Intensity less than 5 MM** (refer to Section 10 for Modified Mercalli Scale)	• Inspect the Embankment, Spillway Structure, and Abutments, forward report to 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 experienced in the area Intensity greater than 5 MM** (refer to Section 10 for Modified Mercalli Scale)	• Immediately inspect the Embankment, Spillway Structure, and Abutments, forward report to EEC • 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, Emerald Shire.
STAGE 3 **Dam Failure is imminent due to Earthquake**	• Lower reservoir level • Photograph the damage from a safe point • Vacate the immediate vicinity of the dam • Forward event report to EEC (see note # below)	• Implement **ACTION 3.** (Section 2, page 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 Biloela 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**	• 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**	• 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, Emerald Shire
STAGE 3 **Dam Failure is imminent due to Piping** Water Level at Full Supply Level (FSL 204.23 m)	• Lower reservoir level. • Photograph the seepage and piping from a safe point. • Vacate the immediate vicinity of the embankment • Forward event report to EEC (see note # below)	• 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 Biloela 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	FOR RECORD: Use Sheets from Section 6 and 6E	ACTION TO BE TAKEN BY: Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)
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			
		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			

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.

[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 Fairbairn 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
- 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...../...../.....

FAIRBAIRN DAM - EMERGENCY ACTION PLAN
RECORD OF COMMUNICATION

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

FAIRBAIRN DAM EMERGENCY ACTION PLAN
LOG OF EVENTS / ACTIONS

Date	Time	Event description / Action carried out	Recorded By (initials)

Visual Inspection and Storage Report
Note: See Page 5 for instructions **

VISUAL INSPECTION		First Inspection	Second Inspection (+6 hrs)	Third Inspection (+12 hrs)
	DATE			
	TIME			
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)				
Main Dam Embankment				
	General Condition			
	Cracks, subsidence in pavement			
Upstream Face (Use binoculars) :	Settlement			
	Displacement of riprap material			
Downstream face:	Subsidence, slides, erosion			
	Sign of seepage, Wet spots / seams			
Area Downstream of Dam				
	Seepage from any location apart from seepage point			
Seepage				
	Seepage water - Clear or Turbid (Tick for clear)			
Spillway				
Spillway Channel	Erosion, damage to concrete structure			
Trainings Walls:	General Condition/Cracking/Spalling			
U/S Face (if visible):	General Condition			
Apron (if visible):	General Condition / Impact Damage			
Crest (if visible):	General Condition			
	Impact Damage			
Bridge:	General Condition/Cracking/Spalling/Construction Joints			

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

.....

.....

.....

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

Visual Inspection and Storage Report
Note: See Page 5 for instructions **

VISUAL INSPECTION	First Inspection	Second Inspection (+6 hrs)	Third Inspection (+12 hrs)
DATE			
TIME			
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)			
River			
Left Bank: General Condition/Seepage/Slips/Slumps			
Seepage/Erosion/Deposits			
Right Bank: General Condition/Seepage/Slips/Slumps			
Intake Structure			
Structure: General Condition/Cracking/Spalling/Impact Damage			
Trashracks/Baulks: General Condition/Coatins/Impact Damage			
Access Bridge: General Condition/Cracking/Spalling/Impact Damage			
Outlet Works Right Bank			
Outlets: General Condition/Cavitation/Cracking/Spalling			
Channel: General Condition/Loose Rock/Erosion/Deposits			
Culverts: General Condition/Cracking/Spalling/Settlement			
Bull Ring: General Condition/Cracking/Spalling/Damage/Joints			
Outlet Works Left Bank (if Accessable)			
Outlets: General Condition/Cavitation/Cracking/Spalling			
Channel: General Condition/Loose Rock/Erosion/Deposits			
Culverts: General Condition/Cracking/Spalling/Settlement			
Pump House: General Condition/Cracking/Damage			
Selma Channel Gate House: General Condition/Cracking/Damage			

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

.....

.....

.....

Inspecting Officer's initials			

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

Visual Inspection and Storage Report
Note: See Page 5 for instructions **

VISUAL INSPECTION	First Inspection	Second Inspection (+6 hrs)	Third Inspection (+12 hrs)
DATE			
TIME			
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)			
Saddle Dam Embankments (Earth & Rockfill Structure)			
Saddle Dam 1			
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion			
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion			
Drainage System			
U/S Slope: Slides/Sinkholes/Beaching/Erosion			
Left Abutment: Cracks/Wetspots/Slides			
Right Abutment: Cracks/Wetspots/Slides			
Saddle Dam 2			
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion			
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion			
Drainage System			
U/S Slope: Slides/Sinkholes/Beaching/Erosion			
Left Abutment: Cracks/Wetspots/Slides			
Right Abutment: Cracks/Wetspots/Slides			
Saddle Dam 3			
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion			
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion			
Drainage System			
U/S Slope: Slides/Sinkholes/Beaching/Erosion			
Left Abutment: Cracks/Wetspots/Slides			
Right Abutment: Cracks/Wetspots/Slides			

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

.....

.....

Inspecting Officer's initials			

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

Visual Inspection and Storage Report
Note: See Page 5 for instructions **

VISUAL INSPECTION	First Inspection	Second Inspection (+6 hrs)	Third Inspection (+12 hrs)
DATE			
TIME			
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)			
Saddle Dam Embankments (Earth & Rockfill Structure)			
Saddle Dam 4			
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion			
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion			
Drainage System			
U/S Slope: Slides/Sinkholes/Beaching/Erosion			
Left Abutment: Cracks/Wetspots/Slides			
Right Abutment: Cracks/Wetspots/Slides			
Saddle Dam 5			
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion			
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion			
Drainage System			
U/S Slope: Slides/Sinkholes/Beaching/Erosion			
Left Abutment: Cracks/Wetspots/Slides			
Right Abutment: Cracks/Wetspots/Slides			
Saddle Dam 6			
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion			
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion			
Drainage System			
U/S Slope: Slides/Sinkholes/Beaching/Erosion			
Left Abutment: Cracks/Wetspots/Slides			
Right Abutment: Cracks/Wetspots/Slides			
Details of significant changes. New occurrences and issues warranting further attention			
Inspecting Officer's initials			

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

** INSTRUCTION FOR COMPLETING SHEET - Flood Operation

STAGE 1
- Monitor Fairbairn Dam Gauging Station - 12-hourly
- Plot Rainfall vs. Storage Level - daily

STAGE 2
- Monitor Fairbairn Dam Gauging Station - 12 hourly
- Plot Storage Level vs. Time graph - twice a day.

STAGE 3
- Inspect the Embankment and read Instrumentation, as per the 'Flood Operation' sheet
- Monitor Fairbairn Dam Gauging Station - 12 hourly

STAGE 4
- Inspect the Embankment and read Instrumentation - regularly
- Monitor Fairbairn Dam Gauging Station - 6 hourly

STAGE 5
- Inspect the Embankment and read Instrumentation - regularly
- Monitor Fairbairn Dam Gauging Station - 6 hourly

VISUAL INSPECTION

Frequency of visual inspection required is indicated by

STAGE 3 ONCE A DAY	STAGE 4 TWICE A DAY	STAGE 5 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 points	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), Brisbane. The degree of urgency of this advice varies with the nature of the matter.

TABLE 1

RECORD OF RAINFALL AND WATER LEVEL DURING FLOOD EVENT

Date	Time	Rainfall mm	Daily Total	Comments

FAIRBAIRN DAM HYDRAULIC PIEZOMETER READINGS

(Required if storage level is higher than EL 207 M and safe to do so)

	First Inspection		Second Inspection		Third Inspection		Fourth Inspection	
Tip No	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								

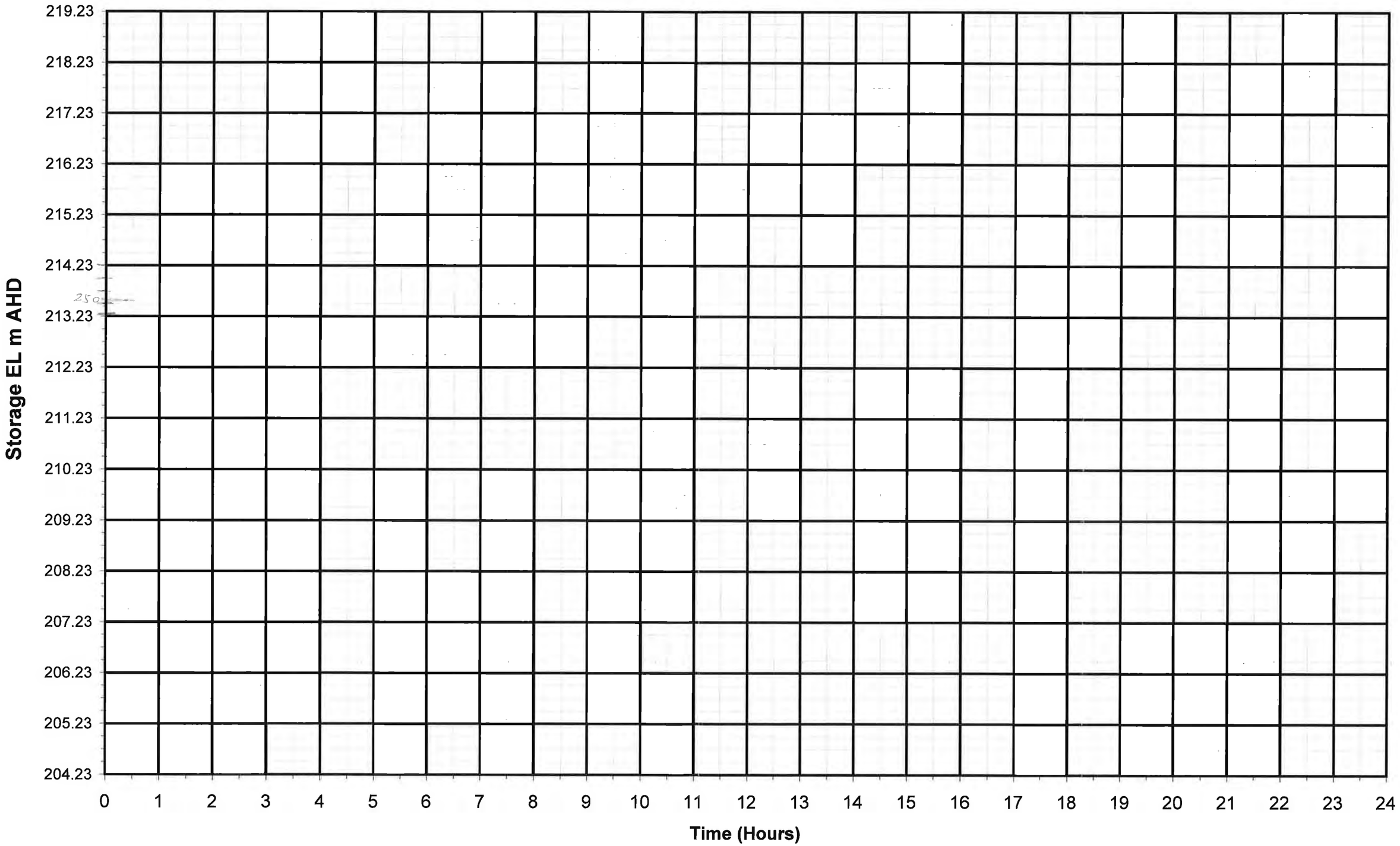
Fairbairn Dam Instrumentation Readings

(Required if storage level is higher than EL 207 M and safe to do so)

ELECTRIC PIEZOMETERS

Piezometer	1ST Inspection	2ND Inspection	3RD Inspection	4TH Inspection
EP01				
EP02				
EP03				
EP04				
EP05				
EP06				
EP07				
EP08				
EP09				
EP10				
EP11				
EP12				
EP13				
EP14				
EP15				

STORAGE LEVEL AT SPILLWAY VERSUS TIME



Visual Inspection and Storage Report
Note: See Page 5 for instructions **

VISUAL INSPECTION **Earthquake Intensity experienced:.....MM**		Earthquake experienced	First Inspection	Second Inspection (within 12 hrs)	Third Inspection (+12 hrs)
	DATE				
	TIME				
	Storage Water Level EL (m) **(FSL 204.23)**				
	Daily Rainfall (mm)				
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)					
Main Dam Embankment					
	General Condition				
	Cracks, subsidence in pavement				
Upstream Face (Use binoculars) :	Settlement				
	Displacement of riprap material				
Downstream face:	Subsidence, slides, erosion				
	Sign of seepage, Wet spots / seams				
Area Downstream of Dam					
	Seepage from any location apart from seepage point				
Seepage					
	Seepage water - Clear or Turbid (Tick for clear)				
Spillway					
Spillway Channel	Erosion, damage to concrete structure				
Trainings Walls:	General Condition/Cracking/Spalling				
U/S Face :	General Condition				
Apron :	General Condition / Impact Damage				
Crest :	General Condition				
	Impact Damage				
Bridge:	General Condition/Cracking/Spalling/Construction Joints				

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

.....

.....

.....

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

Visual Inspection and Storage Report
Note: See Page 5 for instructions **

VISUAL INSPECTION **Earthquake Intensity experienced:.....MM**	Earthquake experienced	First Inspection	Second Inspection (within 12 hrs)	Third Inspection (+12 hrs)
DATE				
TIME				
Storage Water Level EL (m) **(FSL 204.23)**				
Daily Rainfall (mm)				
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)				
River				
Left Bank: General Condition/Seepage/Slips/Slumps				
Seepage/Erosion/Deposits				
Right Bank: General Condition/Seepage/Slips/Slumps				
Intake Structure				
Structure: General Condition/Cracking/Spalling/Impact Damage				
Trashracks/Baulks: General Condition/Coatins/Impact Damage				
Access Bridge: General Condition/Cracking/Spalling/Impact Damage				
Outlet Works Right Bank				
Outlets: General Condition/Cavitation/Cracking/Spalling				
Channel: General Condition/Loose Rock/Erosion/Deposits				
Culverts: General Condition/Cracking/Spalling/Settlement				
Bull Ring: General Condition/Cracking/Spalling/Damage/Joints				
Outlet Works Left Bank				
Outlets: General Condition/Cavitation/Cracking/Spalling				
Channel: General Condition/Loose Rock/Erosion/Deposits				
Culverts: General Condition/Cracking/Spalling/Settlement				
Pump House: General Condition/Cracking/Damage				
Selma Channel Gate House: General Condition/Cracking/Damage				
Details of significant changes. New occurrences and issues warranting further attention				
Inspecting Officer's initials				

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

Visual Inspection and Storage Report
Note: See Page 5 for instructions **

VISUAL INSPECTION **Earthquake Intensity experienced:.....MM**	Earthquake experienced	First Inspection	Second Inspection (within 12 hrs)	Third Inspection (+12 hrs)
DATE				
TIME				
Storage Water Level EL (m) **(FSL 204.23)**				
Daily Rainfall (mm)				
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)				
Saddle Dam Embankments (Earth & Rockfill Structure)				
Saddle Dam 1				
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion				
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion				
Drainage System				
U/S Slope: Slides/Sinkholes/Beaching/Erosion				
Left Abutment: Cracks/Wetspots/Slides				
Right Abutment: Cracks/Wetspots/Slides				
Saddle Dam 2				
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion				
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion				
Drainage System				
U/S Slope: Slides/Sinkholes/Beaching/Erosion				
Left Abutment: Cracks/Wetspots/Slides				
Right Abutment: Cracks/Wetspots/Slides				
Saddle Dam 3				
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion				
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion				
Drainage System				
U/S Slope: Slides/Sinkholes/Beaching/Erosion				
Left Abutment: Cracks/Wetspots/Slides				
Right Abutment: Cracks/Wetspots/Slides				
Details of significant changes. New occurrences and issues warranting further attention				
Inspecting Officer's initials				

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

Visual Inspection and Storage Report
Note: See Page 5 for instructions **

VISUAL INSPECTION **Earthquake Intensity experienced:.....MM**	Earthquake experienced	First Inspection	Second Inspection (within 12 hrs)	Third Inspection (+12 hrs)
DATE				
TIME				
Storage Water Level EL (m) **(FSL 204.23)**				
Daily Rainfall (mm)				
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)				
Saddle Dam Embankments (Earth & Rockfill Structure)				
Saddle Dam 4				
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion				
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion				
Drainage System				
U/S Slope: Slides/Sinkholes/Beaching/Erosion				
Left Abutment: Cracks/Wetspots/Slides				
Right Abutment: Cracks/Wetspots/Slides				
Saddle Dam 5				
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion				
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion				
Drainage System				
U/S Slope: Slides/Sinkholes/Beaching/Erosion				
Left Abutment: Cracks/Wetspots/Slides				
Right Abutment: Cracks/Wetspots/Slides				
Saddle Dam 6				
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion				
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion				
Drainage System				
U/S Slope: Slides/Sinkholes/Beaching/Erosion				
Left Abutment: Cracks/Wetspots/Slides				
Right Abutment: Cracks/Wetspots/Slides				
Details of significant changes. New occurrences and issues warranting further attention				
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
COMPLETE FIRST VISUAL INSPECTION ONLY	COMPLETE ALL VISUAL INSPECTIONS AND INSTRUMENTATION DATA AS WELL

Additional Inspections should be made, when:

- New seepage which requires further action
- When specifically requested

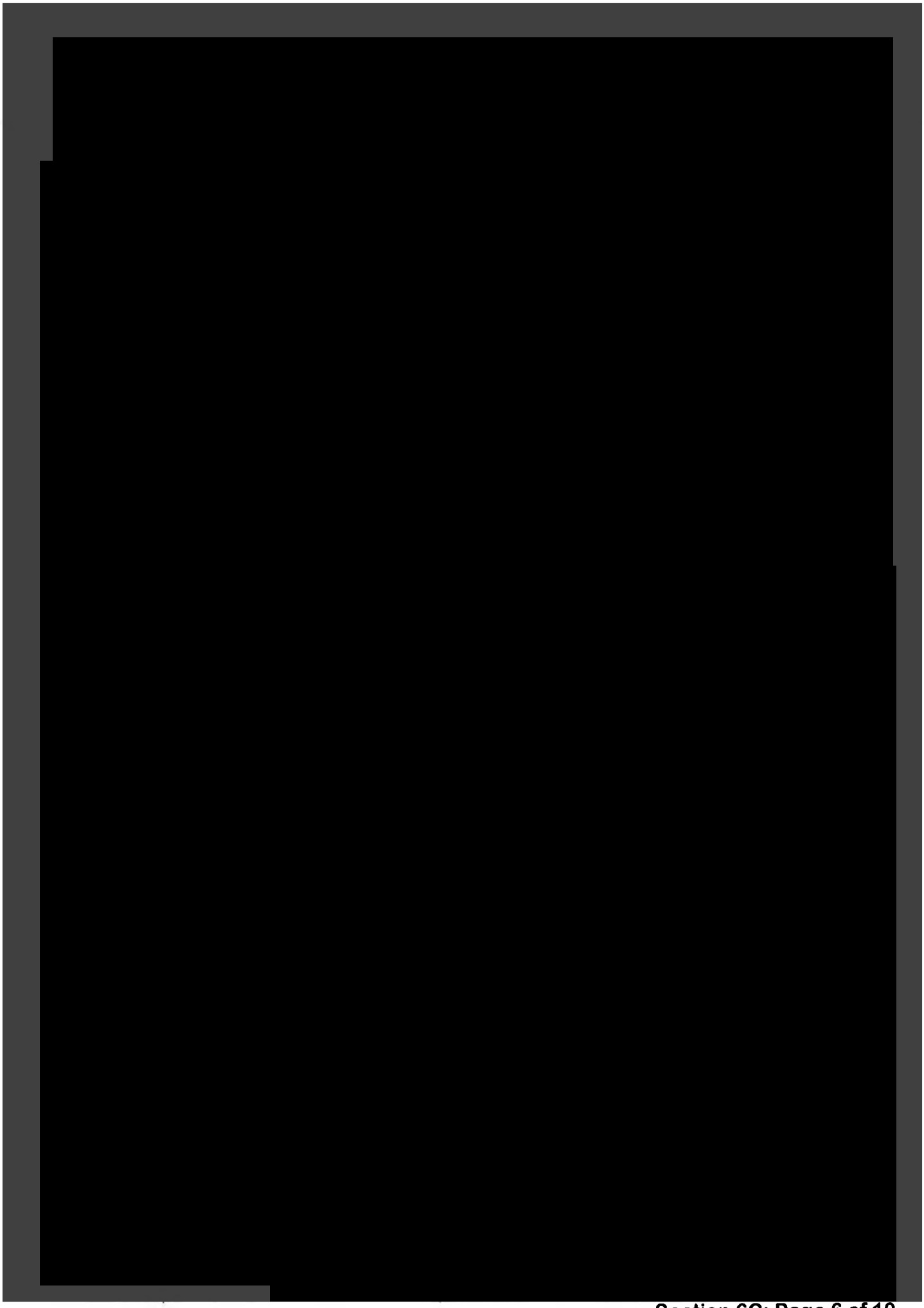
Show results of inspections as follow:-

- 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 the Principal Engineer (Dam Safety), Brisbane. The degree of urgency of this advice varies with the nature of the issue.

[redacted]



Instrumentation Readings

(REQUIRED IF EARTHQUAKE GREATER THAN 5 MM)

SURFACE SETTLEMENT POINTS

Settlement Point	1ST Inspection	2ND Inspection	3RD Inspection	4TH Inspection
CS1				
CS2				
CS3				
CS4				
CS5				
CS6				
SS1				
SS2				
SS4				
SS5				
SS6				
SS7				
SS8				
SS9				
SS10				
SS11				
SS12				
SS13				
SS14				
SS15				
SS16				
SS17				
SS18				
SS19				
SS20				
SS21				
SS22				
SS23				
SS24				
SS25				
SS26				
SS27				
SS28				

ELECTRIC SETTLEMENT POINTS

ES A				
ES B				
ES C				
ES D				
ES E				
ES F				

SEEPAGE MEASUREMENT

(REQUIRED IF EARTHQUAKE IS GREATER THAN 5MM)

	First Inspection	Second Inspection	Third Inspection	Fourth Inspection
SR01 **mm**				
SR02 **mm**				
SR03 **mm** (Seepage point D/S of Bull Ring)				

HYDRAULIC PIEZOMETER READINGS

(REQUIRED IF EARTHQUAKE IS GREATER THAN 5MM)

	First Inspection		Second Inspection		Third Inspection		Fourth Inspection	
Tip No	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								

Instrumentation Readings

(REQUIRED IF EARTHQUAKE GREATER THAN 5 MM)

ELECTRIC PIEZOMETERS

Piezometer	1ST Inspection	2ND Inspection	3RD Inspection	4TH Inspection
EP01				
EP02				
EP03				
EP04				
EP05				
EP06				
EP07				
EP08				
EP09				
EP10				
EP11				
EP12				
EP13				
EP14				
EP15				

Visual Inspection and Storage Report
Note: See Page 5 for instructions **

VISUAL INSPECTION		Earthquake experienced	First Inspection	Second Inspection (within 12 hrs)	Third Inspection (+12 hrs)
	DATE				
	TIME				
	Storage Water Level EL (m) **(FSL 204.23)**				
	Daily Rainfall (mm)				
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)					
Main Dam Embankment					
	General Condition				
	Cracks, subsidence in pavement				
Upstream Face (Use binoculars) :	Settlement				
	Displacement of riprap material				
Downstream face:	Subsidence, slides, erosion				
	Sign of seepage, Wet spots / seams				
Area Downstream of Dam					
	Seepage from any location apart from seepage point				
Seepage					
	Seepage water - Clear or Turbid (Tick for clear)				
Spillway					
Spillway Channel	Erosion, damage to concrete structure				
Trainings Walls:	General Condition/Cracking/Spalling				
U/S Face :	General Condition				
Apron :	General Condition / Impact Damage				
Crest :	General Condition				
	Impact Damage				
Bridge:	General Condition/Cracking/Spalling/Construction Joints				
Details of significant changes. New occurrences and issues warranting further attention					
	Inspecting Officer's initials				

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

Visual Inspection and Storage Report
Note: See Page 5 for instructions **

VISUAL INSPECTION	Earthquake experienced	First Inspection	Second Inspection (within 12 hrs)	Third Inspection (+12 hrs)
DATE				
TIME				
Storage Water Level EL (m) **(FSL 204.23)**				
Daily Rainfall (mm)				
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)				
River				
Left Bank: General Condition/Seepage/Slips/Slumps				
Seepage/Erosion/Deposits				
Right Bank: General Condition/Seepage/Slips/Slumps				
Intake Structure				
Structure: General Condition/Cracking/Spalling/Impact Damage				
Trashracks/Baulks: General Condition/Coatins/Impact Damage				
Access Bridge: General Condition/Cracking/Spalling/Impact Damage				
Outlet Works Right Bank				
Outlets: General Condition/Cavitation/Cracking/Spalling				
Channel: General Condition/Loose Rock/Erosion/Deposits				
Culverts: General Condition/Cracking/Spalling/Settlement				
Bull Ring: General Condition/Cracking/Spalling/Damage/Joints				
Outlet Works Left Bank				
Outlets: General Condition/Cavitation/Cracking/Spalling				
Channel: General Condition/Loose Rock/Erosion/Deposits				
Culverts: General Condition/Cracking/Spalling/Settlement				
Pump House: General Condition/Cracking/Damage				
Selma Channel Gate House: General Condition/Cracking/Damage				
Details of significant changes. New occurrences and issues warranting further attention				
Inspecting Officer's initials				

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

Visual Inspection and Storage Report
Note: See Page 5 for instructions **

VISUAL INSPECTION	Earthquake experienced	First Inspection	Second Inspection (within 12 hrs)	Third Inspection (+12 hrs)
DATE				
TIME				
Storage Water Level EL (m) **(FSL 204.23)**				
Daily Rainfall (mm)				
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)				
Saddle Dam Embankments (Earth & Rockfill Structure)				
Saddle Dam 1				
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion				
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion				
Drainage System				
U/S Slope: Slides/Sinkholes/Beaching/Erosion				
Left Abutment: Cracks/Wetspots/Slides				
Right Abutment: Cracks/Wetspots/Slides				
Saddle Dam 2				
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion				
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion				
Drainage System				
U/S Slope: Slides/Sinkholes/Beaching/Erosion				
Left Abutment: Cracks/Wetspots/Slides				
Right Abutment: Cracks/Wetspots/Slides				
Saddle Dam 3				
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion				
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion				
Drainage System				
U/S Slope: Slides/Sinkholes/Beaching/Erosion				
Left Abutment: Cracks/Wetspots/Slides				
Right Abutment: Cracks/Wetspots/Slides				
Details of significant changes. New occurrences and issues warranting further attention				
Inspecting Officer's initials				

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

Visual Inspection and Storage Report
Note: See Page 5 for instructions **

VISUAL INSPECTION	Earthquake experienced	First Inspection	Second Inspection (within 12 hrs)	Third Inspection (+12 hrs)
DATE				
TIME				
Storage Water Level EL (m) **(FSL 204.23)**				
Daily Rainfall (mm)				
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)				
Saddle Dam Embankments (Earth & Rockfill Structure)				
Saddle Dam 4				
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion				
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion				
Drainage System				
U/S Slope: Slides/Sinkholes/Beaching/Erosion				
Left Abutment: Cracks/Wetspots/Slides				
Right Abutment: Cracks/Wetspots/Slides				
Saddle Dam 5				
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion				
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion				
Drainage System				
U/S Slope: Slides/Sinkholes/Beaching/Erosion				
Left Abutment: Cracks/Wetspots/Slides				
Right Abutment: Cracks/Wetspots/Slides				
Saddle Dam 6				
Crest: Depressions/Cracks/Sinkholes/Alignment/Erosion				
D/S Slope: Cracks/Sinkholes/Bulging/Wetspots/Boils/Depressions/Erosion				
Drainage System				
U/S Slope: Slides/Sinkholes/Beaching/Erosion				
Left Abutment: Cracks/Wetspots/Slides				
Right Abutment: Cracks/Wetspots/Slides				
Details of significant changes. New occurrences and issues warranting further attention				
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 (Piping)

VISUAL INSPECTION

Frequency of visual inspection required is indicated by

STAGE 1	STAGE 2	STAGE 3
ONCE A DAY	TWICE A DAY	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 the Principal Engineer (Dam Safety), Brisbane. The degree of urgency of this advice varies with the nature of the issue.

[redacted]

FAIRBAIRN 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 204.23m**							
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

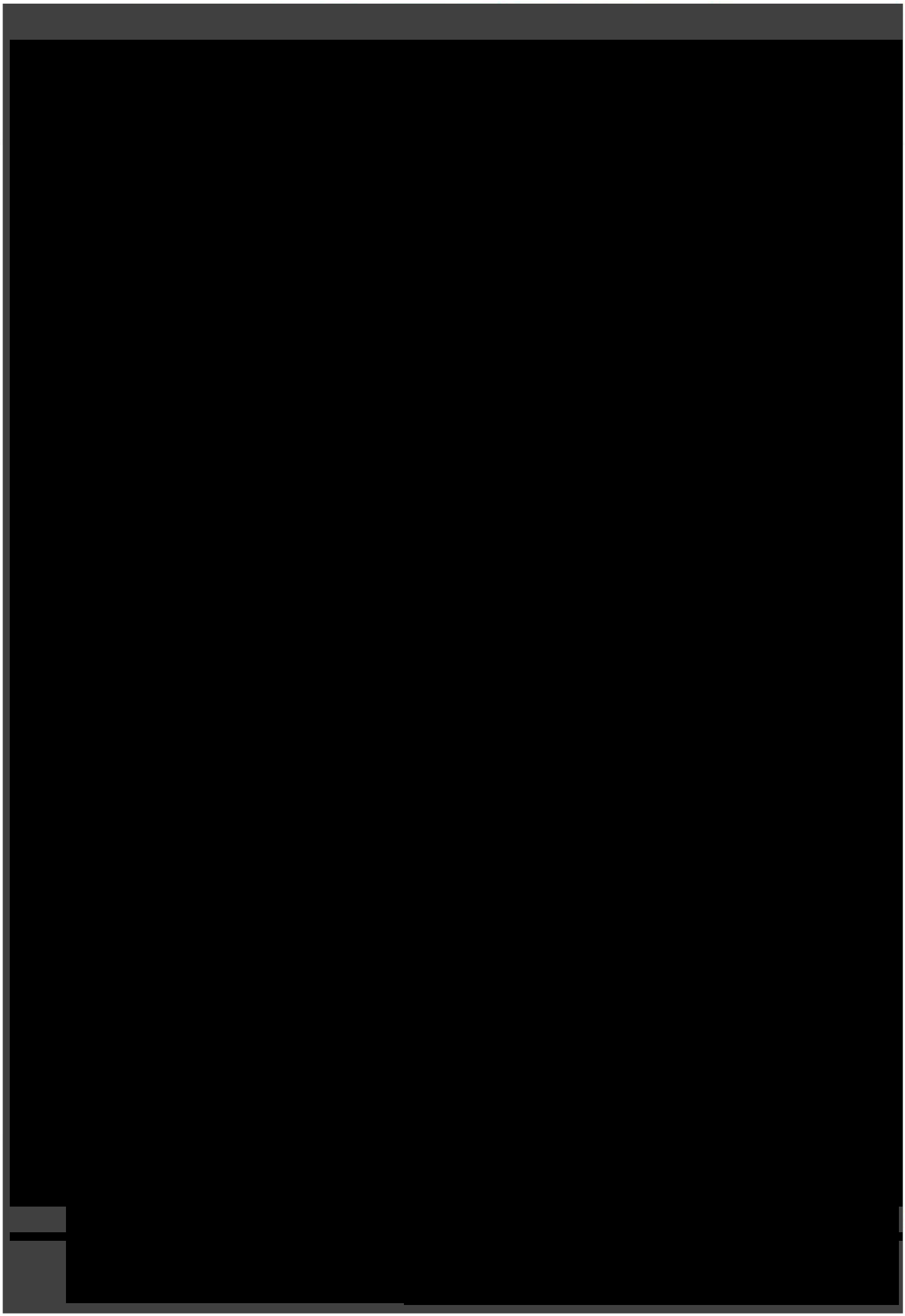
- When specifically requested

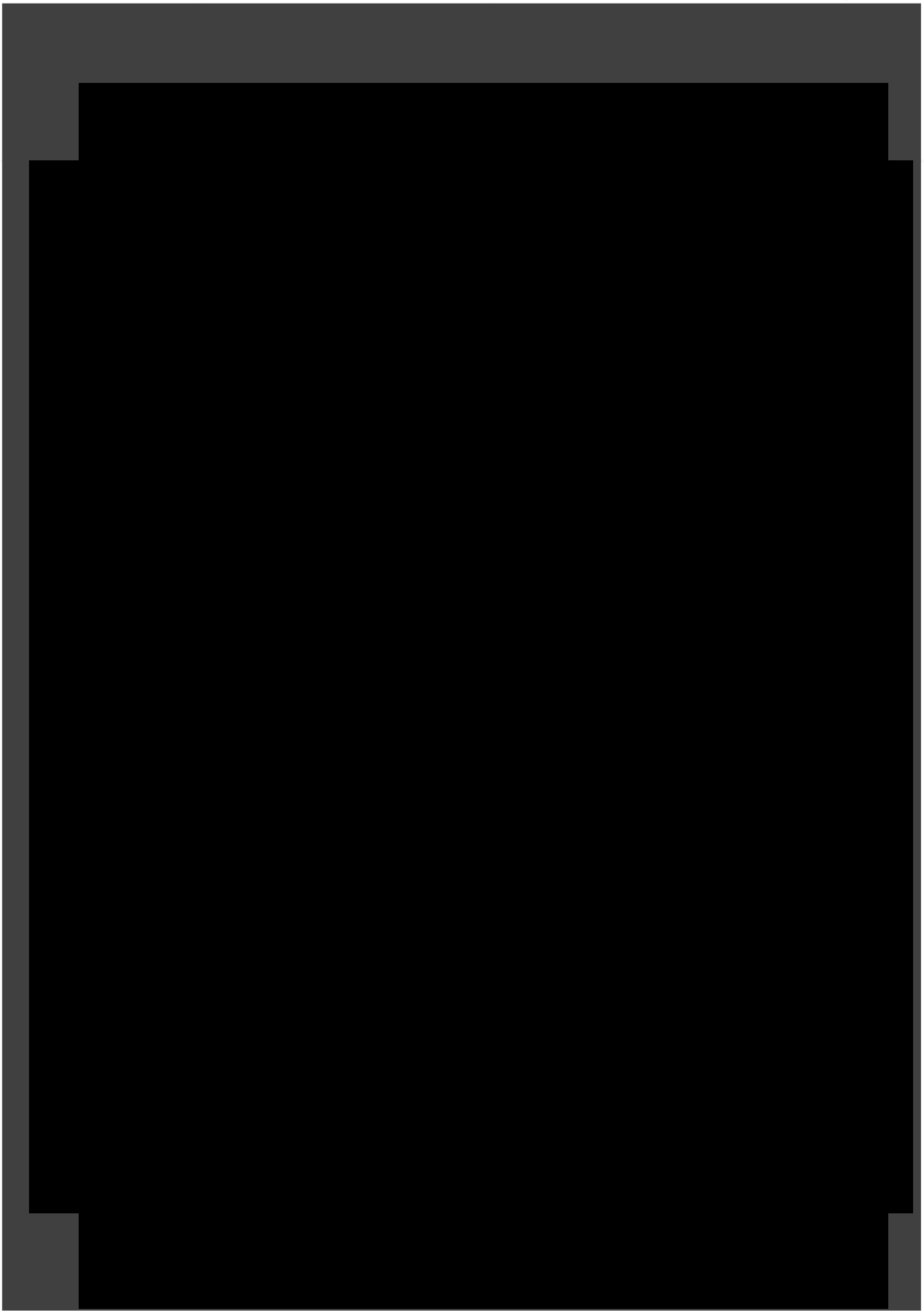
Show results of inspections as follow:-

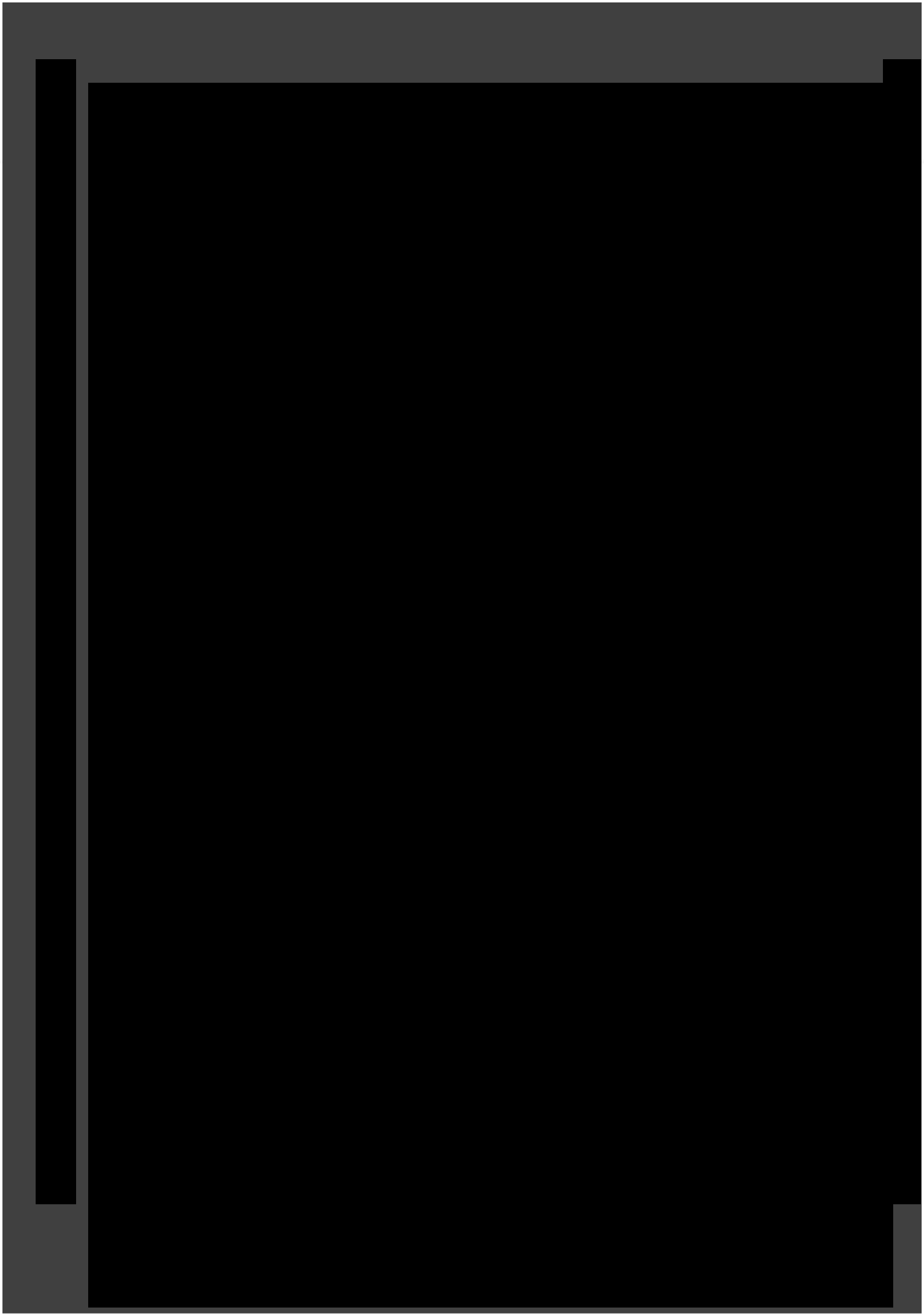
- New Seepage appeared **NEW**
- Significant increase (> 30%) or change in condition. **SG-INC**
- Slight increase (> 10%) or change in condition. **INC**
- NIL change of condition. **NIL**
- Slight decrease (< 10%) or change in condition. **DEC**

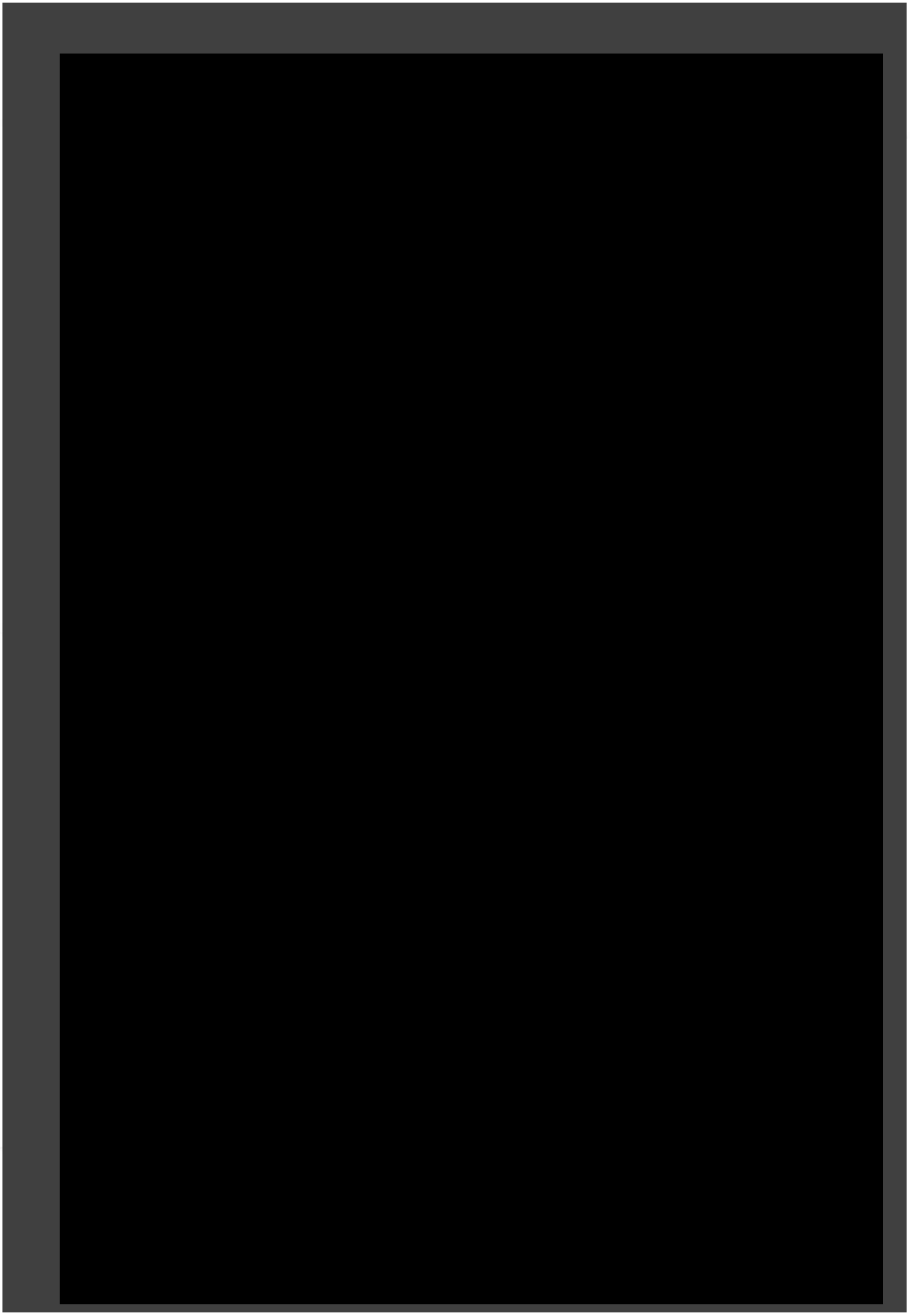
Significant Changes

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.









SECTION 7

EMERGENCY ACCESS ROUTES & PREVENTIVE ACTIONS

7. EMERGENCY ACCESS ROUTES

Locality plan and alternative access routes are shown on Page 2 of this Section.

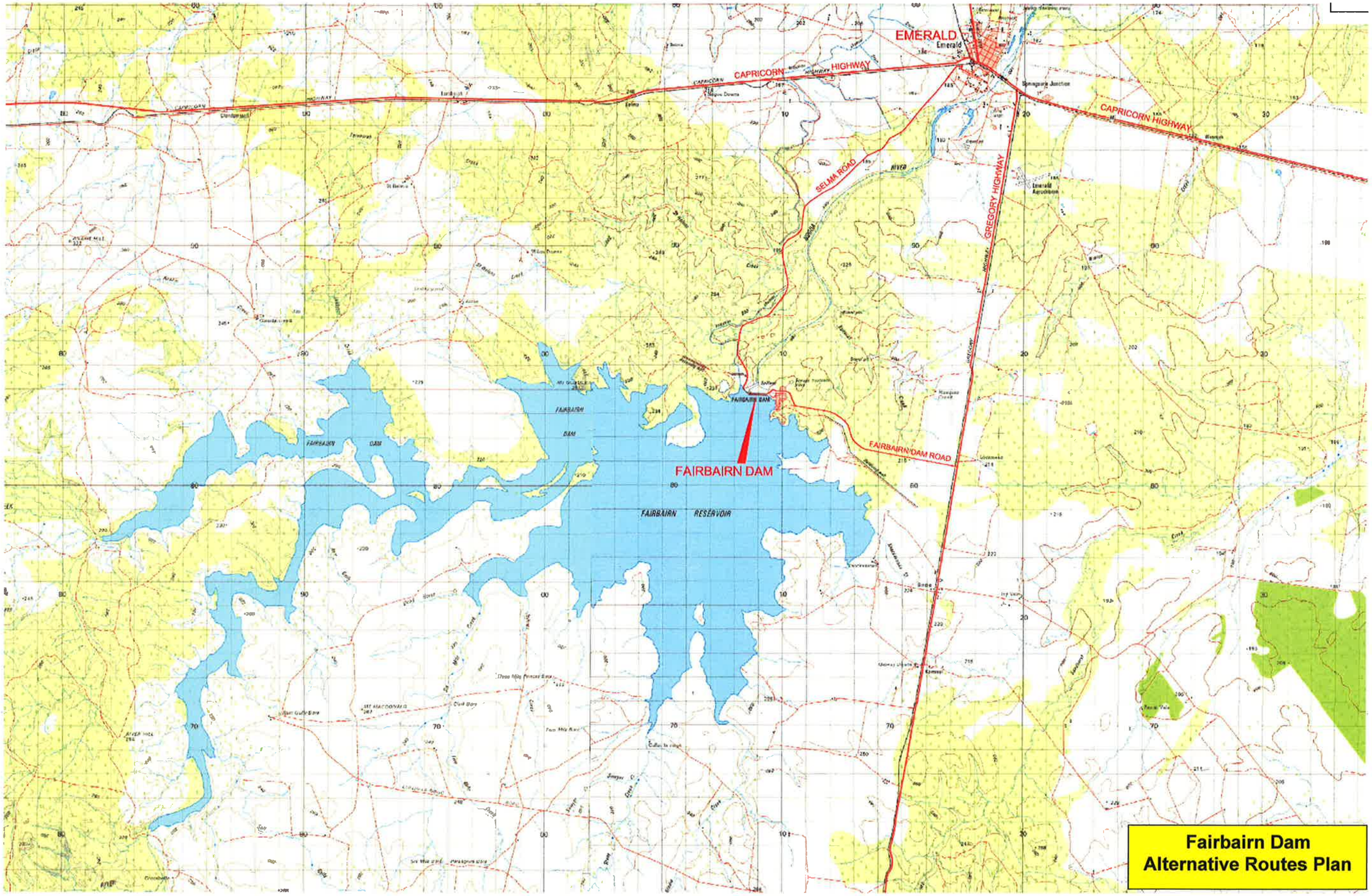
7.1 PREVENTIVE ACTIONS

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 Service Delivery Manager 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 Service Delivery Manager and Asset Engineering Manager 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 scenarios for a dam failure at Fairbairn Dam is from 'Sunny Day' Failure, the stability may be increased by using available earth and rock fill 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 the outlet works are given in Section 2.6 of the Operation and Maintenance Manual for the dam.



Fairbairn Dam
Alternative Routes Plan

SECTION 8

LOWERING STORAGE LEVEL

8.0 LOWERING THE STORAGE LEVEL

It may become necessary during an emergency to lower the Fairbairn 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 has been identified in its early stages. Instructions for operation of the Outlet Works are provided in Section 2.6 of the Operation & Maintenance Manual for the dam.

8.1 Fairbairn Dam Constraints

There are three constraints that need to be considered when evaluating lowering of the storage level. These are:

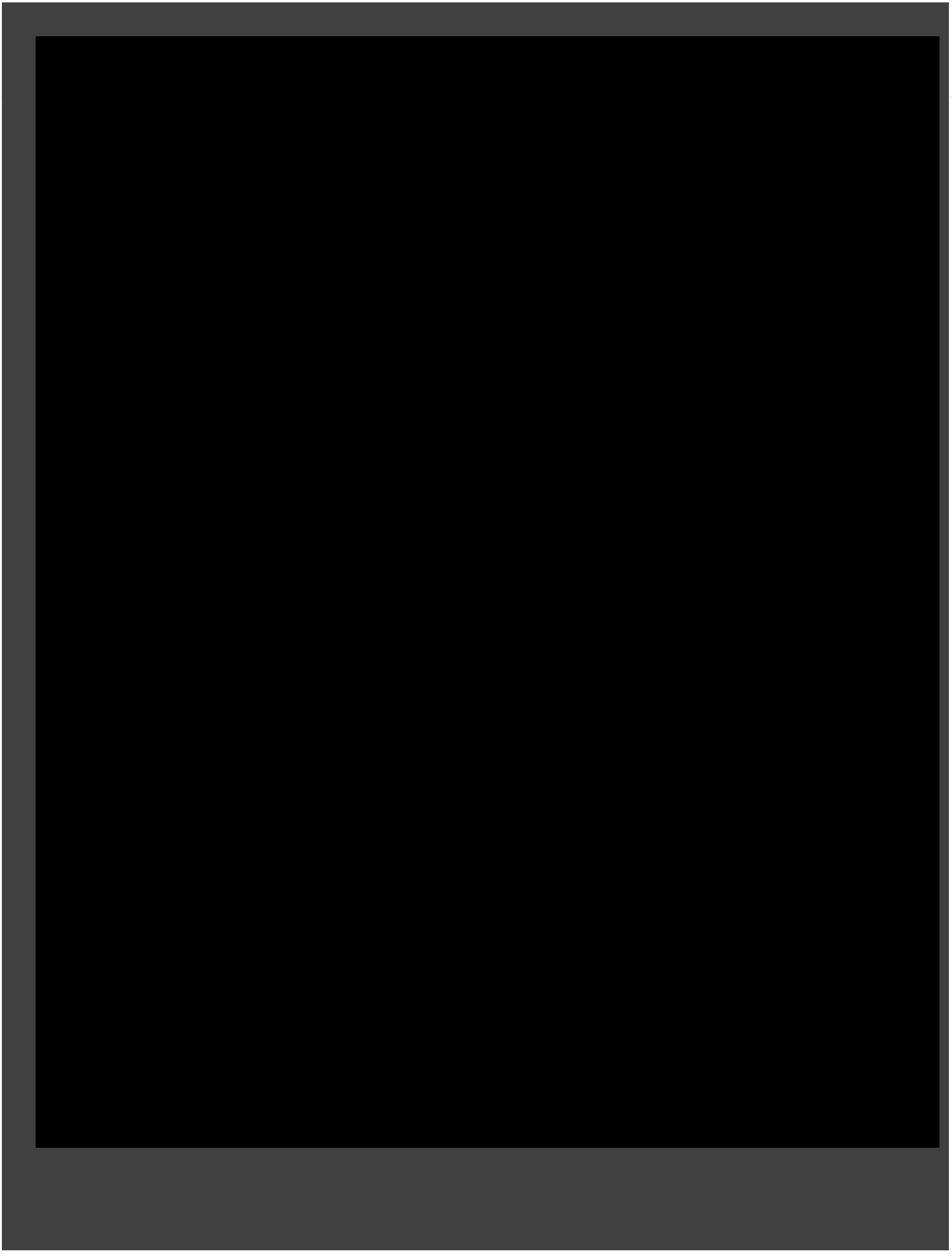
1. Maximum possible releases from Fairbairn Dam; and,
2. Flooding Impacts Downstream.
3. Availability of Left Bank Outlet Works during flood

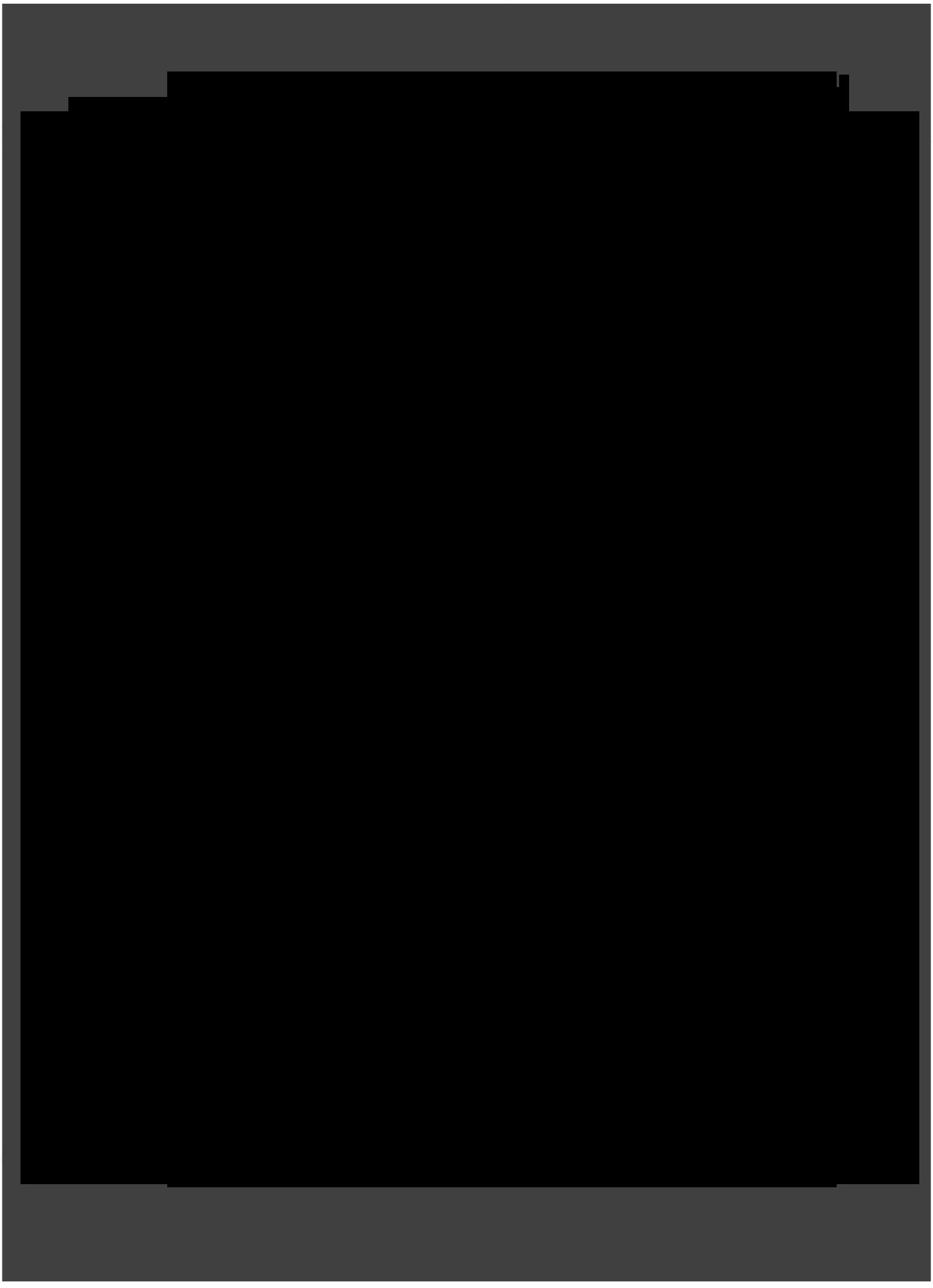
8.1.1 Maximum possible releases from Fairbairn Dam

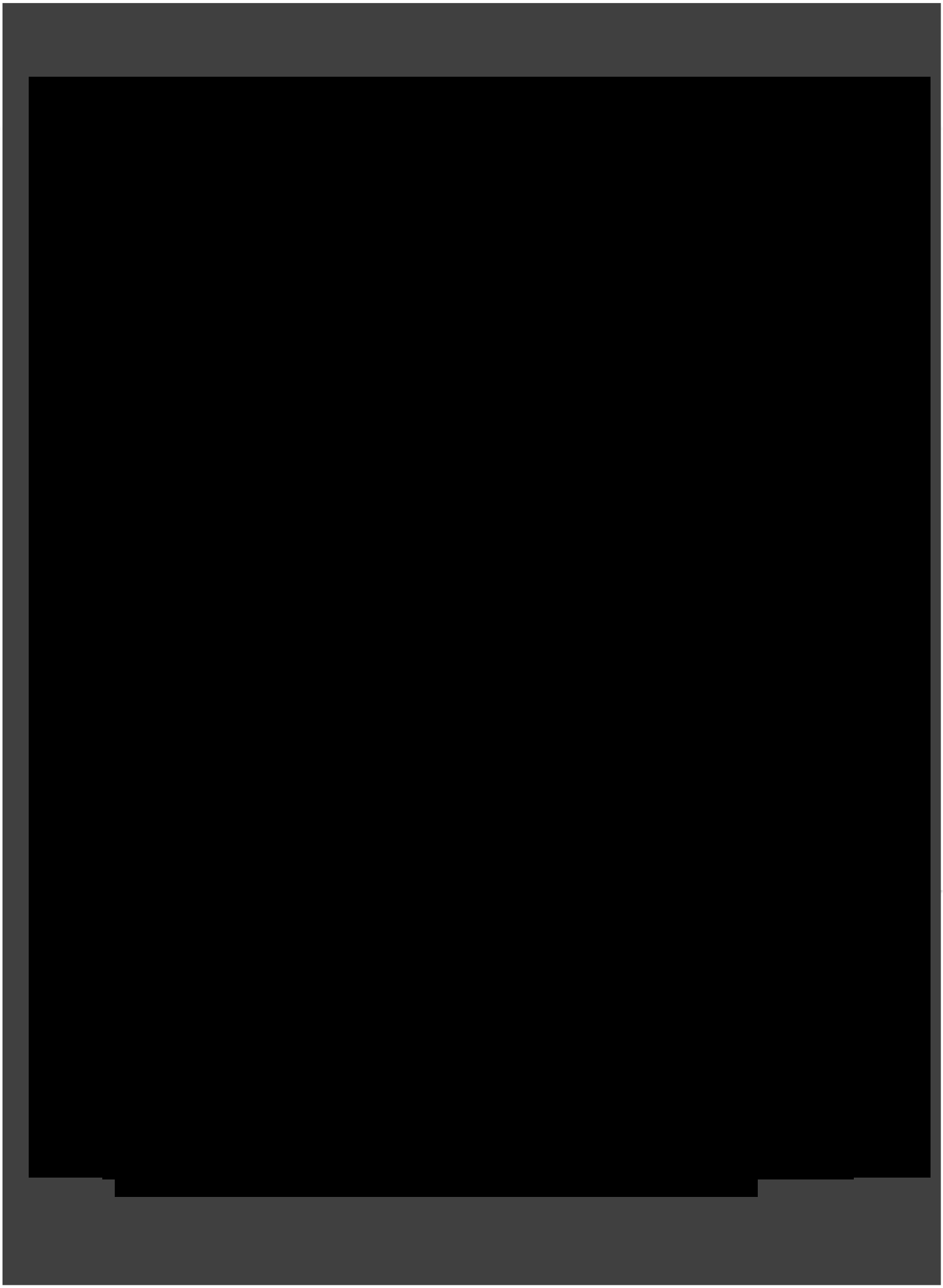
The release rate from the storage may be governed by the storage level at the time of drawdown. The possible mechanisms, which can be operated is through the outlets

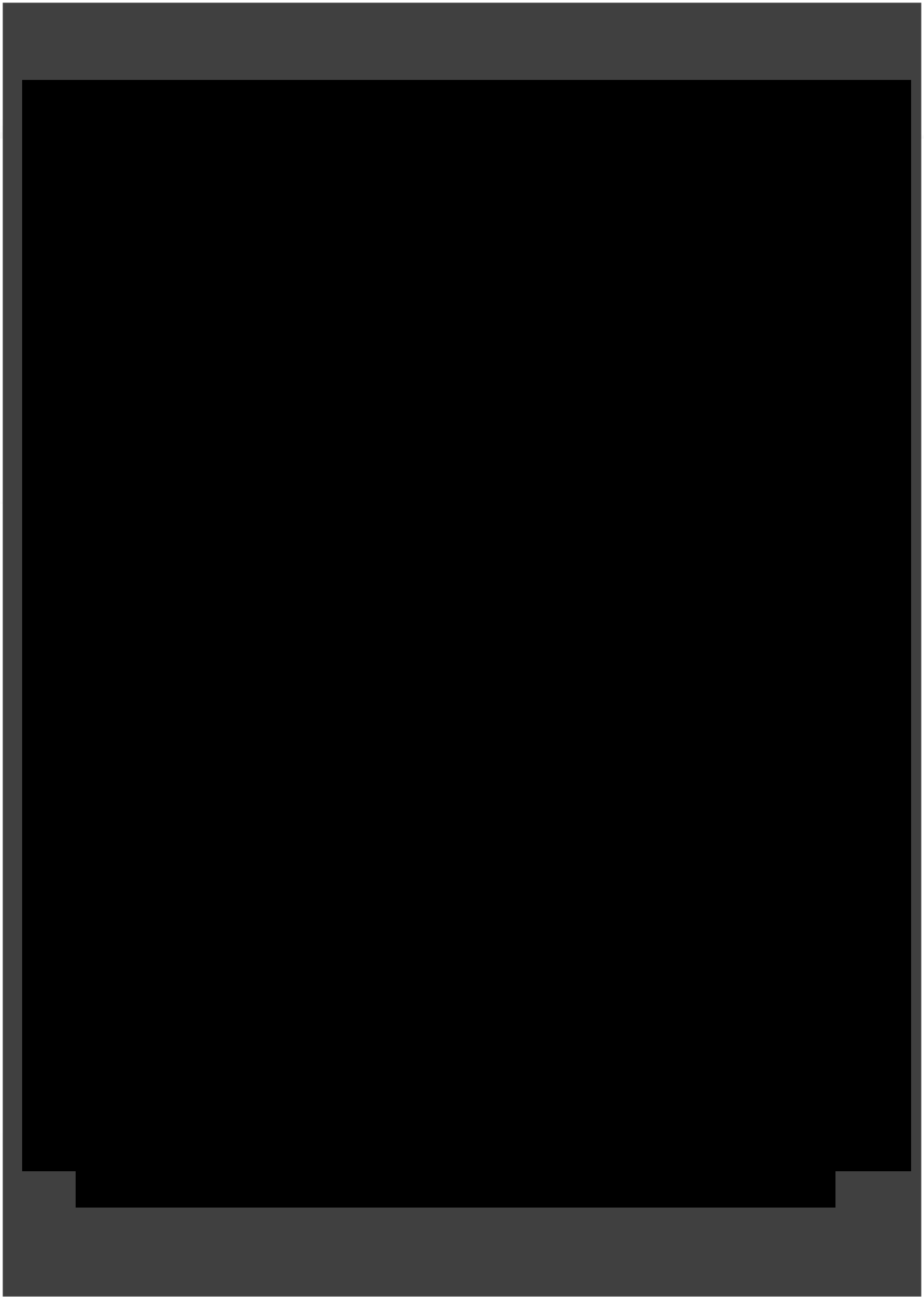
Dewatering Options	Inflow	Number of Days required to Lower the Reservoir level
TBA	Without Inflow	To EL m - Days
TBA	With Inflow	

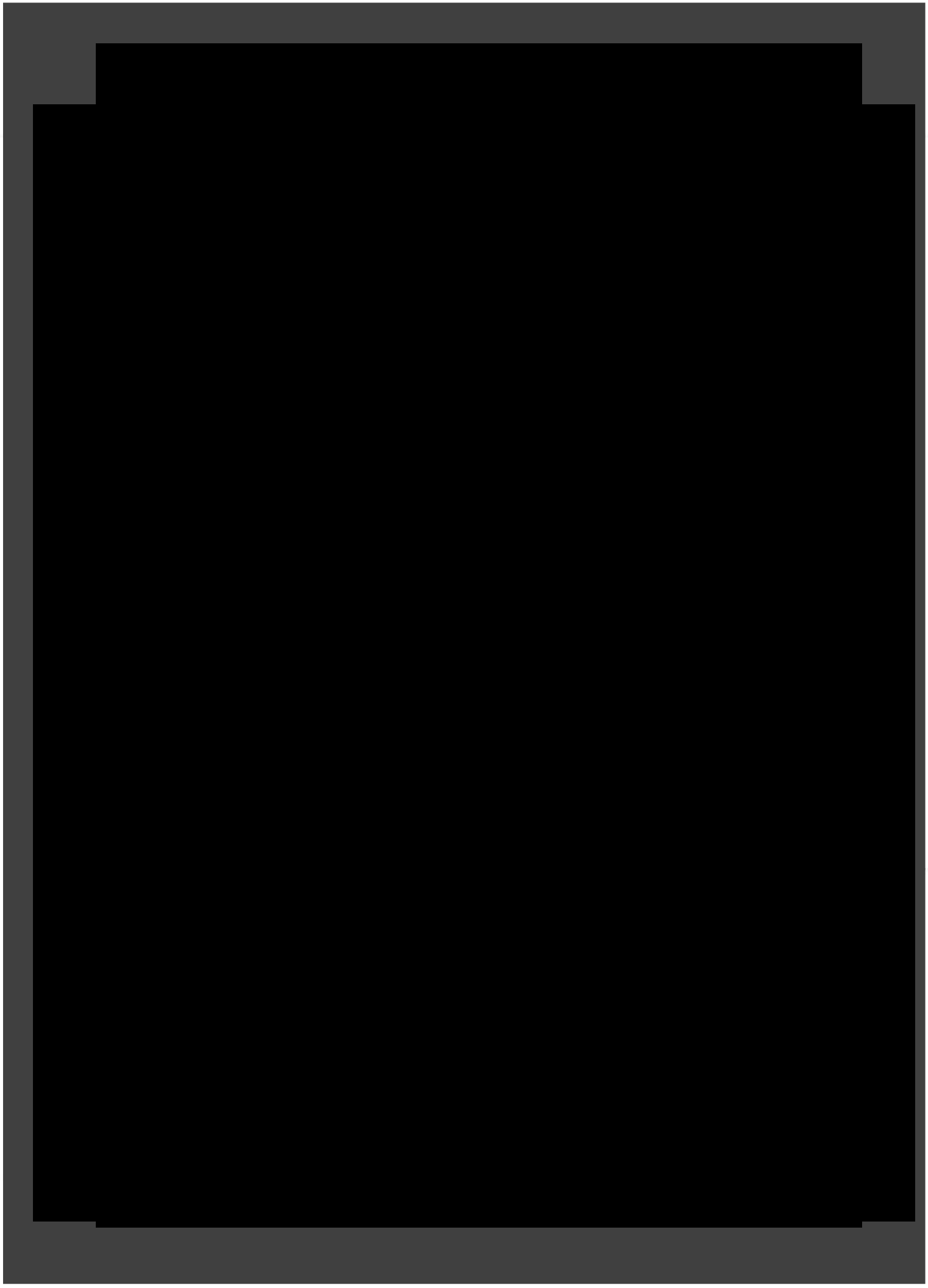
Outlet works curves for rapid drawdown are shown on Page 2











SECTION 9

DESIGN FLOOD ESTIMATION

The PMP estimate for the 96 hour storm event produced a peak storage level of EL 218.59m AHD which would overtop the crest elevation of saddle dams 1, 5 and 6 (EL 217.94m AHD) by 0.65 metres. Peak inflows, outflows, flood volumes and peak storage levels were calculated for the 96 hour storm duration and range of AEP's. Table 9.1 summarises the peak flood estimates for the critical storm duration.

Table 9.1: Fairbairn Dam - Peak flood estimates - 96 hour critical storm duration

AEP (1 in Y)	PMP Depth (mm)	Estimated Peak Inflow m^3/s	Estimated Peak Outflow m^3/s	Flood Volume ML	Peak Storage Level (m AHD)
50	245	966	587	478 000	205.87
100	275	1742	1183	848 000	206.78
200	306	3685	2760	1 740 000	208.47
500	346	4764	3666	2 260 000	209.27
1000	377	5628	4393	2 670 000	209.87
2000	409	6541	5166	3 100 000	210.46
5000	473	8461	6811	4 030 000	211.61
10 000	558	11095	9018	5 300 000	213.04
50 000	979	24768	23452	12 000 000	218.36
61 275 (PMF)	1070	27777	26969	13 500 000	218.59

FLOOD IMPACTS DOWNSTREAM

Tables below show the summarised information of the Dam Break Study conducted by SunWater in 2003.

The peak flood level results are presented as plots of extent of inundation. Figures 9.1 to 9.3 show plots of the longitudinal profiles of the peak flood levels along the Nogoa-Mackenzie Rivers.

Tables 9.1 to 9.3 summarise the peak flood levels at key locations.

Table9.1: Sunny Day Failure Flood Levels

Stream	Location	Peak Flood Level (m, AHD)
Nogoa	1. Fairbairn Dam Tailwater	199.2
Nogoa	2. Selma Weir	193.8
Nogoa	3. Emerald – Capricorn Hwy	193.2
Nogoa	4. Emerald Town Weir	190.1
Nogoa	5. Bellmah	183.4
Nogoa	6. McCoskers Weir	180.6
Nogoa	7. Retreat Ck Junction	174.5
Nogoa	8. Bridge Flats Crossing	171.4
Nogoa	9. Crinum Ck Junction	163.7
Nogoa	10. Wyuna	162.6
Nogoa	11. Duckponds Homestead	158.1
Nogoa	12. Currimundi	155.2
Nogoa Right	13. Lochlees	165.6
Nogoa Right	14. Parker Developments	171.4
Nogoa Right	15. Braylands	165.6
Mackenzie	16. St Aubins	153.5
Mackenzie	17. Rileys Crossing	152.1
Mackenzie	18. Yackam	149.3
Mackenzie	19. Carnangarra	147.5
Comet	20. Myrtle Park	153.5
Comet	21. Comet Town Weir	153.5
Comet	22. Comet – Capricorn Hwy	153.5
Theresa	23. Kingower Billabong	175.4
Theresa	24. Blair Athol Railway Line	174.4
Retreat	25. Trafalgar	175.0
Retreat	26. Blair Athol Railway Line	174.5
Retreat	27. Gregory Highway	174.7
Retreat Right	28. Washpool Waterhole	174.7
Retreat Left	29. Codenwarra Pump Site	174.7
Gordonstone	30. Langley Downs	163.7
Crinum	31. Belong Ck Junction	163.7

Crinum	32. Wyuna Road	163.7
Crinum	33. Colorada	163.7
Mosquito	34. Fenceline	163.7
Winton	35. Locharbor	167.0
Winton	36. Bauhinias Road	159.6
Winton	37. Duckponds Lagoon	157.1
Boggy	38. Ensham	155.4
Sandhurst	39. Karvella	153.5
Sandhurst	40. Capricorn Hwy	153.5

Table 9.2: Probable Maximum Flood - No Failure Flood Levels

Stream	Location	Peak Flood Level (m, AHD)
Nogoa	1. Fairbairn Dam Tailwater	197.7
Nogoa	2. Selma Weir	189.4
Nogoa	3. Emerald – Capricorn Hwy	183.8
Nogoa	4. Emerald Town Weir	178.9
Nogoa	5. Bellmah	175.8
Nogoa	6. McCoskers Weir	174.8
Nogoa	7. Retreat Ck Junction	174.4
Nogoa	8. Bridge Flats Crossing	172.0
Nogoa	9. Crinum Ck Junction	165.0
Nogoa	10. Wyuna	164.2
Nogoa	11. Duckponds Homestead	160.4
Nogoa	12. Currimundi	159.0
Nogoa Right	13. Lochlees	163.6
Nogoa Right	14. Parker Developments	172.1
Nogoa Right	15. Braylands	160.8
Mackenzie	16. St Aubins	158.6
Mackenzie	17. Rileys Crossing	157.6
Mackenzie	18. Yackam	153.5
Mackenzie	19. Carnangarra	149.4
Comet	20. Myrtle Park	158.8

Comet	21. Comet Town Weir	158.7
Comet	22. Comet – Capricorn Hwy	158.6
Theresa	23. Kingower Billabong	180.8
Theresa	24. Blair Athol Railway Line	177.6
Retreat	25. Trafalgar	178.1
Retreat	26. Blair Athol Railway Line	176.2
Retreat	27. Gregory Highway	175.7
Retreat Right	28. Washpool Waterhole	175.4
Retreat Left	29. Codenwarra Pump Site	175.5
Gordonstone	30. Langley Downs	165.1
Crinum	31. Belong Ck Junction	165.7
Crinum	32. Wyuna Road	165.1
Crinum	33. Colorada	165.0
Mosquito	34. Fenceline	165.1
Winton	35. Locharbor	167.1
Winton	36. Bauhinias Road	160.7
Winton	37. Duckponds Lagoon	160.1
Boggy	38. Ensham	159.0
Sandhurst	39. Karvella	158.6
Sandhurst	40. Capricorn Hwy	158.6

Table 9.3: Probable Maximum Flood - Dam Failure Flood Levels

Stream	Location	Peak Flood Level (m, AHD)
Nogoa	1. Fairbairn Dam Tailwater	204.9
Nogoa	2. Selma Weir	202.7
Nogoa	3. Emerald – Capricorn Hwy	201.7
Nogoa	4. Emerald Town Weir	193.8
Nogoa	5. Bellmah	188.4
Nogoa	6. McCoskers Weir	187.7
Nogoa	7. Retreat Ck Junction	187.2
Nogoa	8. Bridge Flats Crossing	183.3
Nogoa	9. Crinum Ck Junction	169.5

Nogoa	10. Wyuna	169.1
Nogoa	11. Duckponds Homestead	167.9
Nogoa	12. Currimundi	166.2
Nogoa Right	13. Lochlees	172.8
Nogoa Right	14. Parker Developments	181.9
Nogoa Right	15. Braylands	168.5
Mackenzie	16. St Aubins	165.7
Mackenzie	17. Rileys Crossing	164.3
Mackenzie	18. Yackam	158.6
Mackenzie	19. Carnangarra	150.2
Comet	20. Myrtle Park	165.7
Comet	21. Comet Town Weir	165.7
Comet	22. Comet – Capricorn Hwy	165.7
Theresa	23. Kingower Billabong	188.4
Theresa	24. Blair Athol Railway Line	188.4
Retreat	25. Trafalgar	188.4
Retreat	26. Blair Athol Railway Line	188.4
Retreat	27. Gregory Highway	188.4
Retreat Right	28. Washpool Waterhole	188.4
Retreat Left	29. Codenwarra Pump Site	188.5
Gordonstone	30. Langley Downs	169.5
Crinum	31. Belong Ck Junction	169.5
Crinum	32. Wyuna Road	169.5
Crinum	33. Colorada	169.5
Mosquito	34. Fenceline	169.5
Winton	35. Locharbor	168.0
Winton	36. Bauhinias Road	168.0
Winton	37. Duckponds Lagoon	168.0
Boggy	38. Ensham	166.2
Sandhurst	39. Karvella	165.7
Sandhurst	40. Capricorn Hwy	165.7

Figure 9.1: Sunny Day Failure - Peak Levels

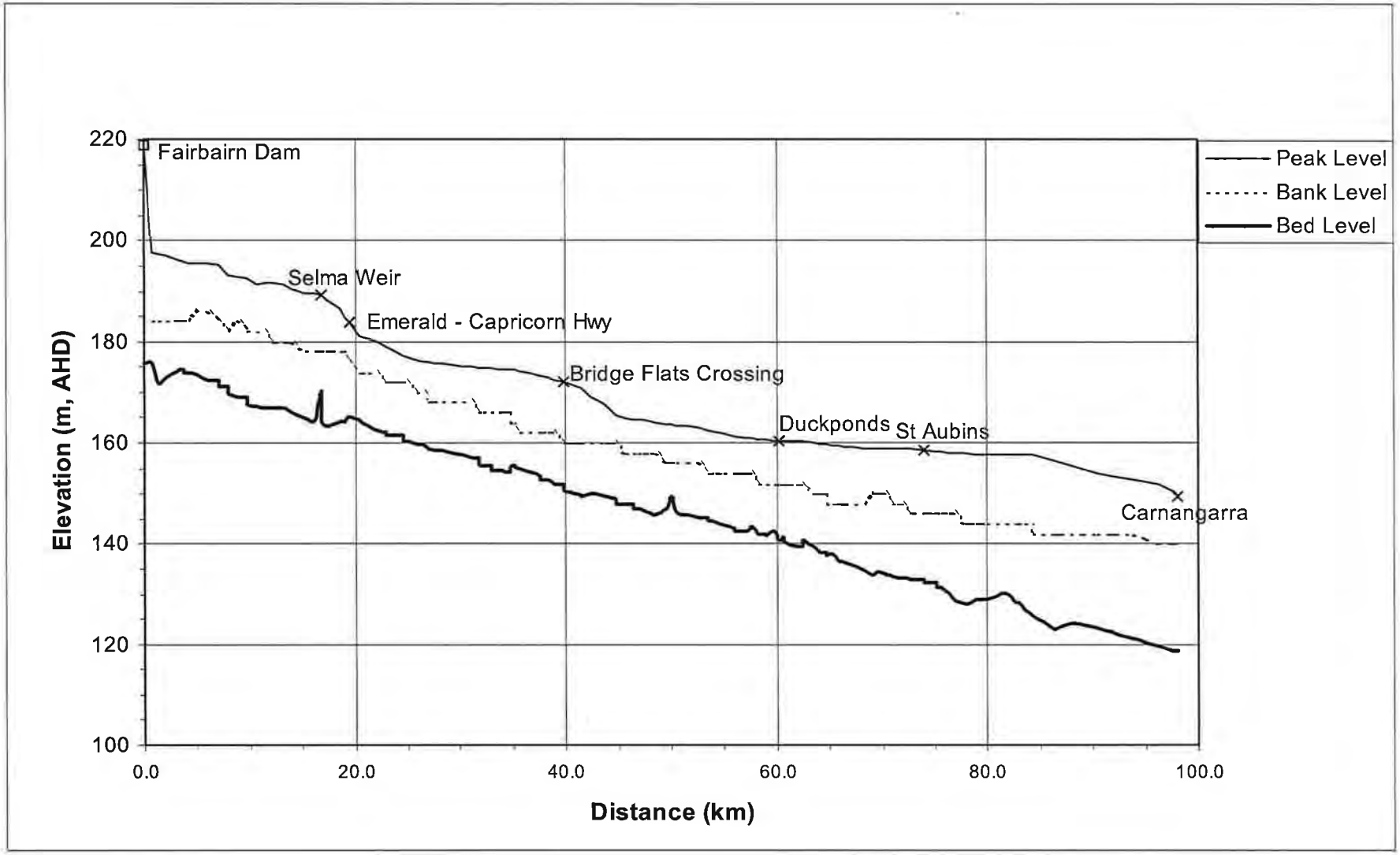


Figure 9.2: PMF No Failure - Peak Levels

Figure 9.3: PMF with Failure - Peak LevelsTime to Peak Flood Levels

The time of start of rise and time to peak for various key locations is summarised in Tables 9.4 to 9.6 for the scenarios simulated. This summary provides an indication of the available response time for each of the sites indicated.

The times shown are measured from the start of the event. For the Sunny Day Failure, the start of the event coincides with the start of the formation of the breach, which begins forming at the dam crest. For the probable maximum flood events, the times are measured from the start of the rainfall event.

Table 9.4: Sunny Day Failure Flood Rise Times

Stream	Location	Time to Start of Rise (dd:hh:mm)	Time to Peak Flood Level (dd:hh:mm)
Nogoa	1. Fairbairn Dam Tailwater	0:00:00	0:07:00
Nogoa	2. Selma Weir	0:02:20	0:07:20
Nogoa	3. Emerald – Capricorn Hwy	0:02:20	0:07:40
Nogoa	4. Emerald Town Weir	0:03:00	0:08:00
Nogoa	5. Bellmah	0:03:40	0:10:40
Nogoa	6. McCoskers Weir	0:04:20	0:11:00
Nogoa	7. Retreat Ck Junction	0:04:40	0:11:20
Nogoa	8. Bridge Flats Crossing	0:05:40	0:12:00
Nogoa	9. Crinum Ck Junction	0:06:40	0:13:40
Nogoa	10. Wyuna	0:07:00	0:18:40
Nogoa	11. Duckponds Homestead	0:09:20	0:23:40
Nogoa	12. Currimundi	0:10:20	1:01:40
Mackenzie	16. St Aubins	0:12:00	1:11:20
Mackenzie	17. Rileys Crossing	0:13:20	1:18:20
Mackenzie	18. Yackam	0:16:00	1:19:20
Mackenzie	19. Carnangarra	0:17:20	1:20:20

Table 9.5: Probable Maximum Flood - No Failure Rise Times

Stream	Location	Time to Start of Rise (dd:hh:mm)	Time to Peak Flood Level (dd:hh:mm)
Nogoa	1. Fairbairn Dam Tailwater	0:00:00	6:19:00
Nogoa	2. Selma Weir	0:06:40	6:20:40
Nogoa	3. Emerald – Capricorn Hwy	0:08:00	6:22:40
Nogoa	4. Emerald Town Weir	0:08:40	6:23:00
Nogoa	5. Bellmah	0:12:20	7:14:00
Nogoa	6. McCoskers Weir	0:14:20	7:16:20
Nogoa	7. Retreat Ck Junction	0:16:00	7:17:00
Nogoa	8. Bridge Flats Crossing	0:18:00	7:18:00
Nogoa	9. Crinum Ck Junction	0:22:00	7:19:20
Nogoa	10. Wyuna	0:22:20	7:20:20
Nogoa	11. Duckponds Homestead	1:02:20	8:09:40
Nogoa	12. Currimundi	1:07:00	8:14:00
Mackenzie	16. St Aubins	1:09:20	8:13:20
Mackenzie	17. Rileys Crossing	1:16:00	8:16:00
Mackenzie	18. Yackam	1:20:40	8:16:00
Mackenzie	19. Carnangarra	1:21:00	8:16:40

Table 9.6: Probable Maximum Flood - Dam Failure Rise Times

Stream	Location	Time to Start of Rise (dd:hh:mm)	Time to Peak Flood Level (dd:hh:mm)
Nogoa	1. Fairbairn Dam Tailwater	0:00:00	7:00:20
Nogoa	2. Selma Weir	0:06:40	7:01:20
Nogoa	3. Emerald – Capricorn Hwy	0:08:00	7:01:40
Nogoa	4. Emerald Town Weir	0:08:40	7:02:20
Nogoa	5. Bellmah	0:12:20	7:05:40
Nogoa	6. McCoskers Weir	0:14:40	7:06:20
Nogoa	7. Retreat Ck Junction	0:16:00	7:06:40
Nogoa	8. Bridge Flats Crossing	0:18:00	7:07:00
Nogoa	9. Crinum Ck Junction	0:22:00	7:15:20

Nogoa	10. Wyuna	0:22:20	7:16:20
Nogoa	11. Duckponds Homestead	1:02:20	7:18:40
Nogoa	12. Currimundi	1:07:00	7:22:40
Mackenzie	16. St Aubins	1:09:20	8:00:20
Mackenzie	17. Rileys Crossing	1:16:00	8:01:00
Mackenzie	18. Yackam	1:20:40	8:01:40
Mackenzie	19. Carnangarra	1:21:00	8:02:20

For the Sunny Day Failure Flood, the water level at the Capricorn Highway at Emerald (key location No.3) begins to rise approximately 2 hours after the start of the formation of the breach at the dam and peaks approximately 5½ hours later.

During a PMF flood with no dam failure, the water level at the Capricorn Highway at Emerald (key location No.3) begins to rise 8 hours into the storm event and peaks approximately 6 days 15 hours later.

For the PMF flood with dam failure, the water level at the Capricorn Highway at Emerald (key location No.3) begins to rise 8 hours into the storm event and peaks approximately 6 days 18 hours later. This is approximately 9 hours after the start of the formation of the breach at the dam which occurs 6 days 17 hours into the storm event.

For the two failure cases it is unlikely that there would be sufficient warning time to evacuate the population at risk. For the no failure case, evacuation may be possible.

Peak Flood Flows

Tables 9.7 to 9.9 summarise the peak flood flows at key locations.

Table 9.7: Sunny Day Failure Peak Flows

Stream	Location	Peak Flow (m^3/s)
Nogoa	1. Fairbairn Dam Tailwater	98 500
Nogoa	2. Selma Weir	79 640
Nogoa	3. Emerald – Capricorn Hwy	70 800
Nogoa	4. Emerald Town Weir	60 540
Nogoa	5. Bellmah	42 370
Nogoa	6. McCoskers Weir	36 270
Nogoa	7. Retreat Ck Junction	14 400
Nogoa	8. Bridge Flats Crossing	16 640
Nogoa	9. Crinum Ck Junction	4 190
Nogoa	10. Wyuna	4 740
Nogoa	11. Duckponds Homestead	4 640
Nogoa	12. Currimundi	10 140
Mackenzie	16. St Aubins	12 030
Mackenzie	17. Rileys Crossing	5 320
Mackenzie	18. Yackam	8 110
Mackenzie	19. Carnangarra	8 640

Table 9.8: Probable Maximum Flood - No Failure Peak Flows

Stream	Location	Peak Flow (m^3/s)
Nogoa	1. Fairbairn Dam Tailwater	16 735
Nogoa	2. Selma Weir	16 840
Nogoa	3. Emerald – Capricorn Hwy	16 830
Nogoa	4. Emerald Town Weir	16 830
Nogoa	5. Bellmah	10 610
Nogoa	6. McCoskers Weir	6 700
Nogoa	7. Retreat Ck Junction	10 260
Nogoa	8. Bridge Flats Crossing	16 360
Nogoa	9. Crinum Ck Junction	4 970
Nogoa	10. Wyuna	5 260

Nogoa	11. Duckponds Homestead	4 480
Nogoa	12. Currimundi	14 250
Mackenzie	16. St Aubins	21 710
Mackenzie	17. Rileys Crossing	6 520
Mackenzie	18. Yackam	13 850
Mackenzie	19. Carnangarra	21 640

Table 9.9: Probable Maximum Flood - Dam Failure Peak Flows

Stream	Location	Peak Flow (m^3/s)
Nogoa	1. Fairbairn Dam Tailwater	225 350
Nogoa	2. Selma Weir	167 700
Nogoa	3. Emerald – Capricorn Hwy	156 010
Nogoa	4. Emerald Town Weir	155 000
Nogoa	5. Bellmah	55 360
Nogoa	6. McCoskers Weir	28 290
Nogoa	7. Retreat Ck Junction	35 300
Nogoa	8. Bridge Flats Crossing	44 010
Nogoa	9. Crinum Ck Junction	8 670
Nogoa	10. Wyuna	8 130
Nogoa	11. Duckponds Homestead	13 540
Nogoa	12. Currimundi	35 760
Mackenzie	16. St Aubins	44 810
Mackenzie	17. Rileys Crossing	11 770
Mackenzie	18. Yackam	21 980
Mackenzie	19. Carnangarra	43 510

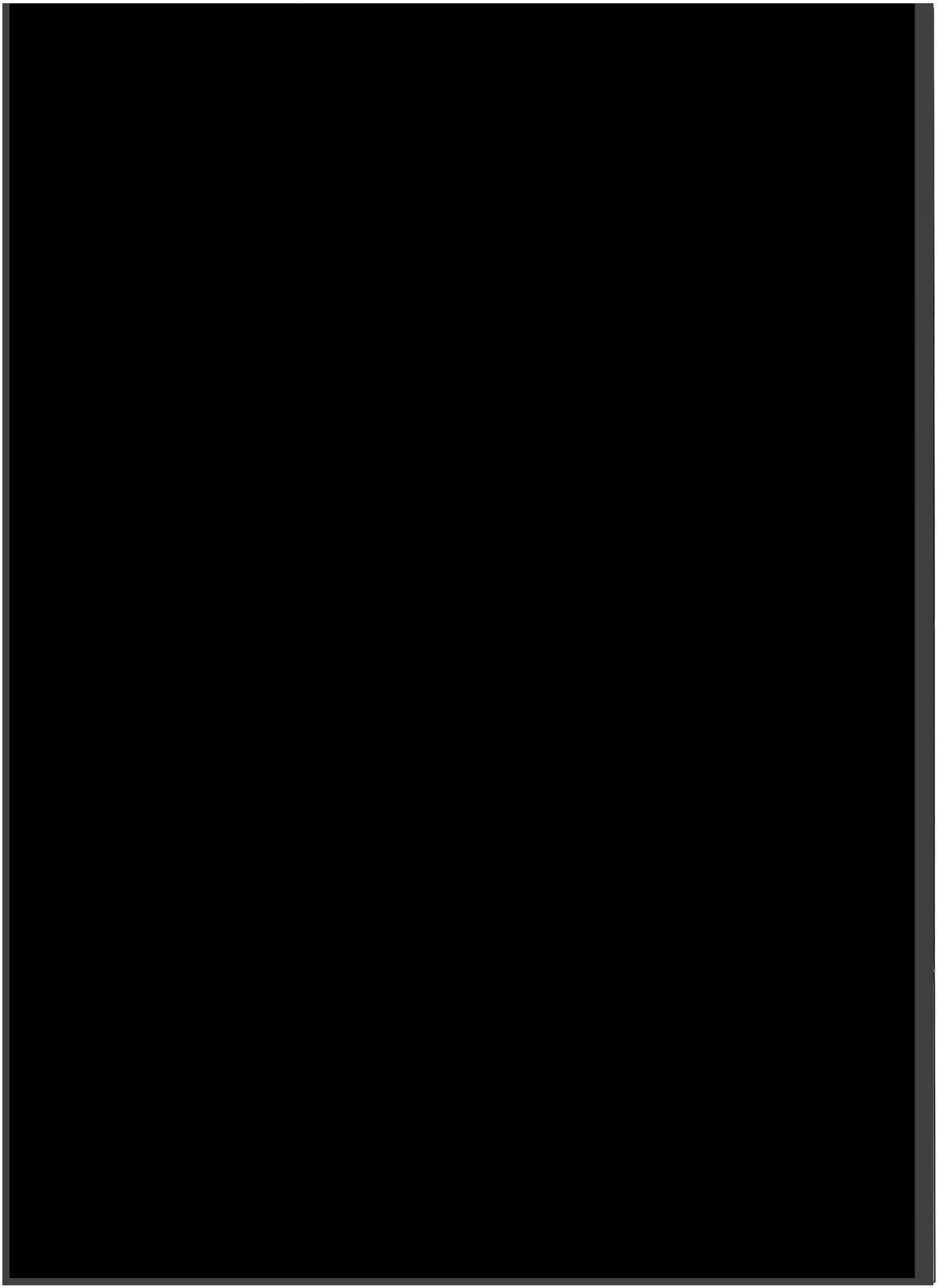
On the basis of the current design flood revision carried out for Fairbairn Dam, it is concluded that:

- The duration of the critical PMF event reduces to 96 hours compared with the 120 hour duration found in the 1994 study,
- The 96 hour PMF peak storage level shall increase by 0.76m to EL 218.59m AHD compared with the 120 hour PMF peak storage level (EL 217.83m AHD) estimated in the 1994 study,
- The 96 hour PMF peak storage level shall overtop the crest levels of saddle dams 1, 5 and 6 (EL 217.94m AHD) by 0.65m and 0.27m below the crest levels of the main embankment and saddle dams 2, 3 and 4 (EL 218.86m AHD).

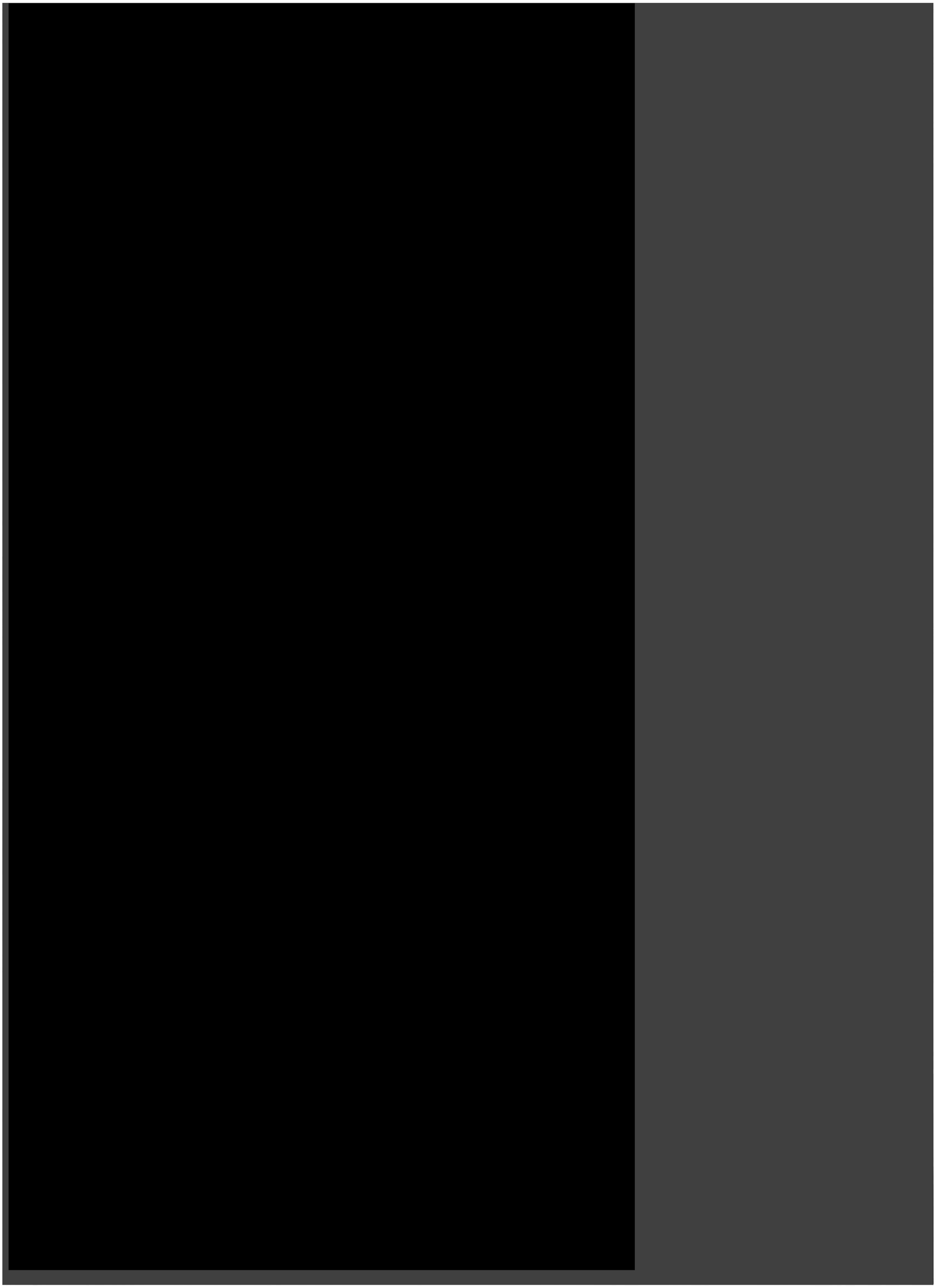
HYDROLOGICAL MODEL FLOODING IMPACTS STUDY SUMMARY

- The Sunny Day Failure Flood causes a similar extent of flooding to the PMF no failure flood. However, the Sunny Day Flood causes worse effects upstream close to the dam due the flood occurring more abruptly and with a higher peak. The PMF with failure causes by far the largest area of flooding over the whole area.
- The Capricorn Highway Road Bridge at Emerald would be inundated by 16.4m, 7.0m and 24.9m for the Sunny Day Failure, PMF with no failure, and PMF with failure events respectively. The Capricorn Highway Road Bridge at Comet would be inundated by 2.5m, 7.6m, and 14.7m for the same respective events. The Gregory Highway Road Bridge at Retreat Ck would be inundated by 1.6m, 2.6m, and 15.3m again, for the same respective events.
- For the Sunny Day Failure Flood, the water level at the Capricorn Highway at Emerald begins to rise approximately 2 hours after the start of the formation of the breach at the dam and peaks approximately 5½ hours later. For the PMF Flood with dam failure, the water level at the same location begins to rise 8 hours into the storm event and peaks approximately 9 hours after the start of the formation of the breach at the dam which occurs 6 days 17 hours into the storm event. For the failure cases it is unlikely that there would be sufficient warning time to evacuate the population at risk.
- For the Sunny Day and PMF failure cases the flood wave attenuates as it progresses downstream. In contrast, the PMF no failure flood shows an increase in peak flows resulting from the contribution of downstream tributary flows.
- Fairbairn Dam can safely pass a PMF event without overtopping.

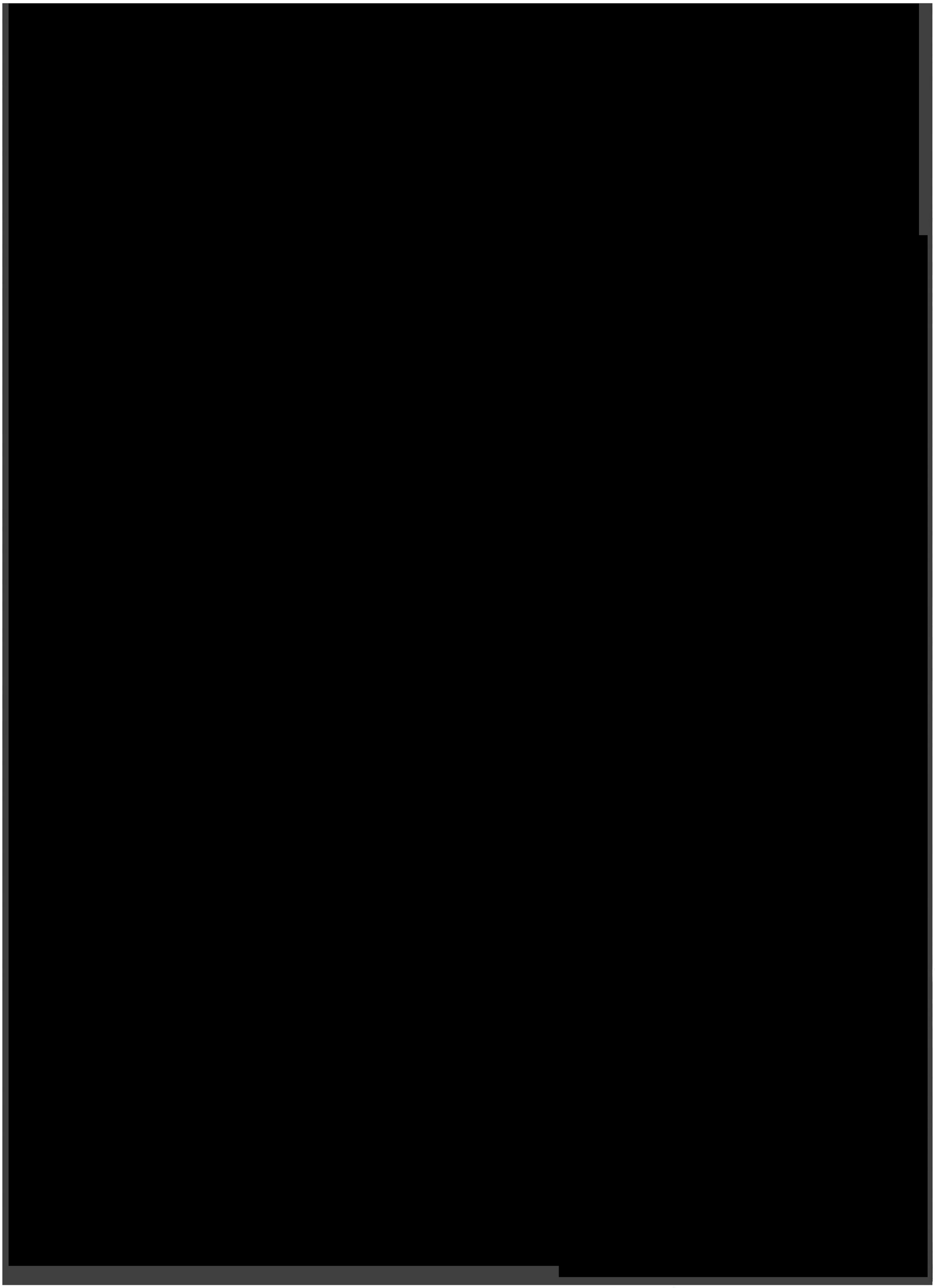
\G Projects\G-30004__Nogoa-Mackenzie WSS\01_Emerald Headworks\07_04 Fairbairn Dam EAP -eak2006\Drafting\AerialPhotos\225917.dwg
:3 Apr 2006 9:31 AM

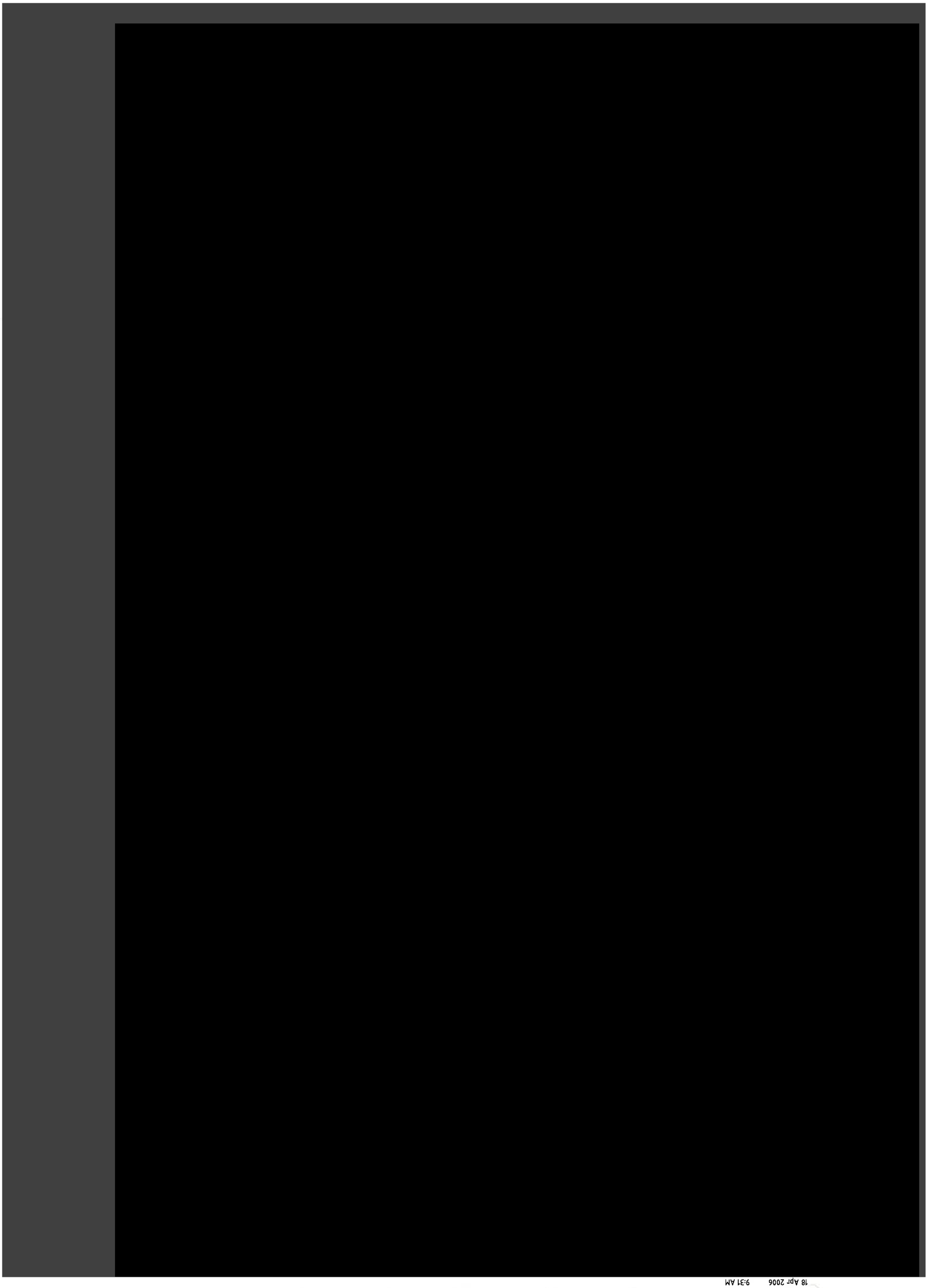


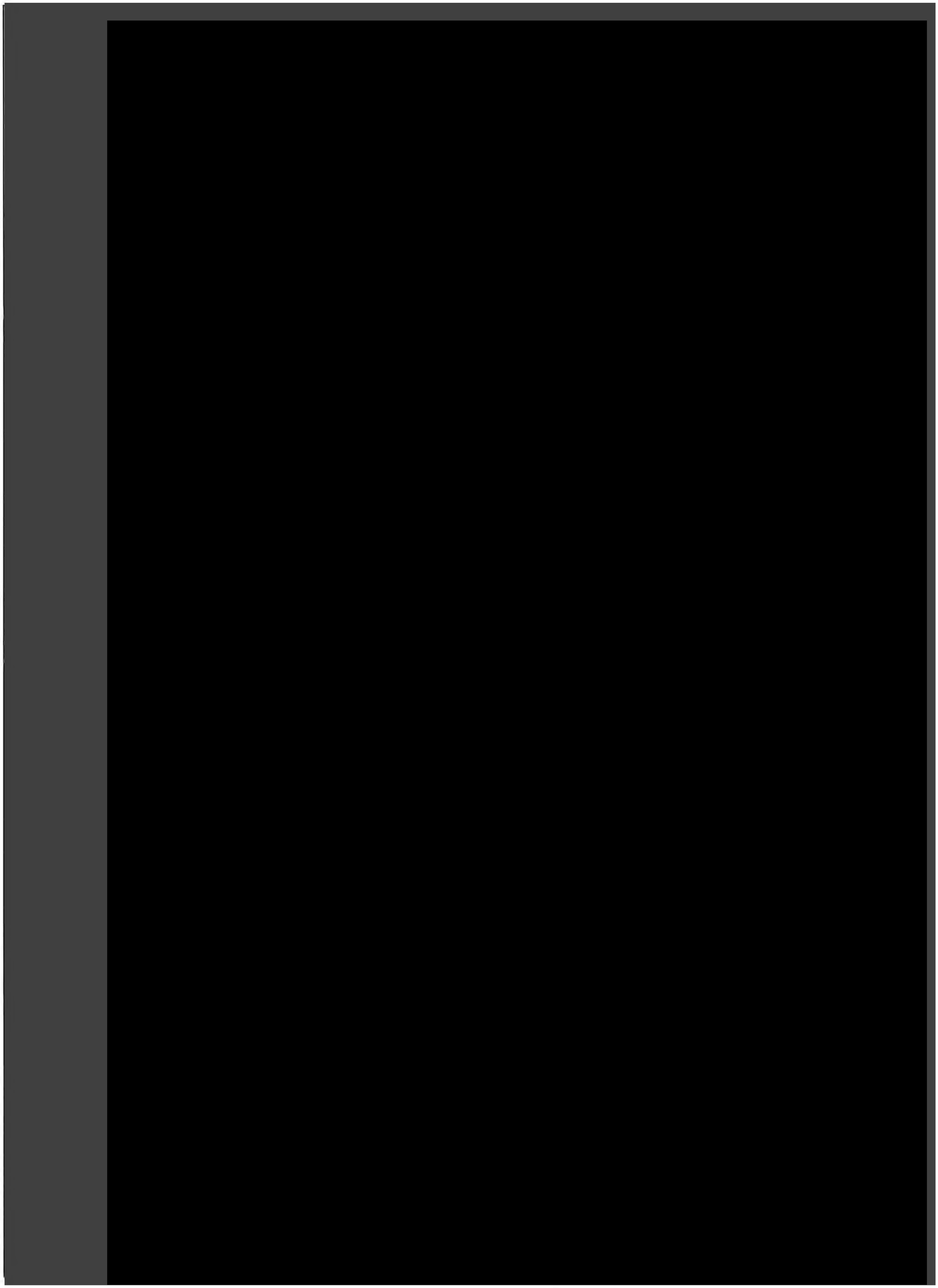
\G Projects\G-30004__Nogoa-Mackenzie WSS\01_Emerald Headworks\07_04 Fairbairn Dam EAP reak2006\Drafting\AerialPhotos\225917.dwg
18 Apr 2006 9:31 AM

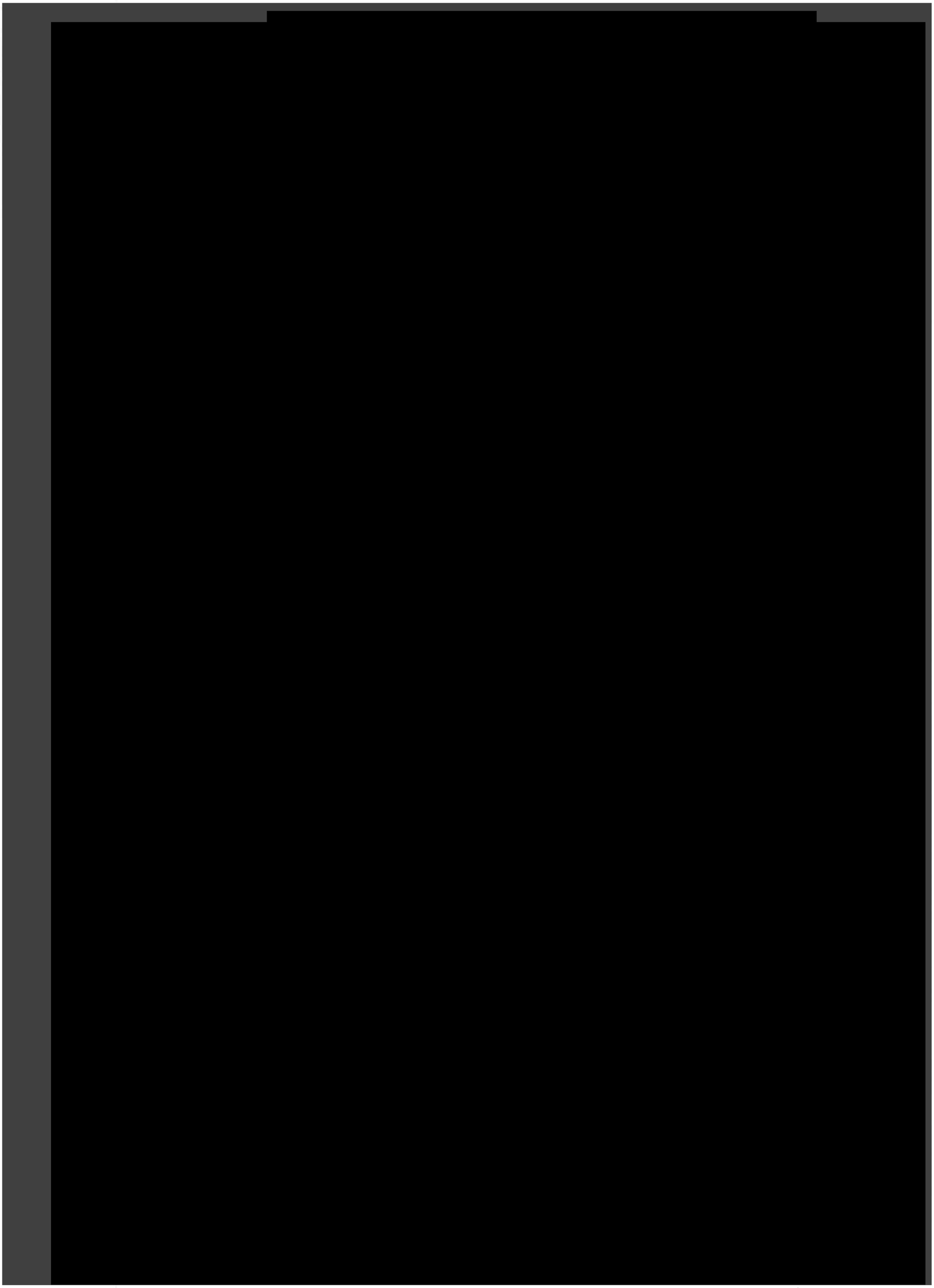


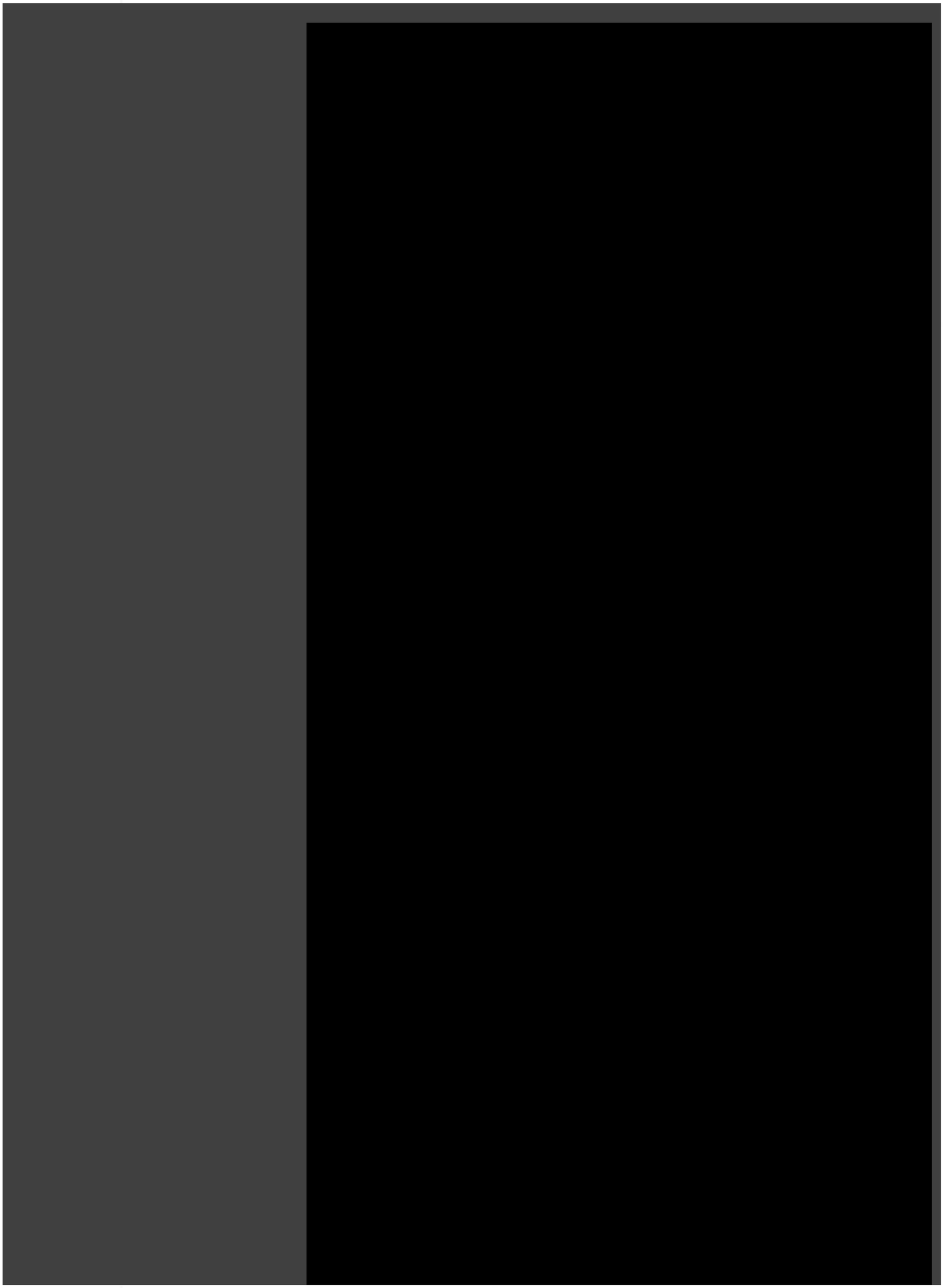
\G Projects\G-30004__Nogoa-Mackenzie WSS\01_Emerald Headworks\07_04 Fairbairn Dam EAF reak2006\Drafting\AerialPhotos\225917.dwg
18 Apr 2006 9:31 AM

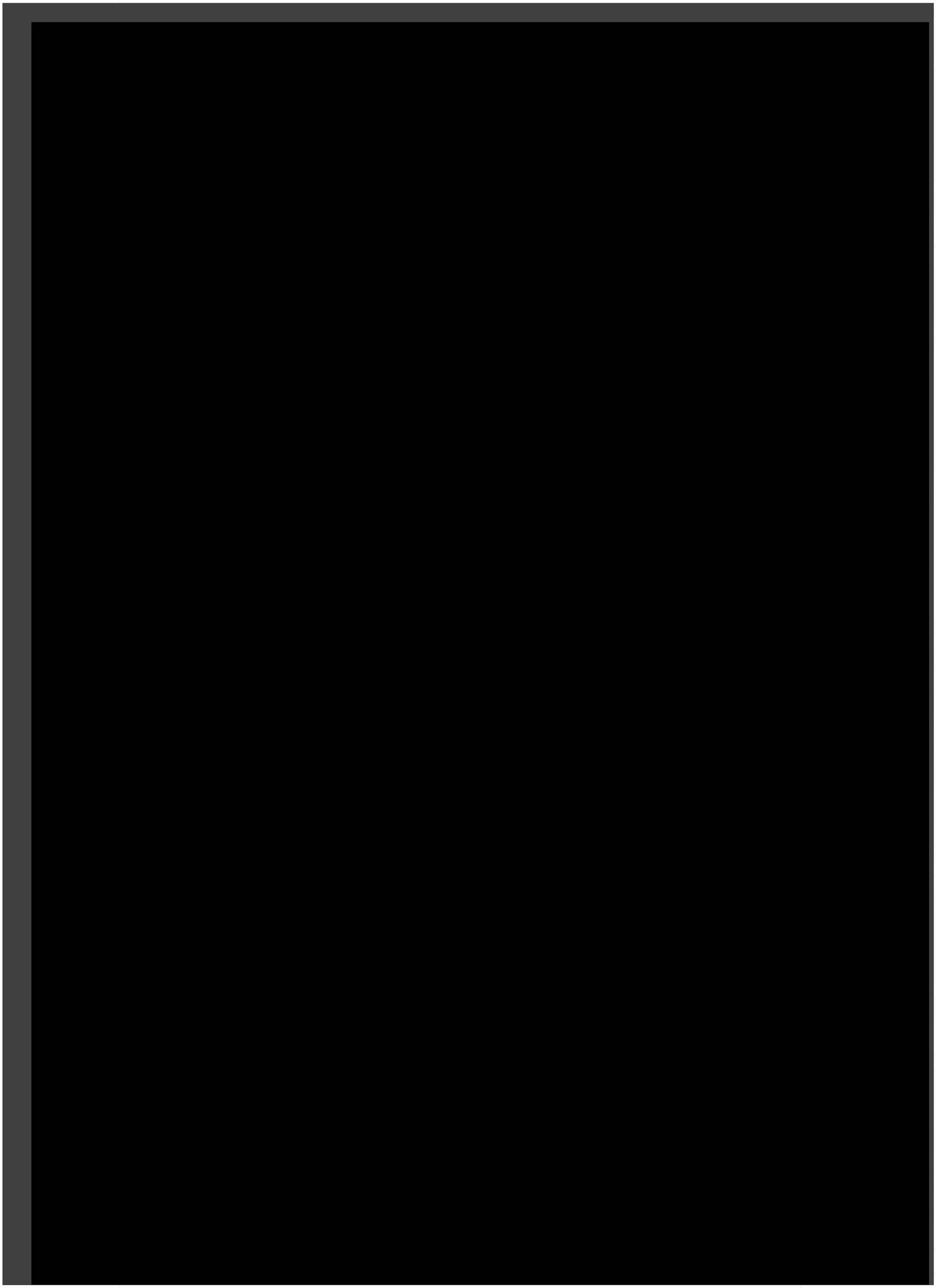




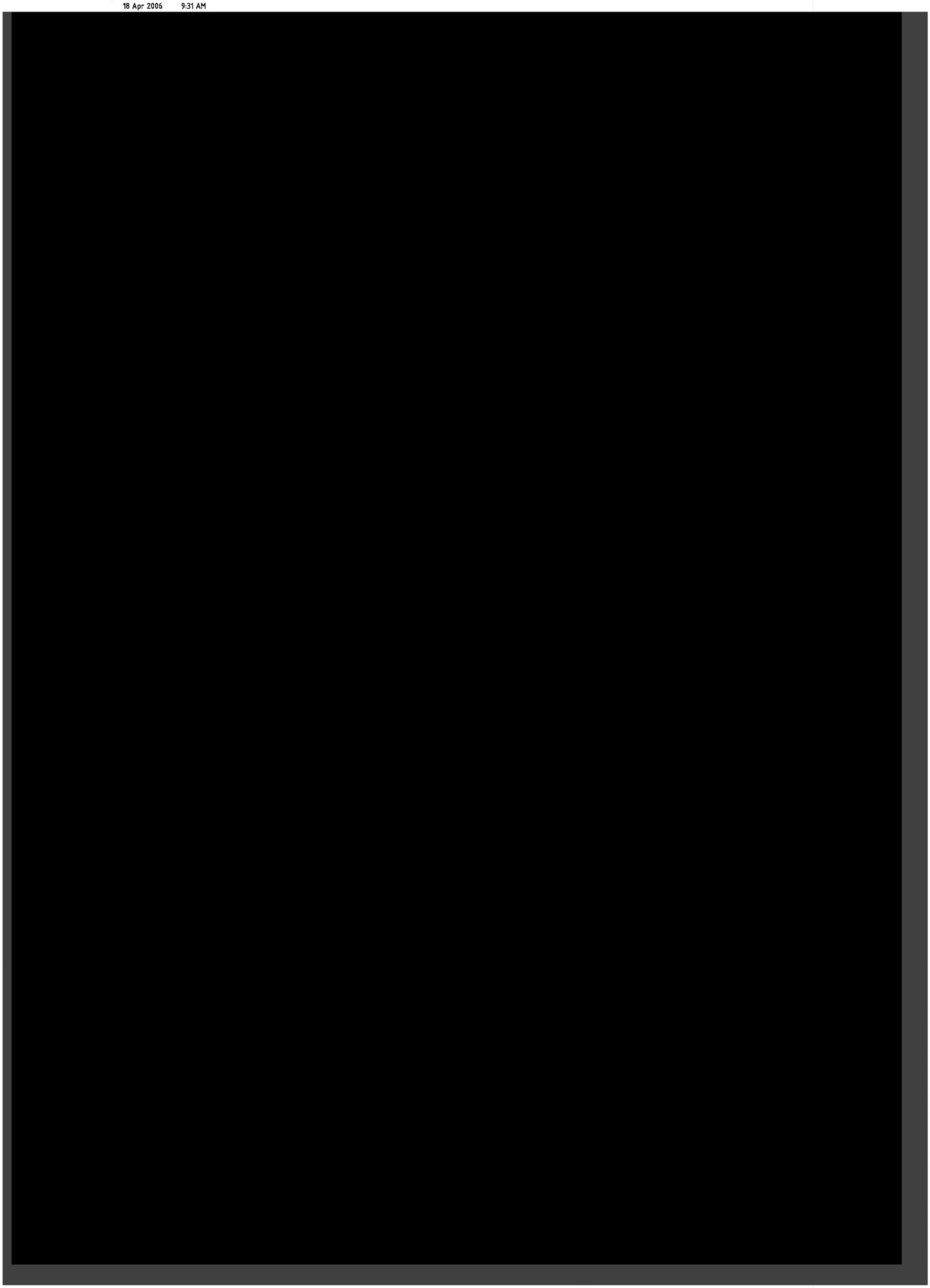








:\G Projects\G-30004__Nogoa-Mackenzie WSS\01_Emerald Headworks\07_04 Fairbairn Dam EAI reak2006\Drafting\AerialPhotos\225917.dwg
18 Apr 2006 9:31 AM



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

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 catchments 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 FAILURE"**
  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
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
SES	State Emergency Service
UHF	Ultra High Frequency
VHF	Very High Frequency
EL	Elevation Level
AEP	Annual Exceedence Probability
DCL	Dam Crest Level

EARTHQUAKE ASSESSMENT (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 wave oscillation of short to long durations.

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.
Un-braced 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 alleviated 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.

Earthquake Size

The Size of Earthquakes

Earthquakes vary enormously in the amount of energy released, over a range exceeding a million million. It is not possible to measure the energy release directly, so it must be computed from measurements of the amplitude of the ground vibrations.

Earthquake Magnitude

The best known method of describing the size of an earthquake is the Richter magnitude scale, ML. This takes the logarithm of the ground displacement as measured by a seismograph, and applies a correction to account for the distance from the earthquake to the seismograph.

The logarithmic nature of the scale means that for each unit of magnitude there is a ten-fold increase in ground displacement. This equates to an approximately thirty-fold increase in energy release for each unit increase in magnitude.

An ML 1 or 2 earthquake releases a similar amount of seismic energy as a typical quarry blast. An ML 5 earthquake releases about the same seismic energy as a 10,000 tonne equivalent nuclear blast, such as that used at Hiroshima.

The Richter magnitude scale is not the only way to measure earthquake size (in the same way as "wattage" is not the only way to measure the size of a light bulb) and a range of different magnitude scales have been defined (eg. MS, Mw, Mb, md). Each scale is defined to be consistent with other scales but exact consistency is not possible as each scale measures a different aspect of the earthquake energy spectrum. Magnitudes values can range from less than 0.0 to over 9.0.

Fault Dimensions

The area of a fault that ruptures in a particular earthquake correlates with the magnitude of the earthquake as do the rupture duration and rupture displacement. Typical values for these parameters are shown in the following table. Note that these are averages only and values for individual earthquakes may vary considerably.

Magnitude Mw	Fault area (km^2)	Dimensions (km x km)	Duration (s)	Displacement (m)
4	1	1 x 1	0.3	0.05
5	10	3 x 3	0.5	0.15
6	100	10 x 10	1.5	0.5
7	1000	30 x 30	5	1.5
8	10,000	50 x 200	30	10

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 Queensland 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.

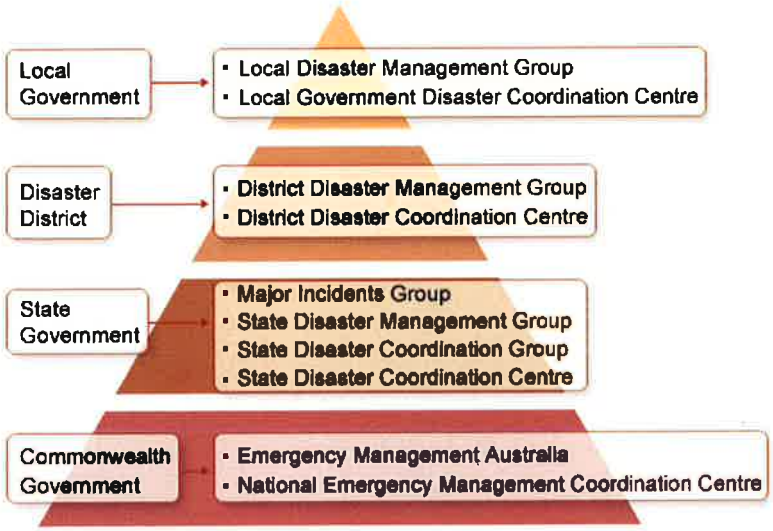


Figure 1 - The Queensland Disaster Management System

Description of the System

The Queensland Disaster Management System has three principal tiers that quickly provide both technical and tangible assistance to disaster stricken communities.

Management of a disaster at the community level is conducted by Local Government who are responsible for the implementation of their Local Disaster Management Plan. If Local Governments require additional resources to manage the event, they are able to request support from their Disaster District Coordinator. This allows for the rapid mobilisation of resources at a regional or district level. If Disaster Districts resources are inadequate or inappropriate, requests for assistance can be passed to State via the State Disaster Coordination Centre. Finally, when State resources are inadequate or inappropriate, support from the Commonwealth can be obtained via Emergency Management Australia (EMA).

Reference: http://www.disaster.qld.gov.au/about/

A brief summary of each of the key components of the Queensland Disaster Management System is set out below:

- **Local Disaster Management Group**. (Formerly called Local Government Counter Disaster Committee). Local Disaster Management Groups (local groups) coordinate the response to a disaster at a local level. The Committees are usually chaired by the Mayor and the Local Government Chief Executive Officer is usually the Executive Officer of the committee. Local Government Counter Disaster Committees develop and maintain Counter Disaster Plans for their Shire. These Local Government Committees are best placed to decide what resources are needed, when they are needed and how best to apply such resources so as to minimise hardship and suffering. They play a key role in the Queensland Disaster Management System.

- **District Disaster Management Group** (formerly called Disaster District Control Group). There are 23 Disaster Districts in Queensland which are based on the Police Districts. The senior Police Officer in each district is designated as the Disaster District Coordinator who Chairs a Disaster District Control Group. These Disaster District Control Groups comprise representatives from regionally-based Queensland Government departments who are able to provide and coordinate whole-of-government support to disaster stricken communities. The Disaster Districts perform a 'middle' management function within the Disaster Management System by providing coordinated State Government support when requested by Local Governments.

- **The State Disaster Coordination Group (SDCG)** is the working body of the State Disaster Management Group (State Group) at State-level. SDCG members are designated liaison officers from each of the Departments represented on the State Group. This Group is the primary mechanism through which coordinated whole-of-government State-level support is provided to disaster-stricken communities.

- **The State Disaster Management Group**. The State Disaster Management Group (State Group) is established as the principal organisation under the new Act for the purposes of disaster management throughout the State. It replaces the State Counter-Disaster Organisation and its executive, the Central Control Group. In particular, the State Group is responsible for disaster mitigation and disaster planning and preparation at a State level and for coordinating 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.

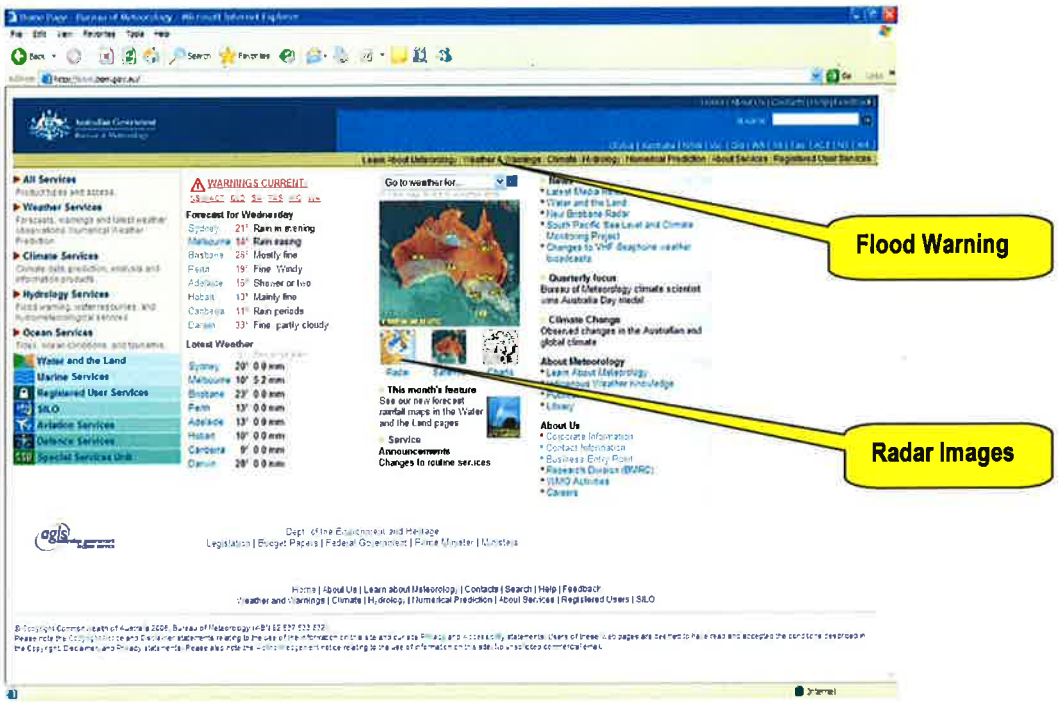
  The State Group comprises Chief Executive Officers (CEO's) from all Queensland Government Departments. The CEO of the Department of the Premier and Cabinet is the Chair, while the Executive Director of Counter Disaster and Rescue Services is the Executive Officer.

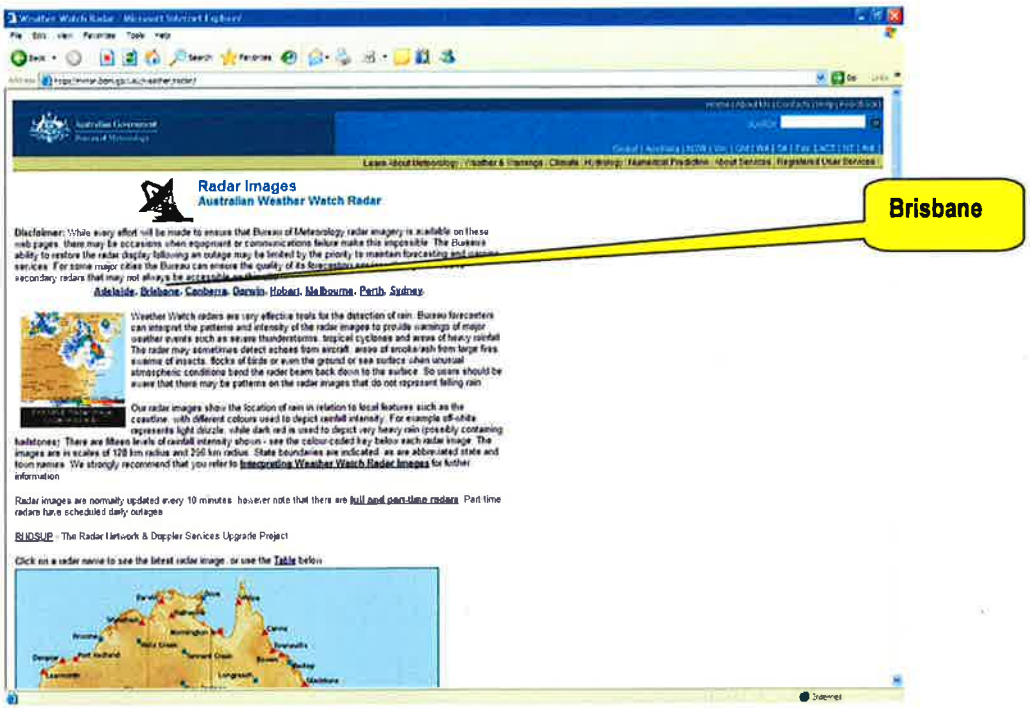
- **Major Incidents Group (MIG)**. The Queensland Government has established a MIG to provide high level Ministerial guidance and support in the event of a significant incident with major community consequences. Conceptually, membership of the MIG would be determined on an incident-by-incident basis and may include, but not be limited to:
  - Premier (Chair)
  - Treasurer
  - Attorney-General
  - Minister for Police
  - Minister for Emergency Services
  - Minister for Health

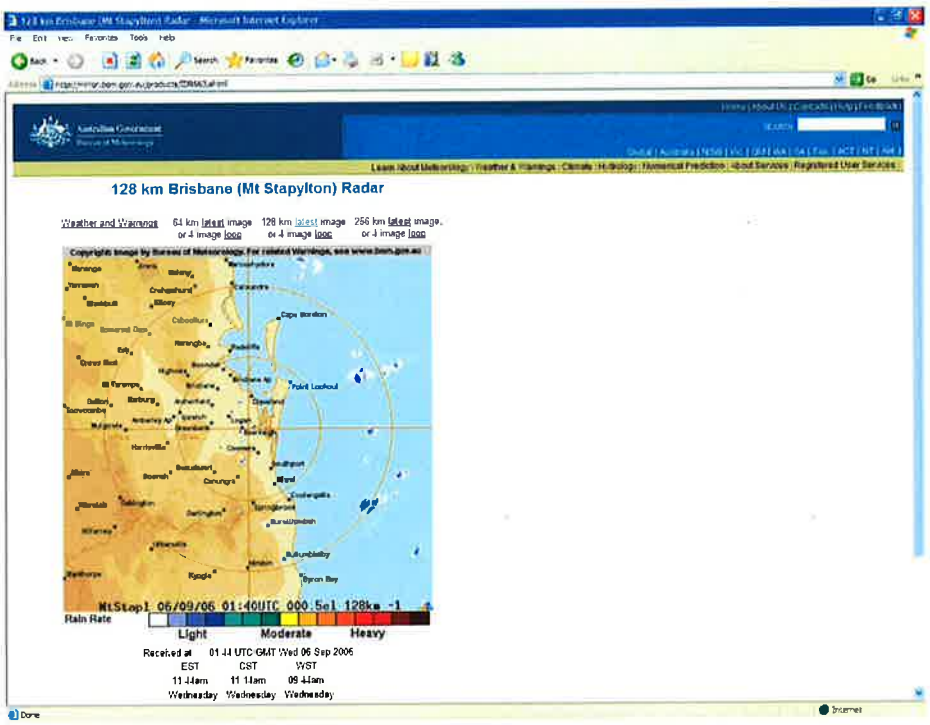
Reference: http://www.disaster.qld.gov.au/about/

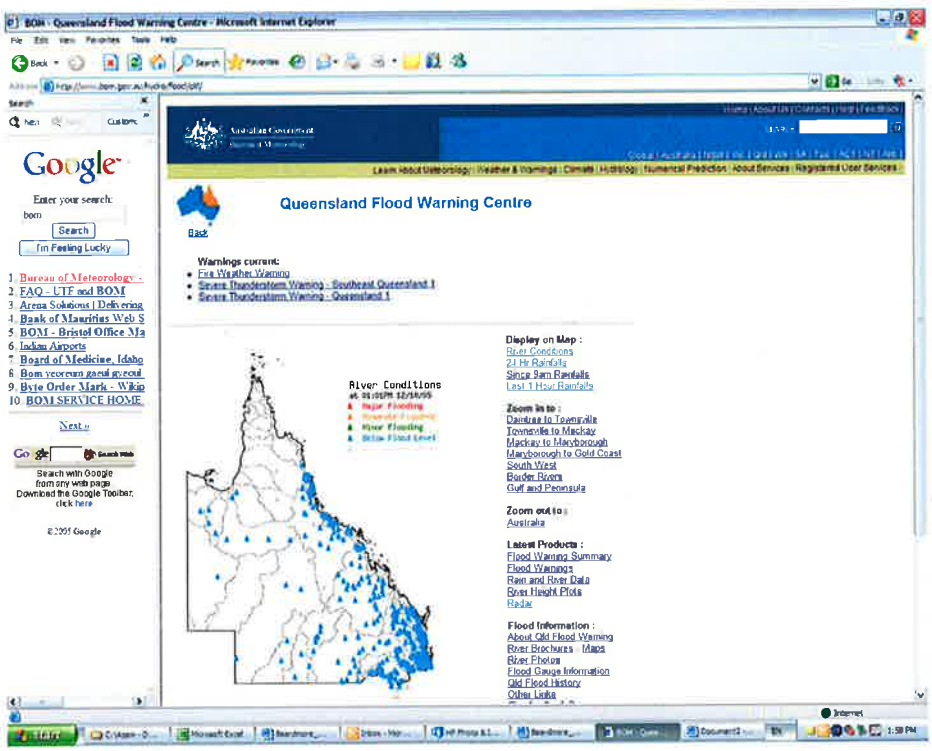
WEATHER INFORMATION (FLOOD WARNING)

Using the Internet
http://www.bom.gov.au/






128 km Brisbane (Mt Stapylton) Radar
Weather and Warnings
64 km latest image or 4 image loop
128 km latest image or 4 image loop
256 km latest image or 4 image loop
Rain Rate
Light
Moderate
Heavy


Google
Enter your search:
Search
I'm Feeling Lucky
Queensland Flood Warning Centre
Warnings current:
River Conditions
Display on Map :
Zoom in to :
Zoom out to :
Latest Products :
Flood Information :