DAM SAFETY EMERGENCY PLAN (DSEP)

Narrabri Coal Operations - Rail Loop Dams

Prepared for:

Whitehaven Coal Limited
10 Kurrajong Creek Rd
Baan Baa NSW 2390

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BASIS OF REPORT

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
622.11156-R01-v1.0	9 August 2019	Danielle O'Toole	Anthony Rayner	Danielle O'Toole

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DOCUMENT REFERENCES

TABLES

APPENDICES

1 BACKGROUND INFORMATION

1.1 Dam Owner

Whitehaven Coal Limited

[Narrabri Coal Operations (NCO)]

10 Kurrajong Creek Rd

Baan Baa, NSW, 2390, Australia.

1.2 Dam Description

The Rail Loop Dams are made up of 7 dams A1, A2, A3, B1, B2, C and D. The NSW Dam Safety Committee (DSC) has prescribed the Dams as one overall dam structure. The dams cover a total area of 21.4 Ha with a total combined capacity of approximately 700 ML.

Table 1: Dam Description

Dam	Type	Max Height (m)	Storage Volume ML (to Spillway)	Catchment Area (Ha) – Direct Rainfall Only as 'Turkeys Nest'	Spills to
A1	Zoned Earthfill, HDPE membrane lining (except D), turkeys nest	7.5	127.6	3.6	B2
A2		7.5	30.0	1.2	A1
A3		7.5	32.0	1.1	A2
B1		8.2	39.4	1.9	C
B2		8.2	158.0	5.8	C
C		8.2	208.9	8.5	D
D		5.0	136.8	5.4	Containment

1.3 Consequence Category

The DSC has prescribed the Dams as one overall dam structure, with a **Significant** Consequence Category.

1.4 Guidelines

This Dam Safety Emergency Plan (DSEP) has been developed in general accordance with the DSC *DSC2G Emergency Management for Dams Guidelines*. A summary information sheet is included in **Appendix D** and the DSC2G is included in **Appendix E** for reference.

The DSC requires that the DSEP forms an important, yet separate, adjunct to the **WHC-STD-NAR-Dam Operation and Monitoring Manual** (OMM) for the dams and should be rigorously implemented by NCO in conjunction with the OMM.

This DSEP outlines the required actions of NCO and their personnel at the Dams in response to a range of possible emergency situations.

1.5 Hydraulic Conditions

The following hydraulic conditions apply to Significant dams:

- The acceptable flood capacity (AFC) is the 1 in 10,000 annual exceedance probability (AEP) event. That is, the spillways need to convey a flood of this magnitude without being overtopped.
- The DSC must be formally notified immediately where the AEP of the dam crest flood is found from a hydrological review to be greater than the 1 in 1,000 AEP.

NCO commissioned a hydraulic study of the Dam to determine the conveyance capacity for the spillway pipes between each of the individual dam cells for:

- The 1 in 1,000 AEP event;
- The 1 in 10,000 AEP event; and
- The Probable Maximum Flood (PMF).

The results of the study indicated that Dam B2, Dam C and Dam D did not have sufficient freeboard for the 1 in 10,000 AEP event, when a allowing for 200 mm of additional freeboard for wave run-up during peak level under the 1 in 10,000 AEP event.

It was recommended to increase the capacity of the outlet pipes to increase the freeboard for Dam B2 and Dam D and prevent an overflow for Dam C.

The following pipe upgrades have since been completed:

- Dam B2 - increased the minimum pipe diameter (internal) to 0.45 m.
- Dam C – duplicated existing 0.35 m (internal) pipe. and;
- Dam D – duplicated existing 0.45m (Internal) pipe.

This pipe upgrades are now expected to provide a minimum of a 0.2m freeboard prevent the dams from overflowing under the 1 in 10,000 AEP event.

1.6 Sunny Day Failure

A dam break at the Rail Loop A1,2,3, B1,2, C and D Dams may result in the uncontrolled flow of water into the containment bund. Overfilling of a dam or dam(s) in combination with other adverse conditions is considered as a possible dam failure trigger.

The **WHC-STD-NAR-Dam Operation and Monitoring Manual** for the Dams will be followed to ensure that the likelihood of failure of the dam is minimised.

Should a dam break occur (“Sunny Day Failure”), i.e. the containment bund is breached, the direction of flow would likely be to the east toward two minor un-named tributaries which converge at Kurrajong Creek approximately 700 m east of the Kamilaroi Highway. It is anticipated that inundation may:

- Feature localised concentration of flow near minor tributaries;

- Possibly impact access along Kurrajong Creek Road and the Kamilaroi highway;
- Possibly impact residences located:
    - East of Kamilaroi Highway, approximately 550m north of intersection with Kurrajong Creek Road;
    - At the intersection between Kurrajong Creek Road and the Kamilaroi highway.

It is considered extremely unlikely that there would be any risk to life within these potential dam break areas.

2 ALERT LEVELS

Table 2: Alert Levels

Alert Level	Conditions	Response
White	Potential incident detected	Preliminary alert to SES only
Amber	Failure possible if storage continues rising or structural defect not fixed	SES Evacuation Warning
Red	Failure imminent or occurred	SES Evacuation Order

3 RESPONSIBILITIES

The NCO DSC trained personnel are responsible for the Dams scheduled and non-scheduled inspections.

The Dams Engineer (specialist consultant appointed by NCO) is responsible for annual and 5-yearly inspections of the Dams, and review and update of this DSEP.

The NCO DSC trained personnel will immediately notify the NCO Surface Operations Manager (or delegate) of any incident considered to be an immediate safety or environmental concern. The NCO Surface Operations Manager (or delegate) will determine if it is necessary to invoke the DSEP.

4 NOTIFICATION PROTOCOL

The emergency conditions which may occur, and the associated actions are as follows:

Table 3: Triggers and Actions

Incident	Incident Indicator	Actions
OVERFILLING	Water is flowing through the spillway pipe	Civil Services Coordinator to commence drawdown operations if possible. Surface Operations Manager (or delegate) to consult with Dams Engineer and, if assessed to be appropriate, notify SES of a **White Alert**.
	Water is above the spillway pipe	Civil Services Coordinator to: • commence drawdown operations if possible. • conduct regular inspection of dam to detect signs of potential dam failure. Surface Operations Manager (or delegate) to notify SES and other authorities (as per flow chart in **Appendix C**) of an **Amber Alert**.
SEEPAGE	Evidence of concentrated seepage of turbid or sediment-laden water	Civil Services Coordinator to commence drawdown operations if possible. Surface Operations Manager (or delegate) to consult with Dams Engineer and, if assessed to be appropriate, notify SES of a **White Alert**.
	Evidence of concentrated seepage of turbid or sediment-lade water with sufficient flow resulting in off site discharge. or Water surface disturbance such as whirlpools (vortices) (probably associated with significant downstream leakage, soft spots or boggy areas)	Civil Services Coordinator to: • commence drawdown operations if possible. • conduct regular inspection of dam to detect signs of potential dam failure. Surface Operations Manager (or delegate) to notify SES and other authorities (as per flow chart in **Appendix C**) of an **Amber Alert**.
STRUCTURAL FAILURE	Defects observed in embankments (cracking, slumping etc.) or spillways	Civil Services Coordinator to implement monitoring system to identify extent of defect movement. Surface Operations Manager (or delegate) to consult with Dams Engineer and, if assessed to be appropriate, notify SES of a **White Alert**.
EARTHQUAKE EVENT	Earthquake event that is: • Felt by staff. • Notified by a person as having been felt in the vicinity of the site. • Advice from an external Authority that an earthquake has been recorded in the area	Civil Services Coordinator to conduct a general overall visual examination of the dam regardless of the time of day. If safe to do so, obtain storage water level, discharge rate, evidence of cracking and / or leakage and any other relevant data. Surface Operations Manager (or delegate) to consult with Dams Engineer and, if assessed to be appropriate, notify SES of a **White Alert**, or SES and other authorities (as per flow chart in **Appendix C**) of an **Amber Alert.**

A notification procedure flowchart is shown in **Appendix C**. A contact list for emergency notification is included in **Appendix B**.

5 ATTENDANCE RESPONSIBILITIES

5.1 Access Routes

The site can be accessed from Baan Baa, 9.5km to the South, or from Narrabri, 28.5km to the North.

- From Baan Baa: heading north along Kamilaroi Highway 9.5km, turn left into Kurrajong Creek Road and the mine site is 1 km on the right.
- From Narrabri: heading south along Kamilaroi Highway 28.5km, turn right into Kurrajong Creek Road and the mine site is 1 km on the right.
- The mine access roads are shown in **Appendix A**.

Surrounding low-lying property located to the south and east of the site can be accessed from:

- Kurrajong Creek Road near the intersection with Kamilaroi Highway (south)
- Kamilaroi Highway, 550 m north of the intersection with Kurrajong Creek Road (east)

5.2 Available Surveillance Information

All inspection reports and surveillance data will be kept by NCO and made readily available. These will include:

- Routine Inspection and Monitoring Checklists.
- Intermediate (Annual) Inspection Reports.
- Comprehensive (5-yearly) Inspection Reports.
- Non-Scheduled Inspection Reports.
- Incident Report Forms.

6 REMEDIAL AND PREVENTATIVE MEASURES

6.1 Inspections and Monitoring

The Rail Loop Dams **WHC-STD-NAR-Dam Operation and Monitoring Manual** outlines requirements for weekly, monthly, quarterly, annual and 5- yearly inspection and monitoring requirements. These activities are intended to provide early warning of any conditions which could potentially lead to the development of an emergency situation.

6.2 Immediate Emergency Repair Tasks

Potential immediate response tasks include:

Table 4 Immediate Emergency Repairs Examples

Potential Problem	Solution	Tasks	Time to Mobilise	Resources to Mobilise
Spillway blockage at inlet or outlet	Unblock spillway	Excavate to remove blockage, dump material away from dam facility	2 Hours	Excavator
Overtopping of dam embankment	Provide Crest Extension	Place clay based material, waste rock or HDPE sheets to downstream side of crest and embankment to prevent erosion.	4 Hours	Clay material, waste rock, tip truck, loader or excavator
Piping Through embankment foundation or abutments	Plug the flow lower water level	Plug the flow with whatever material is available (bentonite or plastic sheeting if the entrance to the leak is in the reservoir basin). Lower the water level until the flow decreases to a non-erosive velocity or until it stops. Place protective sand and gravel filter over the exit area to hold materials in place. Continue lowering the water level until a safe elevation is reached. Continue operating at a reduced level until repairs can be made.	2 Hours	Pumps, excavator, loader, sand / gravel, bentonite / plastic sheeting
Slide on upstream or downstream slope of Embankment	Lower water level and stabilise slide	Lower the water level at a rate and to an elevation considered safe given the slide condition. If the outlet is damaged or blocked, pumping, siphoning or a controlled breach may be required. Restore lost freeboard if required by placing sandbags or filling in the top of the slide. Stabilize slides on the downstream slope by weighting the toe area with additional soil, rock or gravel	2 Hours	Pumps, clay material, waste rock, tip truck, loader or excavator

7 REFERENCES

ANCOLD (2003) *Australian National Committee on Large Dams Guidelines on Dam Safety Management*, 2003.

BOM (2016) Design Rainfall Data System http://www.bom.gov.au/water/designRainfalls/revised-ifd/?multipoint

DSC (2010a) *Surveillance Reports for Dams' New South Wales Dams Safety Committee Guidance Sheet DSC2C*, June 2010.

DSC (2010b) *Operation and Maintenance for Dams' New South Wales Dams Safety Committee Guidance Sheet DSC2F*, June 2010.

DSC (2010c) *Emergency Management for Dams' New South Wales Dams Safety Committee Guidance Sheet DSC2G*, June 2010.

DSC (2010d) *Acceptable Flood Capacity for Dams' New South Wales Dams Safety Committee Guidance Sheet DSC3B*, June 2010.

URS. (2010). *As Built Report, Narrabri Coal Evaporation and Storage Dams.*
WRM. (2019). *Narrabri Coal Rail Loop Dams, Spillway Conveyance Capacity Assessment .*

Whitehaven (2013) *WHC_PLN_NAR Water Management Plan*, prepared by URS on behalf of Narrabri Coal Operations, March 2013.

APPENDIX A

SITE ACCESS ROAD PLAN

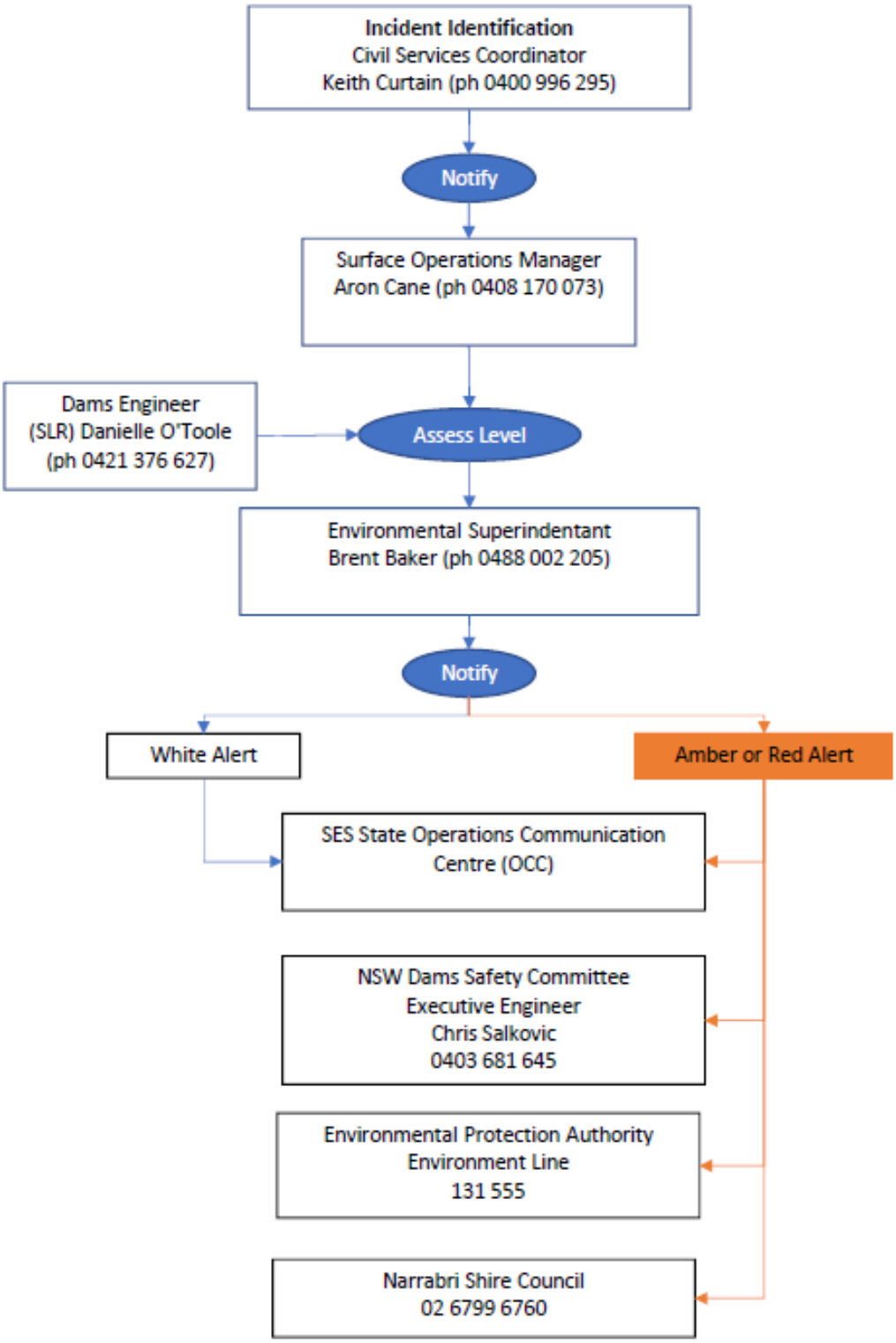
APPENDIX B

CONTACT LIST

Company & Role	Name	Telephone	Mobile	Email
State Emergency Services Operations Communication Centre		1300 737 326		
NSW Dams Safety Committee Executive Engineer	Chris Salkovic	02 9842 8070	0403 681 645	chris.salkovic@damsafety.nsw.gov.au
NSW Dams Safety Committee Executive Engineer (emergency back up only)	Norman Himsley		0412 279 264	norman.himsley@damsafety.nsw.gov.au
Environment Protection Authority, Environment Line		131 555		
Narrabri Local Shire (if road closures required)		02 6799 6760		
NCO Surface Operations Manager	Aron Cane	02 6794 4153	0408 170 073	acane@whitehavencoal.com.au
NCO Civil Services Coordinator	Keith Curtain	02 6794 4755	0400 996 295	kcurtain@whitehavencoal.com.au
NCO Environmental Superintendent	Brent Baker	02 6794 4167	0488 002 205	bbaker@whitehavencoal.com.au
SLR Representative (Dams Engineer)	Danielle O'Toole	07 4722 8020	0421 376 627	dotoole@slrconsulting.com

APPENDIX C

NOTIFICATION FLOWCHART



APPENDIX D

RAIL LOOP DAMS SUMMARY INFORMATION SHEET

Background Information

Dam Owner: Whitehaven Coal Limited

Location: Narrabri Coal Mine 10 Kurrajong Creek Rd, Baan Baa, NSW, 2390, Australia.

Dam Type and Size: Seven zoned Earth fill, HDPE membrane lined (except D), turkeys nest dams with total storage capacity of 700 ML, max height of 8 m

Consequence Category: Significant

Alert Levels

Alert Level	Conditions	Response
White	Potential incident detected	Preliminary alert to SES only
Amber	Failure possible if storage continues rising or structural defect not fixed	SES Evacuation Warning
Red	Failure imminent or occurred	SES Evacuation Order

Notification Protocols

The NCO Civil Services Coordinator will immediately notify the NCO Surface Operations Manager (or delegate) of any incident considered to be an immediate safety or environmental concern.

The NCO Surface Operations Manager (or delegate) will determine if it is necessary to invoke the Dam Safety Emergency Plan.

Refer to **Section 4 NOTIFICATION PROTOCOL** for a full breakdown of notification protocols

Consequence of Dam Failure

A dam break at the Rail Loop A1,2,3, B1,2, C and D Dams may result in the uncontrolled flow of water into the containment bund. Overfilling of a dam or dam(s) in combination with other adverse conditions is considered as a possible dam failure trigger.

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- Possibly impact residences located:
- East of Kamilaroi Highway, approximately 550m north of intersection with Kurrajong Creek Road;
- At the intersection between Kurrajong Creek Road and the Kamilaroi highway.

It is considered extremely unlikely that there would be any risk to life within these potential dam break areas.

APPENDIX E

DSC2G EMERGENCY MANAGEMENT FOR DAMS

ASIA PACIFIC OFFICES

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