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ENVIRONMENTAL SOLUTIONS

CENTRAL NORTH EXTENSION
RESPONSE TO INFORMATION REQUEST

PREPARED FOR

JELLINBAH GROUP PTY LTD

ON BEHALF OF THE JELLINBAH EAST JOINT VENTURE

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LIST OF ABBREVIATIONS

AARC	AustralAsian Resource Consultants Pty Ltd
AEP	annual exceedance probability
AMD	acid mine drainage
ARI	average recurrence interval
CHPP	Coal Handling and Processing Plant
DNRM	Department of Natural Resources and Mines
EA	Environmental Authority
EC	electrical conductivity
EHP	Department of Environment and Heritage Protection
EP Act	*Environmental Protection Act 1994*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ha	hectare(s)
JBT	JBT Consulting Pty Ltd
JEJV	Jellinbah East Joint Venture
Jellinbah	Jellinbah Group Pty Ltd
km	kilometre(s)
L/s	litre(s) per second
m	metre(s)
m^2	square metre(s)
m^3	cubic metre(s)
MAW	mine-affected water
mbgl	metre(s) below ground level
ML	Mining Lease
MLA	Mining Lease Application
mRL	metres (reduced level)

MSES	Matter(s) of State Environmental Significance
Mt	million tonnes
Mtpa	million tonnes per annum
MWMS	Mine Water Management System
Project	Jellinbah Coal Mine
RE	Regional Ecosystem
REMP	Receiving Environment Monitoring Program
RL	reduced level
ROM	run of mine
SWL	standing water level
UDP Group	UDP
µS/cm	micro-Siemens per centimetre

1.0 INTRODUCTION

AustralAsian Resource Consultants Pty Ltd (AARC) was commissioned by Jellinbah Group Pty Ltd (Jellinbah), on behalf of the Jellinbah East Joint Venture (JEJV), to prepare this Response to Information Request for the proposed Central North Extension of the Jellinbah Coal Mine (the Project). This document addresses the Information Request made by the Department of Environment and Heritage Protection (EHP) on 15th September 2015 and supplements the Environmental Authority (EA) Amendment Application for the Central North Extension.

1.1 BACKGROUND

The Jellinbah Coal Mine is located in the Bowen Basin in Central Queensland. The operational area of the existing mine is located approximately 24 kilometres (km) north-north-east of Blackwater and 190 km west of Rockhampton, within the Central Highlands Regional Council area. The currently undeveloped Mackenzie North area, encompassing the area over and to the north of the Mackenzie River, is located within the Isaac Regional Council area.

The Jellinbah Coal Mine is currently authorised by EA EPML00516813, which took effect on 23rd February 2016. The existing Project encompasses 14 approved Mining Leases (MLs) comprising the following approved areas:

- Mackenzie North (approved);
- Jellinbah Plains (operational);
- Central North (approved);
- Jellinbah Central (operational); and
- Jellinbah South (not currently operational).

Jellinbah also holds three Mining Lease Applications (MLAs) relating to the Central North Extension: MLA 700011, MLA 700012 and MLA 700013.

1.1.1 Proposed Central North Extension

The proposed amendment involves the extension of the approved Central North operation into three new MLAs (as shown in Figure 1), encompassing a total area of 805 hectares (ha). The purpose of the Central North Extension is to extend approved mining activities further to the east and expand the area available for spoil dumping and topsoil placement. No changes to the currently approved mining methods or production rates are proposed. The amendment consists of two components:

1. Extension of the approved Central North pit into MLA 700011, located east of ML 80068; and
2. Placement of spoil and topsoil in MLA 700012 and MLA 700013, located west of ML 80068.

Coal mining will only be conducted in MLA 700011. The production life for the Jellinbah Central North operation, including the proposed Extension, is anticipated to be greater than 20 years based on current economic assessment of the resource. Development of the Central North Extension will involve construction and operation of the following major elements:

- Extension of approved open-cut mining excavations (Central North) to the east;

- Access / haul roads;
- Sediment dams and drains for water management; and
- Topsoil stockpiling and spoil dumping.

Figure 1 indicates the proposed amendment in relation to the Jellinbah Coal Mine. Figure 2 shows the conceptual layout of the Central North Extension.

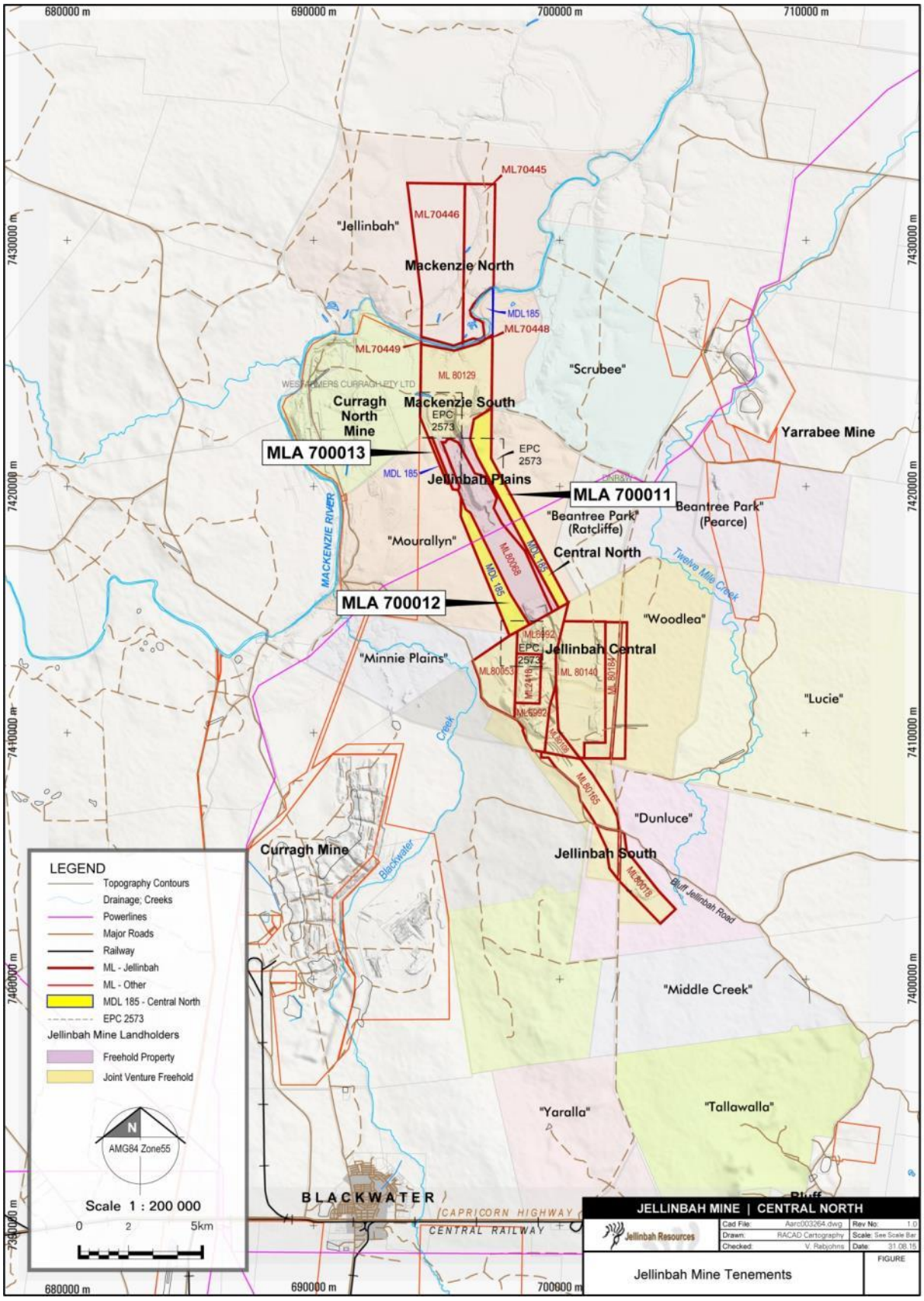


Figure 1 Central North Extension and the Jellinbah Coal Mine

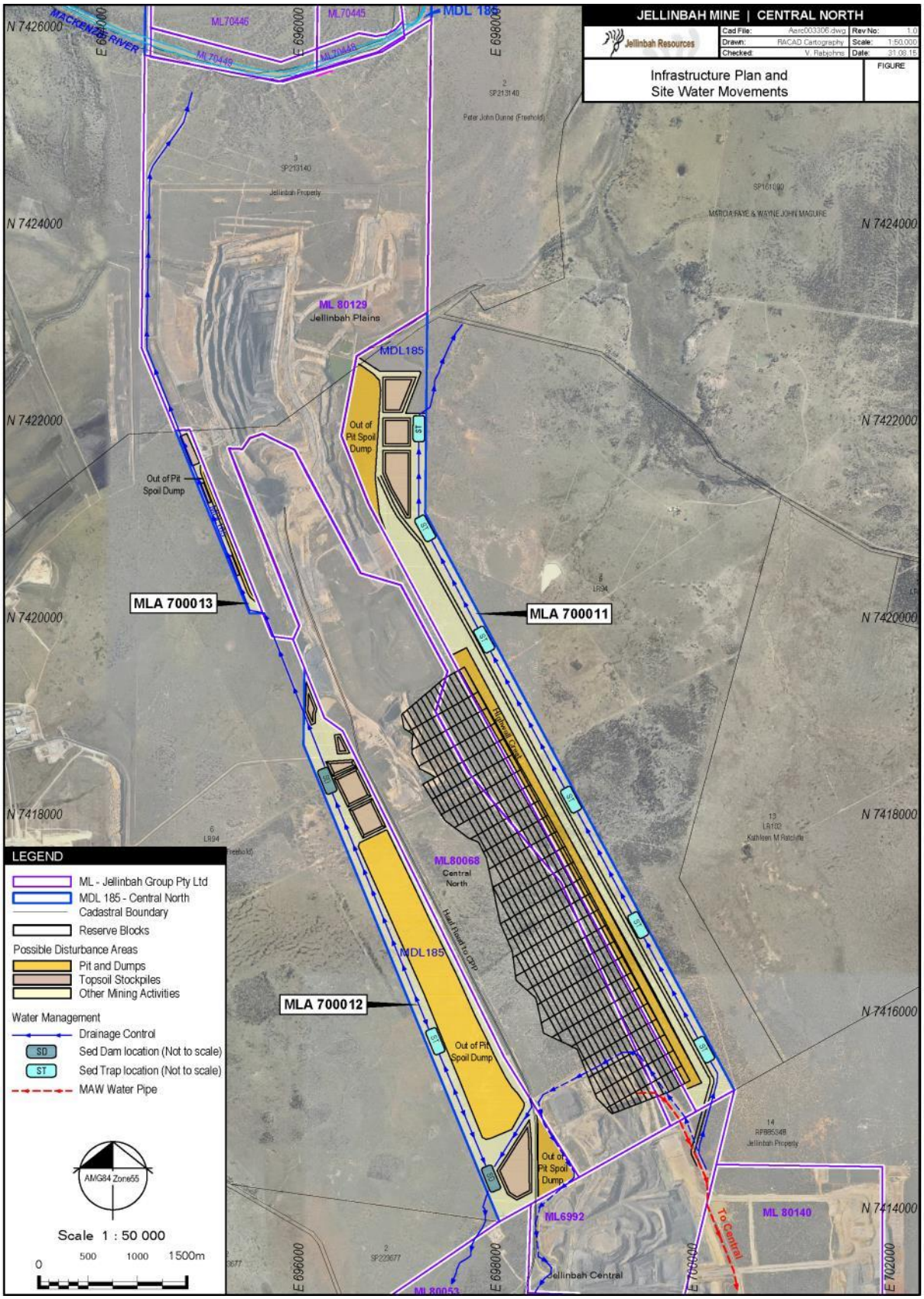


Figure 2 Conceptual Layout and Water Management at the Central North Extension

1.1.2 Amendment Application

The original EA Amendment Application was received by EHP on 4th August 2015. A change to application was subsequently submitted on 11th September 2015. The purpose of the change to the EA Amendment Application was to incorporate the following:

- Revision of proposed maximum disturbance footprint to incorporate additional areas for topsoil stockpiling, out-of-pit spoil dumping and other mining activities;
- Revised areas of impact to vegetation communities; and
- Finalised MLA numbers.

EHP determined that the Central North Extension constituted a major EA Amendment Application, in accordance with section 223 of the *Environmental Protection Act 1994* (EP Act), for the following reasons:

- The amendment proposes additional MLs to the EA;
- The amendment proposes additional surface area, equating to an increase in surface area of greater than 10% for the Jellinbah Coal Mine; and
- The amendment is considered to significantly increase the level of environmental harm caused by the Jellinbah Coal Mine.

It is acknowledged that the Information Request from EHP is based on the original EA Amendment Application, dated June 2015.

1.2 PURPOSE AND SCOPE

The purpose of this document is to provide EHP with all of the information requested to assist in the decision-making process for the Central North Extension EA Amendment Application.

Each issue raised and the information requested by EHP is summarised, with a response provided for each individual request. Additional information likely to be required for EHP to make a decision on the Central North Extension has been provided in each response. Additional technical studies have been completed by specialist consultants to assist in responding to the information request. These studies are referenced in each response and the complete technical reports attached as appendices.

2.0 RESPONSE TO INFORMATION REQUEST

2.1 ITEM 1 – MINE WATER MANAGEMENT SYSTEM

2.1.1 Issue / Concern

The amendment application for the proposed Central North Extension states that disturbance will cover an area of approximately 803 ha and involves the construction and operation of an open-cut mine, heavy vehicle haul roads, topsoil dumping and stockpiling. These activities have the potential to cause considerable changes to the quality and quantity of water managed on the site. The proponent has concluded in the supporting information supplied with the amendment application that there will not be any substantial changes to water quality or current water management practices. Additionally, the proponent proposes no changes to the current EA water conditions.

Supporting information does not provide sufficient background to justify that the Project activities, as described, will not substantially change the mine water management system (MWMS). It is recommended that the proponent provides further detail and data in support of the proposed changes required to the MWMS onsite.

2.1.2 Information Requested

It is requested that the proponent provides the following information:

a) Mine water balance and relevant modelling results;

b) Data regarding the estimated water quality and quantity expected as part of new operations on the Project;

c) Details of any likely controlled / uncontrolled releases;

d) The capacity of proposed new MWMS dams (both regulated and non-regulated structures); and

e) Proposed monitoring points for the receiving environment.

2.1.3 Response

The proponent clarifies that the proposed amendment application pertains to a small extension to existing approved mining and infrastructure areas at Central North, located between Jellinbah Central and Jellinbah Plains. The proposed amendment will include a small extension of the Central North pit (94.5 ha), as well as spoil dumps, topsoil stockpiles, roads and water management infrastructure. No new or novel mining activities are proposed and no new contaminant sources will arise. Proposed disturbance in the Central North Extension area represents a small increase relative to the existing disturbed catchment of the Jellinbah Mine. As such, only minor changes to water management infrastructure are required. This has been demonstrated in the following response to EHP's information request.

UDP Group (UDP) was commissioned to prepare a revised Site Water Management Plan (UDP 2016) for the Jellinbah Coal Mine, incorporating both the approved Central North development and the proposed Central North Extension. The proponent's response to the information requested has been developed with reference to the Site Water Management Plan, which is provided in Appendix A. Key components of the revised Site Water Management Plan include:

- Site water balance modelling to quantify the specific impact of Central North and the proposed Central North Extension; and

- A revision of site water management arrangements to ensure all clean water and mine-affected water (MAW) generated by the Project are managed accordingly.

The principal objective of the Site Water Management Plan is to effectively manage the separation of clean water and MAW. The different types of water on site are summarised below:

- Clean stormwater runoff – Runoff from areas not affected by coal or operational facilities, including undisturbed or rehabilitated areas, or disturbed natural earth areas. Clean runoff is directed to sediment traps and/or dams to minimise sediment loads and subsequent downstream impacts; and

- MAW – Water that comes into contact with coal areas (e.g. run of mine (ROM) pad) or other potentially contaminated areas. This includes pit water (including groundwater and rainfall runoff), runoff from coal-contaminated areas, and water contained in the Max Pit Tailings Dam. This is consistent with the definition of MAW provided in the EA, which states that water associated with the pit, tailings dam or processing plant is mine-affected, while rainfall runoff from other areas such as spoil, managed by sediment and erosion control structures, is not. The Site Water Management Plan aims to ensure MAW remains separate from other water sources to minimise the potential for offsite release.

Water management associated with the Central North Extension is shown in Figure 2.

2.1.3.1 Mine Water Balance and Modelling Results

A site water balance model was developed by UDP (2016) using digital survey and rainfall data for the purpose of assessing the potential impacts of Central North and the Central North Extension on current site water management arrangements at the Jellinbah Mine. The site water balance aims to quantify flows and determine the effects of rainfall events on the MWMS at the Jellinbah Coal Mine, as well as the separation of MAW and clean water.

Water Balance Model Results

Modelling concluded that the development of the Central North operation, with the inclusion of the Central North Extension, will not significantly affect the mine water balance. While there is an increase in the total quantities of clean and MAW, the ratio of clean to contaminated areas will not change significantly. A summary of the results of the mine water balance is shown in Table 1. Detailed results of the site water balance model are provided in the Site Water Management Plan (UDP 2016) in Appendix A.

A negative balance indicates that available storage capacity exceeds runoff and groundwater inflows. As shown in Table 1, the water balance model predicts adequate storage capacity is available at the Jellinbah Mine for all MAW, with the inclusion of the Central North Extension.

Development of the Central North operation will require clean drainage from the eastern side of the Central and Central North pits to be diverted north-west to the receiving environment. Currently, a drain directs water to the west of the Central site into Blackwater Creek. This will continue for the initial phases of development at Central North, after which runoff will be diverted north-west to enable access to coal resources. A detailed design of the clean water diversion drain will be prepared prior to construction to ensure appropriate sizing and direction (UDP 2016).

The only source of MAW associated with the Central North Extension is water from the pit (which comes into contact with coal / groundwater). Pit water will be pumped to the Max Pit Tailings Dam (a regulated structure), consistent with current water management practices at the site. Water levels will be managed at all times by pumping to ensure compliance with the requirements of regulated structures.

Additional water management structures will be established in the Central North Extension area to manage runoff from disturbed areas. Sediment dams will collect sediment runoff from areas that are not mine-affected. The water balance model for the Jellinbah Mine, with the addition of Central North will enable the effective design of such structures. Detailed designs of the clean water sediment dams will be completed at a later stage.

The overall water balance for the Jellinbah Mine indicates that adequate water supply will continue to be available with the development of Central North and the proposed Central North Extension. The relative contribution of the Central North Extension to the site water balance is discussed in further detail in Section 2.1.3.2.

For periods of lower rainfall, a water licence provides authorisation to access water from the Mackenzie River to ensure sufficient water supply remains available. In the event of higher rainfall, controlled releases will be conducted where necessary, in accordance with the release requirements of the EA, in order to maintain the integrity of the water management system. No changes to the release conditions are proposed by this amendment.

Ongoing monitoring of water levels and storage allowances is necessary to ensure sufficient capacity is available for upcoming wet seasons. Where required, the inactive pits at Central and Plains will be utilised for temporary storage until sufficient capacity is achieved. MAW may also be accommodated at Jellinbah South by utilising pumping arrangements at the site (UDP 2016).

Table 1 Overall Site Water Balance

	Current Arrangement		With Central North (including Central North Extension)	
	Mine Affected	**Clean**	**Mine Affected**	**Clean**
Inflows				
Catchment (m^2)	12,298,600	5,487,300	12,727,400	5,950,400
Annual runoff (m^3)	2,809,984	1,253,738	2,907,956	1,359,547
Groundwater inflows (m^3)	1,460,000	-	1,460,000	-
Imported water (m^3)	0	0	0	0
Outflows				
Estimated evaporation (m^3)	841,724	148,637	841,724	173,597
CHPP process losses (m^3)	100,000	-	100,000	-
Dust suppression (m^3)	1,336,000	-	1,336,000	-
Inflows – Outflows	1,992,260	1,105,101	2,090,232	1,185,950
Storage available *	3,755,640 *	171,440	3,755,640 *	251,440
Balance	**-1,763,380**	**933,661**	**-1,665,408**	**934,510**

Notes: * Storage available does not include the volumes of the Plains, Central and Central North pits. Vacant parts of pits can be used for storage of water when needed. Source: UDP (2016).

Dam Capacities and Modelled Overflow Events

Table 2 provides details of the capacities and modelled overflow events of water storages at each existing operational area and Central North (including the proposed Extension).

Existing MAW storages at Jellinbah Mine vary in their capacity to cater for wet seasons and storm events. However, when utilising available pumping capacity within each MAW catchment, the required 1:10 wet season storage capacity can be achieved at both Jellinbah Central and Plains. Pumping rates required to achieve the 1:10 wet season storage capacity (as well as other design events) are detailed in the Site Water Management Plan (Appendix A) for existing MAW storages. Pumping may be directed towards Plains pit, Plains south void, Jellinbah South Void or Max Pit Tailings Dam, dependent on available capacity.

MAW from the Central North pit will be pumped to other MAW storages, or pits at Plains, Central or South, where adequate storage is available to prevent unauthorised releases to the receiving environment.

Final design of proposed clean water dams at Central North has yet to be completed. Sizing of the dams will be sufficient to ensure adequate storage is available to enable sufficient sediment retention. Estimated storage capacity of each of the proposed sediment dams is 40,000 cubic metres (m^3). No overflow will occur from the Central North pit.

Table 2 Dam Capacities and Modelled Overflow Events

Dam	Type	Catchment Area (m^2)	Dam Capacity (m^3)	Overflow Event
Jellinbah Plains				
Plains Water Dam	Clean	470,400	63,000	1:1 year annual rainfall and above 1:10 year wet season and above 1:100 year 72 hour storm
Plains Levee Dam	MAW	59,000	91,280	No events
Plains High Wall Dam	MAW	904,000	148,710	1:1 year annual rainfall and above 1:10 year wet season and above 1:100 year 72 hour storm
Plains Pit area	MAW	2,405,300	-	No overflow
Central North and Central North Extension				
Sediment Dam North	Clean	267,200	40,000	Details yet to be designed. Dam area ~15,000 m^2.
Sediment Dam South	Clean	195,900	40,000	Details yet to be designed. Dam area ~15,000 m^2.
Central North Pit area	MAW	428,800	Pumped	No overflow
Jellinbah Central				
Max Pit Tailings Dam	MAW, regulated	342,900	482,500	No overflow
Central Release Dam	MAW, regulated	44,400	88,800	No overflow Receives pumped water from pit

Dam	Type	Catchment Area (m^2)	Dam Capacity (m^3)	Overflow Event
Son of Max Pit	MAW	186,500	87,000	1:1 year wet season and above 1:50 year 72 hour storm 1:100 year 24 hour storm
South Dam	Clean	n/a	n/a	Not connected within the MWMS
South West Dam	Clean	n/a	n/a	Not connected within the MWMS
ROM West Dam	MAW	454,700	53,000	1:1 year wet season and above 1:10 year 72 hour storm 1:100 year 24 hour storm
South of Workshop Dam	MAW	344,900	21,600	1:1 year wet season and above 1:20 year 72 hour storm 1:50 year 24 hour storm
Workshop Dam	MAW	142,800	30,000	1:20 year wet season and above
North Dam	Clean	438,700	43,440	1:2 year annual and above 1:10 year wet season and above 1:100 year 72 hour storm
Marks Dam	MAW	386,800	19,350	1:1 year wet season and above 1:10 year 72 hour storm 1:20 year 24 hour storm 1:50 year 24 hour storm
Max Bypass Dam	MAW	328,600	91,000	1:1 year annual and above 1:2 year wet season and above 1:20 year 72 hour storm 1:100 year 24 hour storm
Central site pit	MAW	5,748,800	Pumped	No overflow
Central wash plant pump area	MAW	68,600	Pumped	No overflow
Jellinbah South				
Jellinbah South Void	MAW	410,900	2,618,300	No overflow
Jellinbah South Dam	Clean	294,000	25,000	1:100 year annual

Source: UDP (2016)

2.1.3.2 Quality and Quantity of Water

Water Quality

Contaminant Sources

No new contaminant sources are proposed as a result of the Central North Extension. Rather, a relatively small increase in the existing disturbed catchment will result from the additional disturbance footprint. Jellinbah's mining activities have the potential to reduce downstream water quality via the following:

- Removal of vegetation exposing soil to erosion;
- Construction of overburden dumps with no vegetation cover and steep slopes, prior to rehabilitation;

- Contact with coal-affected areas including coal seams, stockpiles, processing infrastructure and groundwater; and

- Contact with oil contaminants from machinery and workshops.

Although water in contact with cleared areas and overburden is considered 'clean runoff' for the purpose of site water management planning, runoff from these areas has the potential to result in sedimentation of receiving water.

Clean Stormwater

The Jellinbah Mine area is characterised by dispersive soils with a high fines content. Runoff from disturbed areas and spoil dumps is likely to contain elevated levels of suspended solids. To address this, additional sediment traps will be established to settle sediments out of the water prior to runoff entering the receiving environment. This management technique has been in place at the Jellinbah Mine since operations first commenced in 1989 and has been proven to be effective.

Four to six additional sediment traps will be constructed along drainage paths to settle silt and sediments from runoff from overburden stockpiles and other non-mine-affected areas at the Central North Extension area. Two additional clean water dams will be established at Central North, in the north-west and south-west of the site. These clean water dams will collect clean runoff from overburden dumps. Additional sediment traps are also likely to be constructed in the west of the Central North Extension area, depending on erosion and sediment control needs.

No coal contamination will be present in these areas. These drainage systems and traps will be established as necessary as Central North is developed. Existing drainage systems at the Jellinbah Mine will remain operational until modifications are necessary.

The characteristics of clean water are described in Section 2.3.3.3.

Saline and Acid Rock Drainage

MAW – i.e. water contaminated through contact with coal or coal-affected areas (including coal pad runoff and pit water) – typically exhibits elevated salinity. Separation of MAW and clean water is a key aspect of the water management strategy at the site. This is typically achieved through the use of pumping and separate dams. MAW is predominantly recycled or evaporated, potentially resulting in a water deficit for the site.

No indication of acid mine drainage (AMD) has previously been identified at Jellinbah Mine. The area is predominantly comprised of layers of mudstone, siltstone, sandstone and coal, with overburden typically between 10 m and 150 m thick. These materials do not tend to be acid forming. No specific strategies have been developed for the management of AMD. Existing water monitoring programs are considered sufficient to identify any changes to the acidity of water draining from waste rock dumps and other areas of concern.

Water Quality of Existing MAW Dams

Existing experience at the Jellinbah Mine shows that exposure to coal-affected areas is likely to increase salinity and sulphate concentration in runoff; past testing of pit waters has indicated that this is typically the case. As a result, such water is classed as MAW (in accordance with the definition of MAW in the EA). Recent testing of water from pits and other coal-exposed areas indicates elevated conductivity and sulphate concentrations. Note that no workshops or coal pads are to be located in the proposed Central North Extension area; existing facilities at Plains and/or Central will be utilised. The

only potential source of MAW associated with the Central North Extension is pit water. This water will be pumped directly to existing mine-affected storages with available capacity at Central.

Existing water quality data for dams collecting MAW runoff at Jellinbah Mine were reviewed to determine the likely characteristics of MAW. Dams reviewed include:

- Plains pit;
- Plains Dirty Water Dam (no longer in use);
- Plains High Wall Dam;
- Plains Levee Dam;
- South of Workshop Dam;
- ROM West Dam;
- Max Pit Tailings Dam;
- Son of Max Pit;
- Max Bypass;
- Marks Dam;
- Central Release Dam; and
- Jellinbah South Void.

Water in MAW storages is characterised by elevated electrical conductivity (EC), with occasional elevated aluminium, sulphate and/or pH, as shown in Table 4. No indication of AMD is evident. Elevated pH, sulphate and aluminium, which are apparent in both MAW and clean water storages (discussed further in Section 2.3.3.3), do not appear to persist across sampling events. Based on the water quality data provided in Table 4, it is likely that the proposed dams will have water quality within the ranges described in Table 3 under normal operating conditions.

Table 3 Likely Water Quality Characteristics of MAW

Quality Characteristics	EC (µS/cm)	pH (pH Units)	Sulphate (mg/L)
Min.	1,300	6.4	39
Max.	36,000	9.6	2,000
Median	13,000	8.45	190
Mean	11,885	8.4	264.1

Table 4 Existing Water Quality Results – MAW

Quality Characteristics		EC (µs/cm)	Fluoride (mg/L)	pH (pH units)	Sulphate (mg/L)	Aluminium (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Zinc (mg/L)
Onsite Water Storage Contaminant Limits		**5,970**	**2**	**4 – 9**	**1,000**	**5**	**0.5**	**0.01**	**1**	**1**	**0.1**	**1**	**20**
Jellinbah Plains													
Plains Dirty Water Dam	13/08/2014	19,000	0.5	7.6	630	0.22	0.003	0.0002	0.002	0.005	0.001	0.012	0.007
	17/10/2014	3,800	0.5	6.9	160	0.17	0.04	0.001	0.01	0.01	0.01	0.01	0.01
	11/12/2014	3,200	0.5	8	230	0.18	0.001	0.0002	0.004	0.001	0.001	0.006	0.003
	26/03/2015	13,000	0.5	8.3	410	0.61	0.002	0.0002	0.001	0.003	0.001	0.005	0.005
	14/01/2016	1,300	0.5	7.9	71	0.09	0.001	0.0002	0.001	0.001	0.001	0.001	0.002
Plains High Wall Dam (no longer in use)	13/08/2014	24,000	0.5	8.3	200	0.29	0.007	0.0002	0.003	0.005	0.001	0.015	0.012
	17/10/2014	22,000	0.5	6.8	150	0.05	0.01	0.001	0.01	0.01	0.01	0.02	0.01
	11/12/2014	25,000	0.5	8.5	160	0.08	0.003	0.0002	0.001	0.002	0.001	0.006	0.003
	26/03/2015	19,000	0.5	8.6	130	0.22	0.003	0.0002	0.001	0.001	0.001	0.003	0.002
	26/06/2015	19,000	0.5	8.7	120	0.25	0.005	0.001	0.005	0.005	0.005	0.007	0.005
	9/10/2015	13,000	0.5	8.4	82	0.63	0.006	0.0002	0.003	0.002	0.001	0.015	0.004
	14/01/2016	11,000	0.5	8.7	63	0.05	0.006	0.0002	0.001	0.002	0.001	0.003	0.003
	31/03/2016	7,200	0.5	9.1	39	1.8	0.004	0.0002	0.003	0.003	0.001	0.005	0.005
Plains Levee Dam	13/08/2014	23,000	0.5	9.3	210	0.13	0.008	0.0002	0.003	0.006	0.001	0.008	0.012
	17/10/2014	26,000	0.5	8.9	2000	0.09	0.03	0.001	0.01	0.01	0.01	0.02	0.01
	11/12/2014	36,000	0.5	8.4	290	0.17	0.006	0.0002	0.001	0.001	0.001	0.003	0.003
	26/03/2015	22,000	0.5	8.4	130	0.25	0.005	0.001	0.005	0.005	0.005	0.005	0.005
	26/06/2015	24,000	0.5	8.8	160	0.25	0.005	0.001	0.005	0.005	0.005	0.005	0.005
	9/10/2015	12,000	0.5	8.9	67	0.07	0.009	0.0002	0.002	0.001	0.001	0.006	0.003

Quality Characteristics		EC (µs/cm)	Fluoride (mg/L)	pH (pH units)	Sulphate (mg/L)	Aluminium (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Zinc (mg/L)
Onsite Water Storage Contaminant Limits		**5,970**	**2**	**4 – 9**	**1,000**	**5**	**0.5**	**0.01**	**1**	**1**	**0.1**	**1**	**20**
	14/01/2016	11,000	0.5	8.7	63	0.05	0.006	0.0002	0.001	0.002	0.001	0.003	0.003
	14/01/2016	12,000	0.5	8.5	63	0.06	0.007	0.0002	0.001	0.001	0.001	0.004	0.014
	31/03/2016	3,600	0.5	8.6	44	0.25	0.005	0.0002	0.001	0.001	0.001	0.002	0.002
Plains Pit	26/03/2015	12,000	0.5	8.1	50	0.13	0.002	0.0002	0.007	0.002	0.001	0.011	0.005
Jellinbah Central													
South of Workshop Dam	11/12/2014	15,000	0.5	8.5	550	0.14	0.003	0.0002	0.001	0.001	0.001	0.006	0.004
	13/08/2014	15,000	0.5	8.2	500	0.05	0.003	0.0002	0.002	0.004	0.001	0.014	0.005
	17/10/2014	13,000	0.5	8.4	490	0.27	0.05	0.001	0.01	0.01	0.01	0.02	0.01
	26/06/2015	14,000	0.5	8.5	440	0.05	0.003	0.0002	0.001	0.001	0.001	0.005	0.001
	26/03/2015	13,000	0.5	8.5	370	0.05	0.003	0.0002	0.001	0.001	0.001	0.004	0.002
	9/10/2015	16,000	0.5	8.4	440	0.13	0.002	0.0002	0.001	0.001	0.001	0.006	0.002
	14/01/2016	15,000	0.5	8.3	490	0.05	0.002	0.0002	0.001	0.001	0.001	0.004	0.002
	31/03/2016	8,100	0.5	8.6	260	0.05	0.001	0.0002	0.001	0.003	0.001	0.002	0.039
ROM West Dam	13/08/2014	17,000	0.5	-	590	6.4	0.003	0.0002	0.012	0.029	0.009	0.029	0.045
	17/10/2014	5,900	0.5	7.7	170	0.18	0.03	0.001	0.01	0.01	0.01	0.01	0.01
	11/12/2014	3,800	0.5	7.7	150	0.18	0.002	0.0002	0.001	0.002	0.001	0.001	0.003
	26/03/2015	4,000	0.5	8.3	150	0.2	0.001	0.0002	0.001	0.003	0.001	0.001	0.035
	14/01/2016	2,100	0.5	8.1	94	0.2	0.001	0.0002	0.001	0.001	0.001	0.001	0.002
	31/03/2016	1,700	0.5	8.6	92	0.05	0.001	0.0002	0.001	0.001	0.001	0.001	0.002
Son of Max Pit	13/08/2014	8,600	0.5	8.5	340	0.05	0.002	0.0002	0.001	0.003	0.001	0.009	0.007
	17/10/2014	7,200	0.5	8.7	290	0.07	0.03	0.001	0.01	0.01	0.01	0.01	0.01

Quality Characteristics		EC (µs/cm)	Fluoride (mg/L)	pH (pH units)	Sulphate (mg/L)	Aluminium (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Zinc (mg/L)
Onsite Water Storage Contaminant Limits		**5,970**	**2**	**4 – 9**	**1,000**	**5**	**0.5**	**0.01**	**1**	**1**	**0.1**	**1**	**20**
	11/12/2014	7,200	0.5	8.5	280	0.23	0.002	0.0002	0.001	0.001	0.001	0.002	0.002
	26/03/2015	4,900	0.5	9.6	190	0.05	0.001	0.0002	0.001	0.001	0.001	0.001	0.023
	26/06/2015	5,000	0.5	8.5	200	0.06	0.001	0.0002	0.001	0.001	0.001	0.001	0.001
	9/10/2015	5,500	0.5	8.4	200	0.95	0.002	0.0002	0.002	0.003	0.001	0.004	0.005
	14/01/2016	5,400	0.5	8.6	190	0.05	0.001	0.0002	0.001	0.002	0.001	0.002	0.003
	31/03/2016	2,300	0.5	8.8	88	0.05	0.001	0.0002	0.001	0.001	0.001	0.001	0.001
Max Pit Tailings Dam	13/08/2014	14,000	0.5	8.2	490	0.05	0.005	0.0002	0.011	0.003	0.001	0.027	0.006
	17/10/2014	15,000	0.5	8.4	490	0.1	0.01	0.001	0.01	0.01	0.01	0.03	0.01
	11/12/2014	14,000	0.5	8.4	540	0.2	0.003	0.0002	0.004	0.001	0.001	0.01	0.003
	26/03/2015	13,000	0.5	6.4	360	0.16	0.003	0.0002	0.001	0.001	0.001	0.006	0.003
	26/06/2015	14,000	0.5	8.4	440	0.11	0.003	0.0002	0.004	0.001	0.001	0.009	0.002
	9/10/2015	16,000	0.5	8.4	440	0.1	0.001	0.0002	0.002	0.001	0.001	0.007	0.001
	14/01/2016	14,000	0.5	8.3	440	0.05	0.003	0.0002	0.002	0.001	0.001	0.008	0.002
	31/03/2016	7,300	0.5	8.5	210	0.05	0.002	0.0002	0.001	0.001	0.001	0.003	0.001
Max Bypass Dam	13/08/2014	15,000	0.5	8.3	160	1.6	0.006	0.0002	0.006	0.013	0.003	0.016	0.025
	26/03/2015	17,000	0.5	8.9	130	0.05	0.001	0.0002	0.001	0.003	0.001	0.003	0.004
	14/01/2016	3,300	0.5	8.1	100	0.29	0.001	0.0002	0.001	0.003	0.001	0.002	0.003
	31/03/2016	1,800	0.5	8.4	52	0.14	0.001	0.0002	0.001	0.002	0.001	0.001	0.001
Marks Dam	13/08/2014	14,000	0.5	8.4	220	0.09	0.005	0.0002	0.002	0.005	0.001	0.007	0.011
	17/10/2014	15,000	0.5	8.7	340	0.41	0.04	0.001	0.01	0.01	0.02	0.02	0.01
	11/12/2014	8,900	0.5	8.3	320	0.08	0.002	0.0002	0.001	0.001	0.001	0.002	0.002

Quality Characteristics		EC (µs/cm)	Fluoride (mg/L)	pH (pH units)	Sulphate (mg/L)	Aluminium (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Zinc (mg/L)
Onsite Water Storage Contaminant Limits		**5,970**	**2**	**4 – 9**	**1,000**	**5**	**0.5**	**0.01**	**1**	**1**	**0.1**	**1**	**20**
	26/03/2015	15,000	0.5	8.2	130	0.05	0.002	0.0002	0.001	0.002	0.001	0.003	0.002
	9/10/2015	17,000	0.5	8.4	150	0.05	0.001	0.0002	0.001	0.003	0.001	0.002	0.002
	14/01/2016	12,000	0.5	7.8	230	0.05	0.002	0.0002	0.001	0.002	0.001	0.002	0.002
	31/03/2016	5,300	0.5	8.4	130	0.27	0.002	0.0002	0.001	0.003	0.001	0.002	0.003
Central Release Dam	13/08/2014	16,000	0.5	6.7	380	4.8	0.007	0.0002	0.009	0.012	0.003	0.023	0.018
	17/10/2014	15,000	0.5	7.9	390	0.11	0.02	0.002	0.01	0.01	0.01	0.02	0.01
	11/12/2014	18,000	0.5	8.5	370	0.05	0.003	0.0002	0.001	0.001	0.001	0.004	0.002
	26/03/2015	12,000	0.5	8.1	160	1.2	0.004	0.0002	0.004	0.007	0.001	0.011	0.013
	26/06/2015	15,000	0.5	8.5	250	0.07	0.003	0.0002	0.001	0.001	0.001	0.006	0.001
	9/10/2015	13,000	0.5	8.5	380	2.1	0.003	0.0002	0.003	0.005	0.001	0.007	0.005
	14/01/2016	14,000	0.5	8.5	390	0.16	0.003	0.0002	0.001	0.001	0.001	0.003	0.002
	31/03/2016	6,100	0.5	8.8	77	0.05	0.002	0.0002	0.002	0.002	0.001	0.005	0.005
Jellinbah South													
Jellinbah South Void	13/08/2014	6,400	0.8	8.6	150	1.6	0.004	0.0002	0.003	0.005	0	0.004	0.009
	11/12/2014	6,900	0.5	9	150	0.13	0.003	0.0002	0.001	0.001	0.001	0.001	0.002
	26/03/2015	6,800	0.5	9	150	0.05	0.002	0.0002	0.001	0.001	0	0.001	0.001
	26/06/2015	6,600	0.5	8.8	150	1.7	0.003	0.0002	0.003	0.004	0	0.003	0.004
	9/10/2015	6,900	0.5	9	150	0.44	0.003	0.0002	0.001	0.002	0	0.001	0.002
	14/01/2016	7,300	0.5	8.9	160	0.05	0.003	0.0002	0.001	0.001	0	0.001	0.002
	31/03/2016	5,500	0.5	9	100	0.05	0.002	0.0002	0.001	0.001	0	0.002	0.002

Water Quantity

The mine water balance, discussed in Section 2.1.3.1, demonstrates the relatively small impact of the Central North Extension on water quantities and flows at the Jellinbah Mine. These impacts are summarised in Table 5, which indicates the additional quantities of MAW and clean water inflows and outflows generated by the Central North Extension, as a proportion of the Central North operation. The water balance includes two additional clean water sediment dams that are proposed to provide a further 80,000 m^3 of clean water storage for sediment retention. With these storages, Central North (including the Extension) will generate an additional 849 m^3 of clean water.

Additional MAW inputs of 97,972 m^3 are predicted to occur with the development of Central North. This represents an increase of less than 5% in MAW volume at the Jellinbah Mine. Of this, approximately 24,326 m^3 of MAW is attributed to the portion of the Central North pit located within the Central North Extension area. This constitutes an increase in volume of approximately 1.22%, compared to current operations.

Model results demonstrate that a surplus storage capacity of 1,665,408 m^3 is available for MAW, representing more than 44% of total MAW storage capacity (excluding available pit storage capacity). As discussed in Section 2.1.3.1 and shown in Table 1, sufficient capacity is available within the existing Jellinbah Mine water management system to manage the small increase in MAW flows.

Table 5 Additional Inflows and Outflows with Central North (and Central North Extension)

	Mine Affected Water		Clean Water
	Total Central North	**Central North Extension**	**Total Central North**
Inflows			
Catchment (m^2)	+ 428,800	+ 106,468	+ 463,100
Annual runoff (m^3)	+ 97,972	+ 24,326	+ 105,809
Groundwater inflows (m^3)	0	0	0
Imported water (m^3)	0	0	0
Outflows			
Estimated evaporation (m^3)	0	0	+ 24,960
CHPP process losses (m^3)	0	0	-
Dust suppression (water carts & crushers) (m^3)	0	0	-
Inflows – Outflows	+ 97,972	+ 24,326	+ 80,849
Storage available *	0	0	+ 80,000 *
Balance	**+ 97,972**	**+ 24,326**	**+ 849**

Notes: * Storage available does not include the volumes of the Plains, Central and Central North pits. Vacant parts of pits can be used for storage of water when needed. Source: UDP (2016).

2.1.3.3 Capacity of New Water Storages

Table 6 details the additional water management structures proposed for the Central North Extension (including the pit area).

Table 6 Proposed Water Management Structures

Dam	Catchment Area (m^2)	Dam Area (m^2)	Dam Volume (m^3)
Central North Pit Area	428,800	n/a	Pumped
Sediment Dam South	195,900	15,000	40,000
Sediment Dam North	267,200	15,000	40,000

Source: UDP (2016)

No new MAW storages are proposed as a result of the amendment application. Additional MAW collected in the pit will be contained within the Jellinbah Mine's existing structures, as described in the Site Water Management Plan.

2.1.3.4 Controlled and Uncontrolled Releases

As stated in Section 4.3.2.1 (Risk and Magnitude of Impacts to Environmental Values – Surface Water) of the EA Amendment (Change to Application):

> *The addition of the Central North Extension will not result in any substantial change to water quality or water management. No additional regulated structures, contaminated water storages or release points are proposed. Any water released to the receiving environment will be via currently authorised release points at Jellinbah Coal Mine and in accordance with current EA conditions.*

Site water balance modelling presented in Section 2.1.3.1 demonstrates that the addition of the Central North Extension (estimated increase of 1.22% in MAW) will not substantially increase the likelihood of release, either controlled or uncontrolled, from the Jellinbah Mine.

Utilising pumping capacity will allow Jellinbah Plains and Central to achieve the required MAW storage capacity. If required, vacant voids can be used for additional emergency water storage. No changes to the release conditions, criteria or procedures are proposed as part of this application. No risk to the receiving environment is considered likely. Release procedures are discussed in Section 2.3.3.2.

2.1.3.5 Proposed Receiving Environment Monitoring

No changes to the current Receiving Environment Monitoring Program (REMP) are proposed. As demonstrated in previous sections of this report, no new contaminant sources will result from the amendment. The risk associated with additional disturbed catchments is considered to be low. The receiving environment to the Central North Extension is already captured in the scope of the Jellinbah Mine REMP.

Additional receiving water monitoring sites are not considered necessary as the development of the Central North Extension is unlikely to pose any further risks to the downstream surface water environment beyond those already managed at the Jellinbah Coal Mine.

Monitoring locations for the receiving environment are detailed in Table 7 and shown in Figure 3.

Table 7 REMP Monitoring Locations

Monitoring Point	Receiving Waters Location Description	Latitude	Longitude
Upstream (Background) Monitoring Points			
MP2	Blackwater Creek 1360 m upstream of RP2	-23.4081°	148.9145°
MP4	Upstream Mackenzie River	-23.2638°	148.9017°
US3	Upstream Three Mile Lagoon	-23.283°	148.9011°
Downstream (Impact) Monitoring Points			
MP1	Blackwater Creek 1500 m downstream of RP1	-23.3774°	148.9055°
MP3	Downstream Mackenzie River	-23.264°	148.9251°
MP5	Downstream Mackenzie River	-23.243°	148.9299°
DS5	Downstream Five Mile Lagoon	-23.29°	148.9232°

Note: Coordinates are in GDA 94.

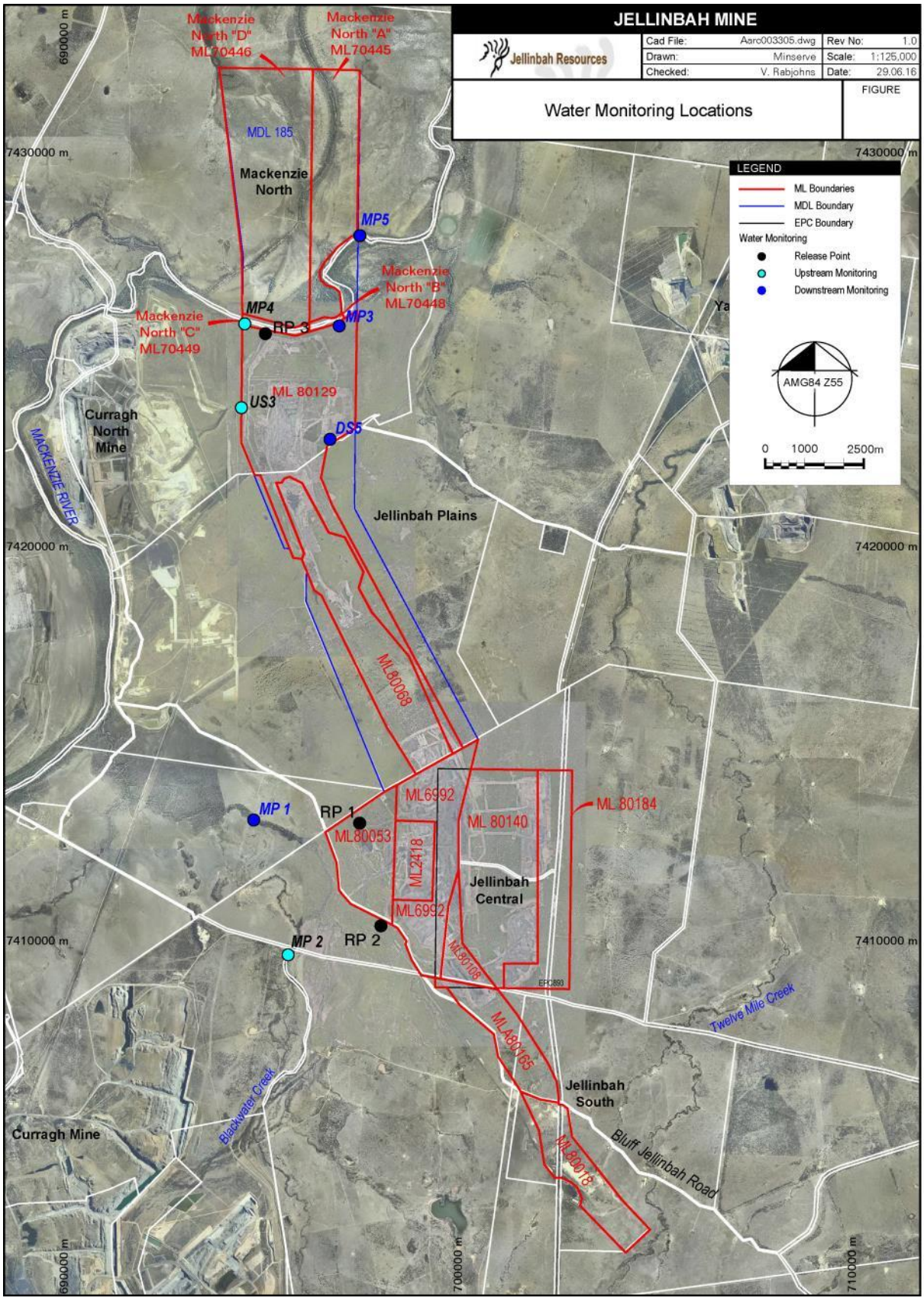


Figure 3 Receiving Water Monitoring Locations

2.2 ITEM 2 – REGULATED STRUCTURES

2.2.1 Issue / Concern

The amendment application states that no additional regulated structures, MAW storages or release points are proposed for the Project. However, the application information also states that the construction of new dams and diversions of several existing drains will be undertaken as part of the activities for the Project.

2.2.2 Information Requested

It is requested that the proponent clearly states how water will be managed at the Project, including proposed regulated structures and the drainage diversions.

2.2.3 Response

2.2.3.1 Water Management Infrastructure

Drainage of clean stormwater on the Jellinbah Mine site is managed by designed sediment retention dams, traps and drains and is subsequently discharged into natural waterways (Mackenzie River and Blackwater Creek). There are three clean water dams at the Central site, enabling sediment to settle prior to discharge into the receiving waterways.

An additional eight dams at Central are used to contain MAW, two of which are designated as regulated structures: Max Pit Tailings Dam and Central Release Dam. These structures are managed in accordance with the EA (Schedule J: Transitional Regulated Structures). In addition, Jellinbah Mine maintains pumping capacity to transfer water from the MAW system to inactive pits if emergency storage capacity is required within the MAW system.

Proposed Water Management Structures

Additional water management structures to be constructed in the Central North Extension are:

- Two clean water sediment dams (Sediment Dam North and Sediment Dam South), each with a volume of approximately 40,000 m^3;
- A diversion drain to divert runoff around the pit to the sediment traps, prior to it entering the receiving waterways;
- Four to six smaller sediment traps located along the length of the eastern drain, as shown in Figure 2 in Section 1.1.1; and
- Additional sediment traps in the west of the Central North Extension established as required.

No coal contamination will be present in these areas; runoff from these areas is therefore classified as clean water. These clean water drainage systems and dams will be developed as the site expands to its full size. Existing drainage systems will remain in place and operational until modifications are necessary.

As per condition D1 of the Jellinbah Mine EA, consequence category assessments of each new structure will be undertaken prior to design and construction, in accordance with the *Manual for assessing consequence categories and hydraulic performance of structures* (ESR/2016/1933) (EHP 2016). As these structures contain no MAW, they are likely to be assessed as 'low' consequence for each category of potential harm (harm to humans, general environmental harm and general economic

loss). Similar existing clean water dams at the Jellinbah Mine, including South Dam, South West Dam and North Dam, have previously been assessed as having low consequence categories (UDP 2015).

Consequently, no additional regulated dams will be required as a result of the amendment application; existing MAW storages and regulated structures at Jellinbah Central will be utilised for storage of pit water (MAW) pumped from the Central North area. These have been assessed to provide adequate capacity for the Central North operation, as indicated by the site water balance (Section 2.1.3.1).

Table 8 provides an overview of all existing and proposed water infrastructure at the Jellinbah Coal Mine. The separation and management of MAW and clean water is discussed further in Section 2.3.3.1 and in the Site Water Management Plan in Appendix A.

Table 8 Existing and Proposed Water Management Infrastructure

Dam	Purpose	Type
Jellinbah Plains		
Plains Water Dam	Collection of runoff from hardstand and rehabilitated areas, storage of water pumped from Jellinbah Central for use on site.	Clean
Plains Levee Dam	Receives pit water from seepage part way up northern wall.	MAW
Plains High Wall Dam	Runoff from waste stockpile areas. Used for pit dewatering.	MAW
Central North Extension		
Eastern sediment traps	Four to six sediment traps for the collection and settlement of sediment from flows along the eastern side of ML. Note that additional sediment traps may be established in the west of the ML if necessary.	Clean
Central North Sediment Dams	Two clean water dams for the collection of sediment and runoff from overburden dumps and disturbed areas.	Clean
Jellinbah Central		
South Dam	Collection of clean runoff water from rehabilitated areas to assist in settling out fines.	Clean
Son of Max Pit	Final settlement of fines produced by runoff from coal affected areas. Overflow for wash plant drains pump station. Receives overflow from ROM West Dam.	MAW
Max Pit (Regulated)	Collection of coal affected waste from the wash plant, or from the Central Release Dam that collects pit water. Main source of recycled water. Pumping of pit water from Central North pit.	MAW, regulated
South West Dam	Collection of clean runoff water from rehabilitated area to assist in settling out fines.	Clean
ROM West Dam	Collects mine-affected runoff from ROM areas (excluding the ROM area near the wash plant). Receives overflow from the South of Workshop Dam. Overflows to Son of Max Pit.	MAW
South of Workshop	Collects mine-affected waste from the workshop and nearby ROM areas. Main fill point for water trucks. Filled by pumping from Max Pit Tailings Dam. Overflows to ROM West Dam.	MAW
Workshop Dam	Collection of mine-affected runoff from the workshop area and nearby haul roads. Discharges to Marks Dam.	MAW

Dam	Purpose	Type
North Dam	Collection of runoff from the surrounding haul roads. Receives drainage from rehabilitated area and overflows to clean drain to Blackwater Creek. Receives emergency overflow from Workshop Dam, in the unlikely event that it overflows.	Clean
Marks Dam	Receives mine-affected runoff from northern section of wash plant ROM. Receives pit water. Water truck fill-point. Overflows to Max Bypass.	MAW
Max Bypass	Receives overflows from Marks Dam and some localised runoff.	MAW
Central Release Dam (Regulated)	Turkeys nest specific for receiving pit water. Pumped to Max Pit Tailings Dam as necessary.	MAW, regulated
Jellinbah South		
Jellinbah South Void	Open pit used for storage of excess water from Central site.	MAW
Jellinbah South Dam	Clean runoff from rehabilitated areas only.	Clean

Source: UDP (2016)

2.3 ITEM 3 – RELEASE OF MINE-AFFECTED WATER FROM THE PROJECT

2.3.1 Issue / Concern

The amendment application states that sediment control dams will act as sumps for sediment-laden runoff from the various disturbed catchments from activities for the Central North Extension. Runoff to sediment dams may come from disturbed catchments, including stockpiled spoil and topsoil. EHP considers that water captured by these dams has the potential to be classed as MAW. MAW is not licenced to be managed as part of a site's sediment and erosion plan as proposed and should be managed as part of the conditions of the EA and the site's MWMS.

Supporting information provided to EHP does not include estimates of sediment characteristics likely to be contained in water captured by the sediment dams. The information is required to help inform end-of-pipe monitoring limits and triggers where required. Additionally, in the event that a revised mine water release strategy is required, new or modified conditions will be applied to the amended EA. The release conditions will include considerations of the dilution of potential contaminants and the assimilative capacity of the receiving environment as per the Fitzroy model water conditions within EHP's *Model Mining Conditions* (ESR/2015/1561).

2.3.2 Information Requested

It is requested that the proponent provides the following information:

a) Procedures for the separation and management of mine-affected and clean water on site;

b) A revised mine water release strategy in the event that MAW is required to be released from the site in the future. This is to include, but is not limited to, the following information:

   i) The mechanisms that will be implemented to manage such releases;

   ii) Proposed limits to release rates;

   iii) Stream flow rates triggers that allow a release;

iv) Duration of release;

v) End-of-pipe water quality limits; and

vi) Trigger values;

c) Provide estimates of the likely contaminants and quality characteristics for water contained in the sediment dams;

d) In terms of the Project's Water Management Plan, clearly state the following information:

i) The changes that are required to be made to the Water Management Plan;

ii) How excess water will be managed on site; and

iii) Any relevant information in terms of the mine water release strategy as stated in section (b) above.

2.3.3 Response

UDP (2016) has prepared a revised Site Water Management Plan, incorporating the proposed Central North Extension, for the Jellinbah Mine. The revised Site Water Management Plan is provided in Appendix A.

2.3.3.1 Separation and Management of Mine-Affected and Clean Water

As stated in Section 2.1.3, MAW is defined in the Site Water Management Plan as water that comes into contact with coal-contaminated areas, tailings or groundwater (or other potentially contaminated areas). At Jellinbah Mine, this includes:

- Pit water, including groundwater and rainfall runoff;
- Runoff from areas contaminated with coal fines, particularly active ROM Pads, the process plant area and coal stockpile areas; and
- Water contained in the Max Pit Tailings Dam.

In contrast, runoff from other areas (such as spoil dumps) is not classed as mine-affected, provided that erosion and sediment control structures have been installed and this water has not been in contact with areas contaminated by coal. The distinction of MAW at Jellinbah is based on the definition provided in the EA.

Clean water collected at South Dam, South West Dam, Jellinbah South Dam and the proposed eastern sediment traps originates from undisturbed and/or rehabilitated areas. Other existing clean water dams (i.e. Plains Water Dam and North Dam) and the proposed Central North Extension Sediment Dams also collect runoff from disturbed areas that are not associated with the pit, tailings dam, processing plant or workshops, and are used for erosion and sediment control purposes.

Procedures for Separation and Management of MAW at Jellinbah Mine

Current water management strategies employed at the Jellinbah Mine to separate MAW will continue to be implemented. The Project's Site Water Management Plan (UDP 2016) provides procedures for the separation of MAW at the Jellinbah Mine. These have been summarised below.

At Jellinbah Plains, a flood levee protects the Plains pit from inundation by the Mackenzie River. The levee is discussed in further detail in Section 2.7.3. Mine-affected pit water is generally pumped to either the Plains High Wall Dam, located to the east of the pit, or occasionally to an alternate MAW storage. Clean water runoff from the western catchment of Jellinbah Plains is directed towards sediment traps prior to release via a dedicated drain to the Mackenzie River. Where necessary, additional water required for operations can be pumped from Jellinbah Central and stored in a dam on the western side of the Plains site. Natural overland flow from the eastern side of Plains is separated from potential contaminant sources by a diversion bund and directed into the natural receiving waterways to the north-east. Water management arrangements at Jellinbah Plains are illustrated in Figure 4 and described in further detail in Appendix A.

At Jellinbah Central, open drains are used to divert clean water runoff from the eastern area around the pits. The shallow-grades of the drains minimise sedimentation of water and erosion. In the western areas, drainage from overburden stockpiles and rehabilitated spoil is separated and directed through sediment control structures, towards natural drainage paths into Blackwater Creek. South Dam, South West Dam, as well as additional small sediment traps, intercept runoff to allow for settlement of particulates in clean water before release. Drainage from mine-affected areas is directed towards MAW containment dams to allow coal fines to settle out of the water, and is then recycled for further use on the site.

The Workshop Dam collects runoff from nearby haul roads and the workshop area, and ultimately discharges to Marks Dam. ROM West Dam collects runoff from ROM areas (excluding the ROM area near the wash plant) and overflows to the Son of Max Pit. The South of Workshop Dam and Marks Dam capture runoff from ROM pad areas, workshop and storage areas. The Max Bypass receives overflow from Marks Dam as well as some localised runoff. The Son of Max Pit allows for final settlement of fines in runoff from coal-affected areas. The Max Pit Tailings Dam collects coal-affected waste from the wash plant or from the Central Release Dam, which receives water from the pit.

Water management arrangements at Jellinbah Central are illustrated in Figure 5 and described in further detail in Appendix A.

Jellinbah South is not currently in operation. MAW is diverted into the open-cut pit (Jellinbah South Void). Runoff from clean areas drains along natural drainage paths. Water management arrangements at Jellinbah South are illustrated in Figure 6.

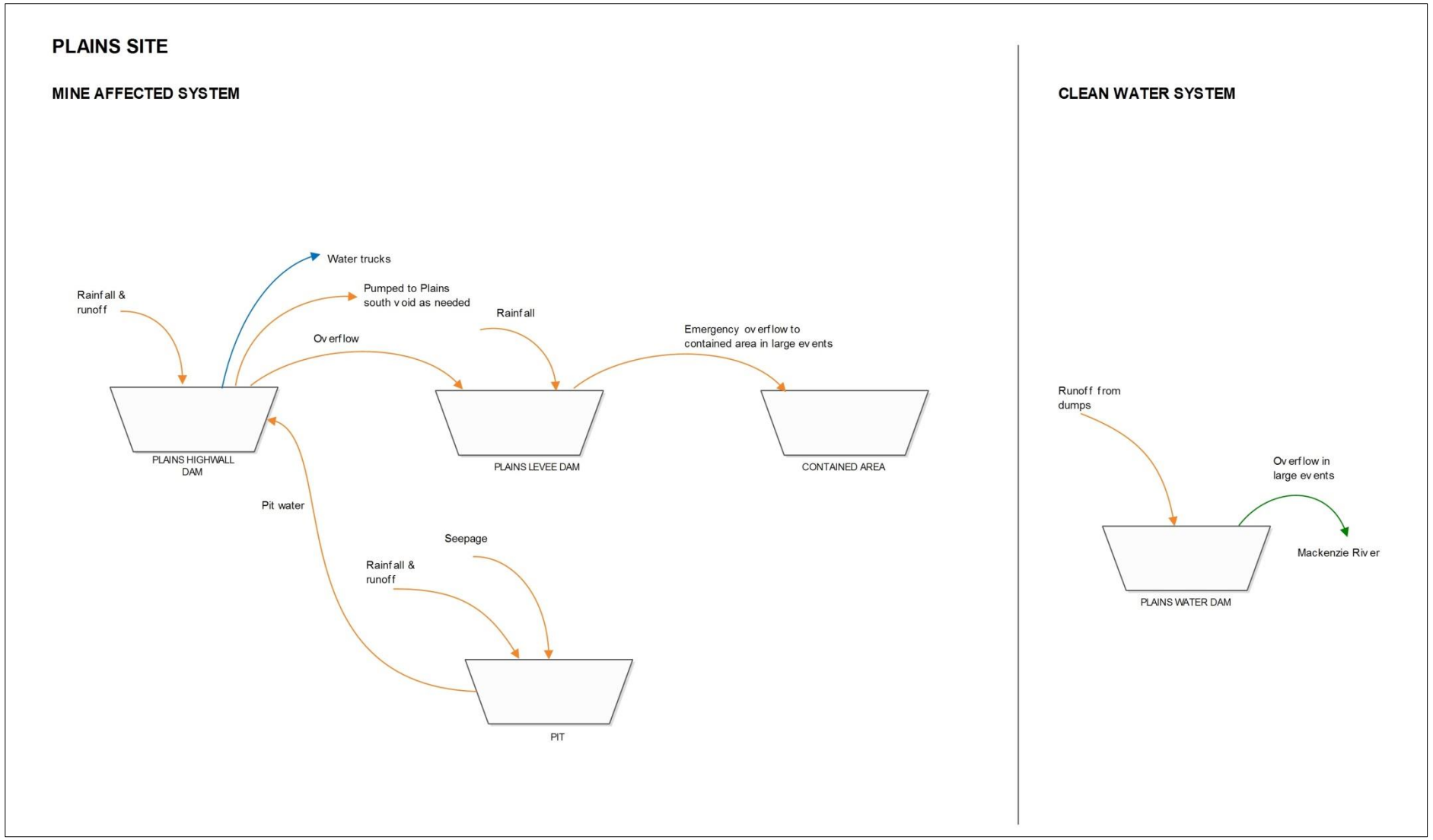
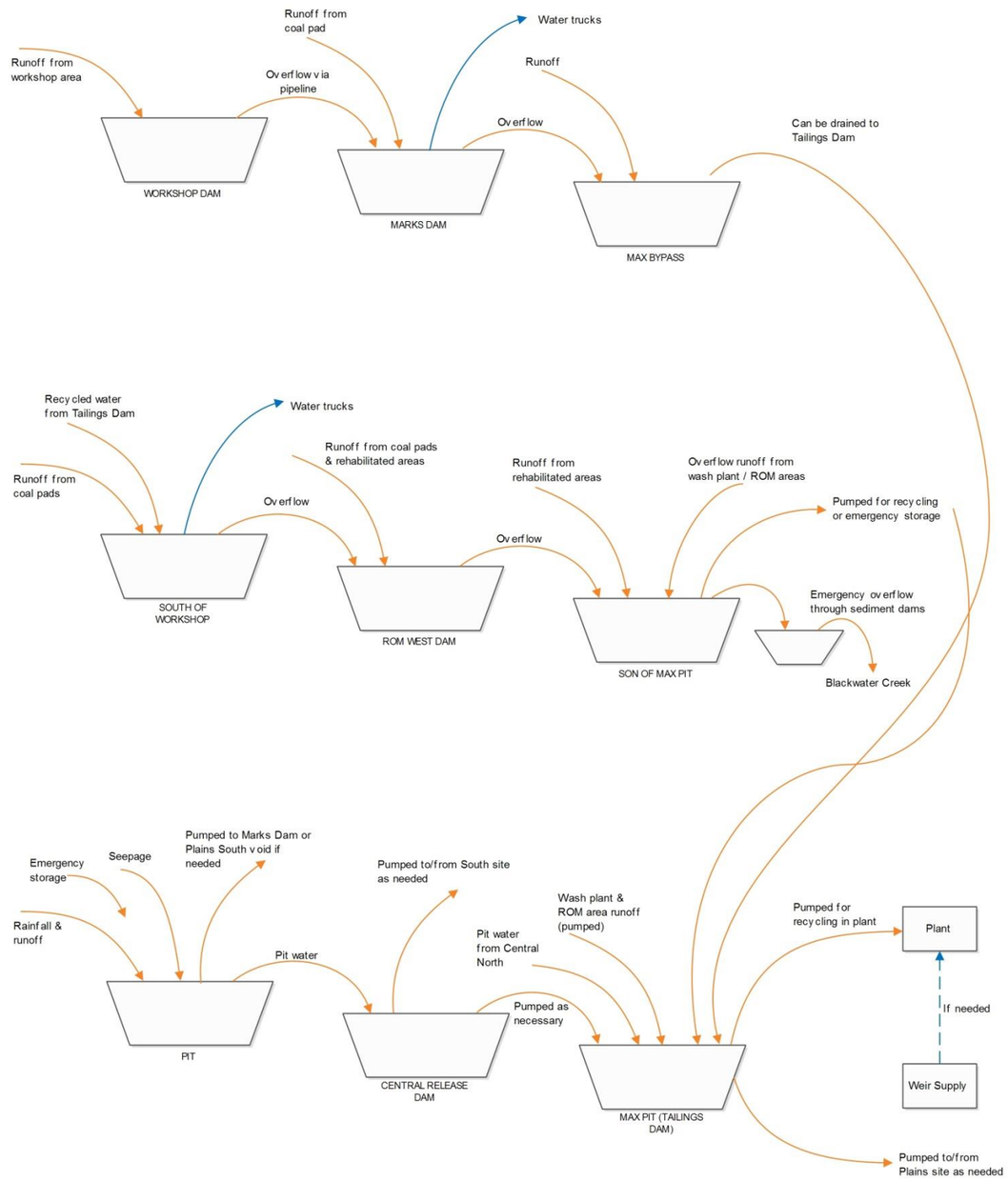


Figure 4 Site Water Management – Jellinbah Plains

CENTRAL SITE

MINE AFFECTED SYSTEM



CLEAN WATER SYSTEM

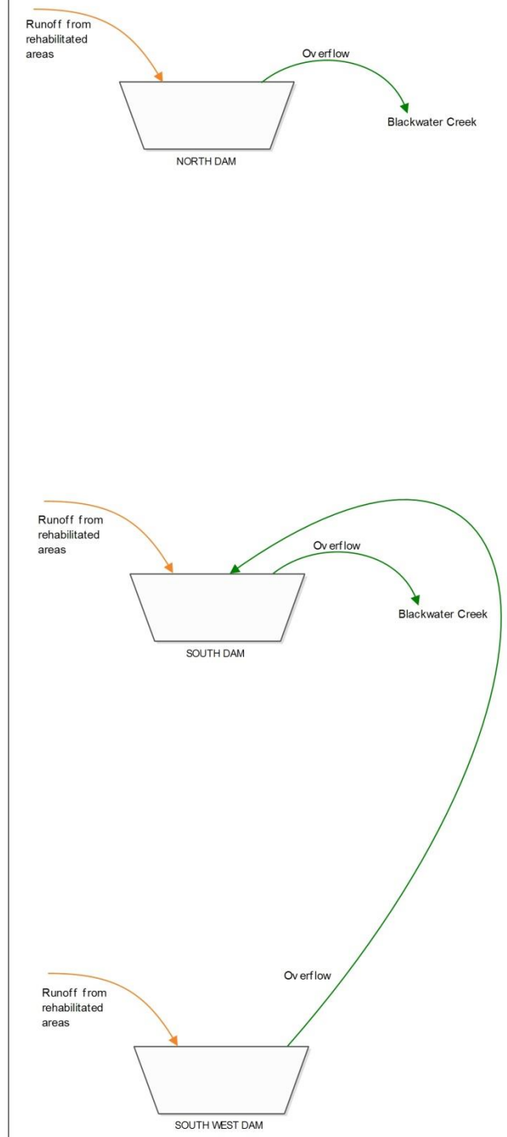


Figure 5 Site Water Management – Jellinbah Central

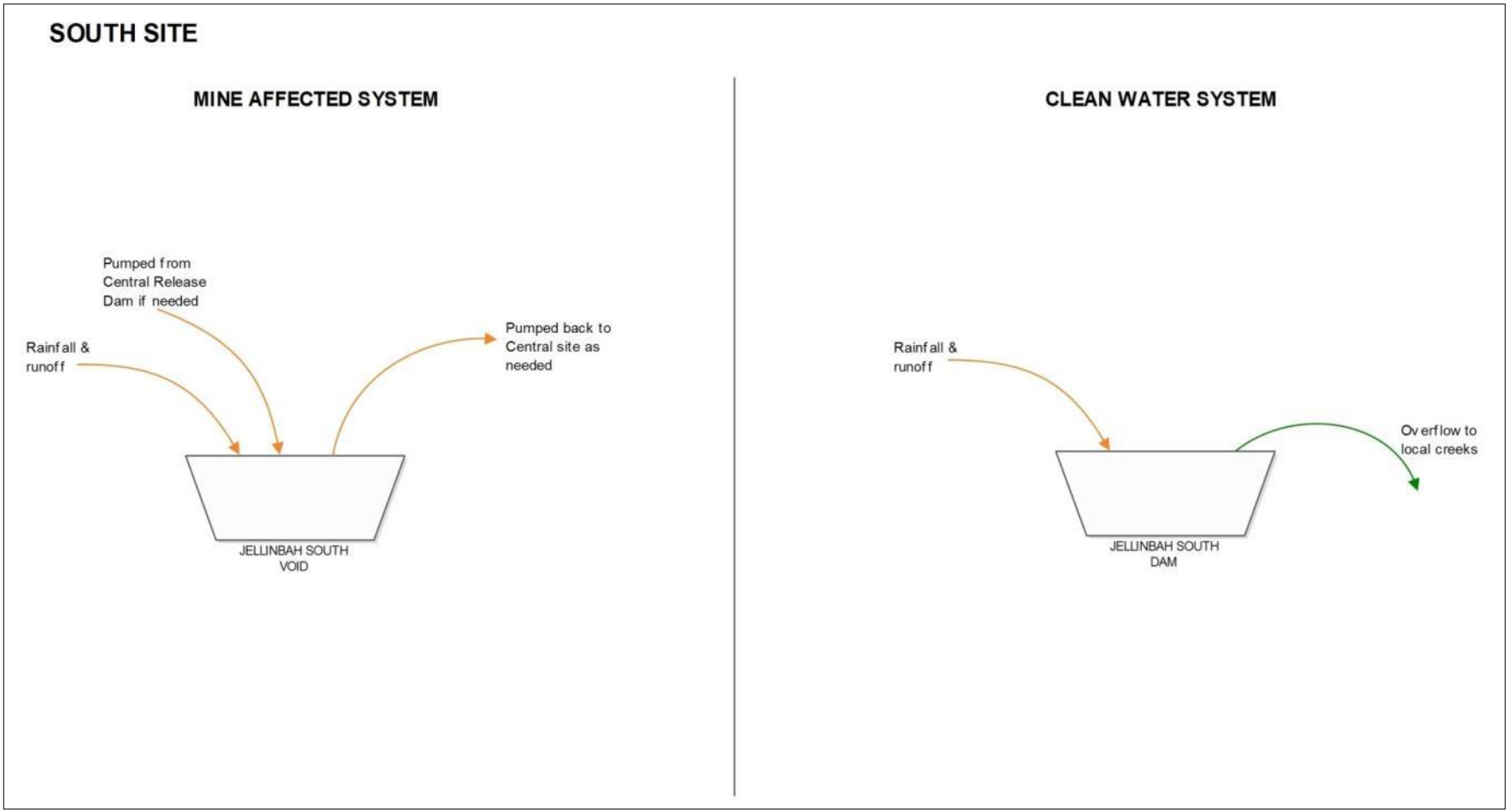


Figure 6 Site Water Management – Jellinbah South

Procedures for Separation and Management of MAW at Central North and Central North Extension

The approved disturbance area for Central North is proposed to be expanded to the east and west of the existing MLs. Due to minimal impact on the water balance and the close proximity of the Central North Extension to the Jellinbah Central site, existing supporting infrastructure and MAW management facilities at Central will be utilised for management of MAW.

Development of the Central North pit into the Central North Extension area will require the diversion of natural runoff from eastern areas to the north, away from the open-cut pit. Dedicated open drains with sediment traps will be established in the Central North Extension area, allowing sediment to settle prior to exit from the site. The clean water drain will outlet into the receiving environment near Five Mile Lagoon, subsequently entering the Mackenzie River. This clean water diversion will add approximately 150 ha of undisturbed catchment to the local waterway, which is less than a 2% increase in the total catchment area. This runoff will be clean water as the area to the east will not be affected by mining activities. As such, no significant impact on the receiving environment is anticipated to result from the Central North Extension. Monitoring of this receiving waterway will continue in order to ensure this outcome.

Overburden dumps will be established on the western side of the Central North Extension as the pit is progressively excavated. Drainage lines and two clean water sediment dams will be installed to manage clean runoff in these areas and to ensure runoff is separated from potential contaminant sources and MAW. Smaller sediment traps may also be established to assist with erosion and sediment control. Pit water is classed as mine-affected and will be pumped directly to the Max Pit Tailings Dam or an alternate MAW storage at Central.

Central North operations will commence with the existing drainage systems in place. The drain that currently splits the two sites will be retained during the initial years of production, with the final diversion arrangement implemented only when this area is to be mined.

Water infrastructure to be utilised by the development of Central North includes the following:

- Eastern sediment traps (proposed) – four to six sediment traps collecting sediment from flows along the eastern side of Central North, draining into Five Mile Lagoon and the Mackenzie River;
- Sediment Dam North and Sediment Dam South (proposed) – collection of runoff and sediment from overburden dumps;
- Max Pit Tailings Dam, Central Release Dam or other existing MAW storage – pumping of pit water; and
- Additional sediment traps established for sediment and erosion control purposes as required.

Water management arrangements at Central North and the Central North Extension are illustrated in Figure 7 and described in further detail in Appendix A.

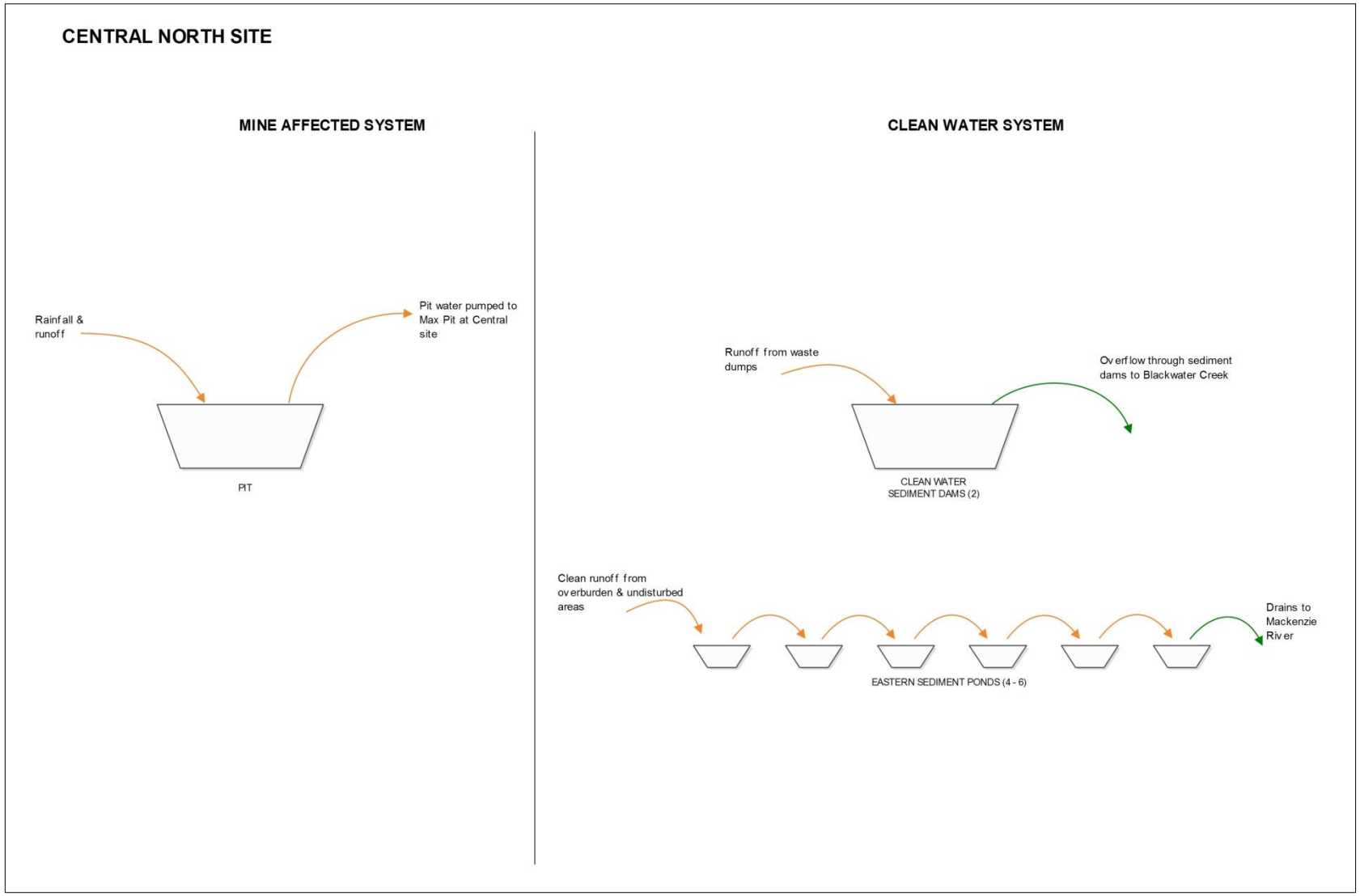


Figure 7 Site Water Management – Central North Extension

2.3.3.2 Mine Water Release Strategy

Water balance modelling, discussed in Section 2.1.3.1, indicates that the development of Central North will result in an additional 97,972 m^3 of MAW at the Jellinbah Mine per annum. Of this, approximately 24,326 m^3 of MAW is attributed to the Central North Extension, which is the subject of the EA Amendment Application. This constitutes an increase in volume of approximately 1.22% of total MAW to be managed at the Jellinbah Mine.

Model results demonstrate that a surplus storage capacity of 1,665,408 m^3 is available for MAW at the Jellinbah Mine during an average year, representing more than 44% of total MAW storage capacity (excluding available pit storage capacity). This indicates that existing storage capacity is more than sufficient to cater for the small increase in MAW. As such, this minor increase in MAW is not likely to significantly increase the likelihood of MAW release from the Jellinbah Mine. On this basis, no change to the release conditions for Jellinbah Mine has been proposed.

No new contaminant sources are proposed for the Central North Extension. Additional dams proposed for the Central North Extension will manage clean water only and are expected to be of a similar quality to existing clean water / sediment dams at the Jellinbah Mine, all of which have been assessed as having low consequence categories as per the *Manual for assessing consequence categories and hydraulic performance of structures* (ESR/2016/1933) (EHP 2016).

Considering the minor change in the volume of MAW to be managed at the Jellinbah Mine, and the likelihood of consistent water quality, no change to the existing approved release strategy is warranted or proposed.

Release Management

Jellinbah maintains a Release Procedure, which sets out actions that are to be undertaken prior to and during a release, as well as notification requirements. The Procedure also contains contingency measures to be implemented in the following circumstances:

- If the mine operator anticipates an uncontrolled release that is not likely to meet the release conditions; or
- If at any point during a release, monitoring determines that the release conditions are not being achieved and the release strategy cannot be quickly adjusted to achieve compliance.

Contingency measures include ceasing the controlled release of MAW and pumping of MAW to one or more of the open pits at Plains, the Jellinbah South Void or Max Pit. The development of Central North does not significantly increase the volume of MAW or affect the quality of MAW and as such will not require changes to the Release Procedure. The release procedure described above will continue to be implemented.

Release Conditions

No changes to the release rates, contaminant limits and trigger levels prescribed in the EA are proposed. Central North, including the Central North Extension, will not significantly increase the occurrence of authorised or unauthorised releases, or change the quality of water such that the release conditions cannot be achieved. The Release Procedure is provided as an attachment to the Site Water Management Plan in Appendix A.

2.3.3.3 Water Quality Characteristics of Sediment Dams

Proposed dams will collect runoff from overburden dumps and other non-mine-affected disturbed areas to allow sediments to settle prior to draining to the receiving environment. As such, the principal contaminants of collected water are likely to be sediments from cleared areas and potentially salts from overburden runoff. Existing water quality data for dams collecting overburden runoff at Jellinbah Central and Jellinbah South were reviewed to determine the likely characteristics of the proposed sediment dams. Dams reviewed include South Dam, South West Dam, North Dam and Jellinbah South Dam.

At the existing Jellinbah Mine, EC is relatively low in all clean water dams, with occasional elevated aluminium and pH, which do not persist across sampling events. No other metals have been found in elevated concentrations within the clean water dams (refer to Table 10). Based on the water quality data provided in Table 10, it is likely that the proposed dams will have water quality within the ranges described in Table 9 under normal operating conditions (i.e. no release). Existing experience at the Jellinbah Mine indicates that it is unlikely that other contaminants, such as metals, will be present in elevated concentrations.

Sediment dams and traps are designed to intercept drainage from non-mine-affected areas, providing retention time for sediments to drop out of solution, before water flows off site. During a rainfall event, further dilution of water will occur in the sediment traps before runoff leaves the Jellinbah Mine.

Table 9 Likely Water Quality Characteristics of Clean Water Dams

Quality Characteristics	EC (µS/cm)	pH (pH Units)	Sulphate (mg/L)
Min.	140	2.8	5
Max.	2,800	9.2	87
Median	1,550	8.3	33.5
Mean	1,599	8	35.6

Table 10 Water Quality Results – Clean Water Dams

Quality Characteristics		EC (µS/cm)	Fluoride (mg/L)	pH (pH units)	Sulphate (mg/L)	Aluminium (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Zinc (mg/L)
Onsite Water Storage Contaminant Limits		**5,970**	**2**	**4 – 9**	**1,000**	**5**	**0.5**	**0.01**	**1**	**1**	**0.1**	**1**	**20**
Jellinbah Central													
North Dam	17/10/14	2,500	0.5	8.5	71	12	0.01	0.001	0.01	0.01	0.01	0.01	0.01
	11/12/14	2,600	0.5	8.3	80	0.43	0.002	0.0002	0.001	0.003	0.001	0.001	0.004
	14/01/16	1,300	0.5	7.9	44	2.6	0.003	0.0002	0.002	0.009	0.002	0.005	0.013
	31/03/16	2,800	0.5	9	87	0.08	0.001	0.0002	0.001	0.003	0.001	0.001	0.003
South West Dam	13/08/14	2,100	0.8	8.6	57	0.72	0.003	0.0002	0.001	0.005	0.001	0.003	0.006
	11/12/14	2,000	0.7	9.2	55	0.71	0.003	0.0002	0.001	0.003	0.001	0.002	0.003
	26/03/15	1,600	0.5	8.8	42	0.34	0.002	0.0002	0.001	0.002	0.001	0.001	0.003
	26/06/15	1,800	0.5	8.6	49	0.48	0.002	0.0002	0.001	0.002	0.001	0.001	0.002
	9/10/15	2,200	0.5	8.8	56	0.41	0.002	0.0002	0.001	0.003	0.001	0.001	0.002
	14/01/16	1,200	0.5	7.6	29	0.05	0.005	0.0002	0.002	0.001	0.001	0.002	0.003
	31/03/16	830	0.7	7.8	23	2	0.002	0.0002	0.001	0.005	0.001	0.003	0.007
South Dam	17/10/14	1,100	0.5	7.5	49	0.84	0.01	0.001	0.01	0.01	0.01	0.01	0.01
	11/12/14	1,300	0.5	7.3	53	0.29	0.002	0.0002	0.001	0.003	0.001	0.001	0.005
	26/03/15	1,500	0.5	8.5	12	0.05	0.006	0.0002	0.001	0.001	0.001	0.001	0.003
	26/06/15	2,400	0.5	8.5	5.1	0.19	0.003	0.0002	0.001	0.001	0.001	0.003	0.003
	14/01/16	670	0.5	7.2	15	2.9	0.006	0.0002	0.004	0.009	0.002	0.006	0.016
	31/03/16	980	0.5	7.5	31	0.44	0.003	0.0002	0.001	0.002	0.001	0.002	0.004

Quality Characteristics		EC (µS/cm)	Fluoride (mg/L)	pH (pH units)	Sulphate (mg/L)	Aluminium (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Zinc (mg/L)
Onsite Water Storage Contaminant Limits		**5,970**	**2**	**4 – 9**	**1,000**	**5**	**0.5**	**0.01**	**1**	**1**	**0.1**	**1**	**20**
Jellinbah South													
Jellinbah South Dam	13/08/14	1,800	0.5	2.8	5	12	0.003	0.0002	0.007	0.019	0.005	0.018	0.033
	11/12/14	1,000	0.5	8.1	17	2.1	0.002	0.0002	0.002	0.004	0.001	0.004	0.008
	26/03/15	560	0.5	7.9	6.8	7.5	0.003	0.0002	0.004	0.012	0.004	0.012	0.022
	26/06/15	900	0.5	8.3	12	3	0.002	0.0002	0.002	0.005	0.001	0.005	0.009
	9/10/15	2,700	0.9	9.1	36	2.6	0.003	0.0002	0.003	0.008	0.002	0.007	0.01
	14/01/16	2,400	0.5	8.3	15	0.42	0.002	0.0002	0.001	0.003	0.001	0.002	0.014
	31/03/16	140	0.5	7.3	5	5	0.003	0.0002	0.002	0.007	0.002	0.007	0.013

2.3.3.4 Site Water Management Plan

Changes to Site Water Management Plan

UDP (2016) has prepared a revised Site Water Management Plan for the Jellinbah Coal Mine. The revised Plan incorporates the approved Central North development and the proposed Central North Extension. The revised Site Water Management Plan is provided in Appendix A.

Management of Excess Water

The Site Water Management Plan (UDP 2016) includes a water balance of all MAW and clean water inputs and outputs at the Project. Model results demonstrate that available storage capacity for MAW exceeds runoff and groundwater inflows. As discussed in Section 2.3.3.1, the water balance indicates that a surplus storage capacity of 1,665,408 m^3 is available for MAW during an average year, representing more than 44% of total MAW storage capacity (excluding available pit storage capacity). Conversely, clean water runoff is not intended for containment onsite; sediment dams and drains ensure sediments settle out of the water prior to discharge into receiving waters.

Mine Water Release Strategy

As stated in Section 2.3.3.2, no changes are required to the Jellinbah Mine's current Release Procedure. No additional release points and no changes to the release rates, contaminant limits and trigger levels are proposed with this EA Amendment Application. Central North, including the Central North Extension, will not significantly increase the occurrence of authorised or unauthorised releases, or change the quality of water such that the release conditions cannot be achieved.

2.4 ITEM 4 – GROUNDWATER MONITORING LOCATIONS

2.4.1 Issue / Concern

The amendment application states that additional groundwater monitoring bores will be established to monitor groundwater quality, groundwater levels and drawdown fluctuations that result from the mining operations at the Project. However, the proponent has not provided the proposed location coordinates for these groundwater monitoring bore locations. Amendments to the current EA will be required to include the additional groundwater monitoring locations, frequency and trigger levels.

2.4.2 Information Requested

It is requested that the proponent provides the following information:

a) Groundwater monitoring bores locations in terms of coordinates (in decimal degrees, GDA94) and a map; and

b) Include proposed groundwater monitoring frequency and contaminant trigger levels based on background data gathered from existing regional scheduled monitoring.

2.4.3 Response

JBT Consulting Pty Ltd (JBT) was commissioned to undertake the following in relation to Item 4:

- Review available groundwater data in the area of the proposed amendment;
- Collect additional groundwater data and observations during a site visit to the Jellinbah Coal Mine in December 2015; and

- Assess the need for further groundwater monitoring bores to be established for the Central North Extension.

A Groundwater Assessment Report (JBT 2016) is provided in Appendix B.

2.4.3.1 Existing Groundwater Conditions

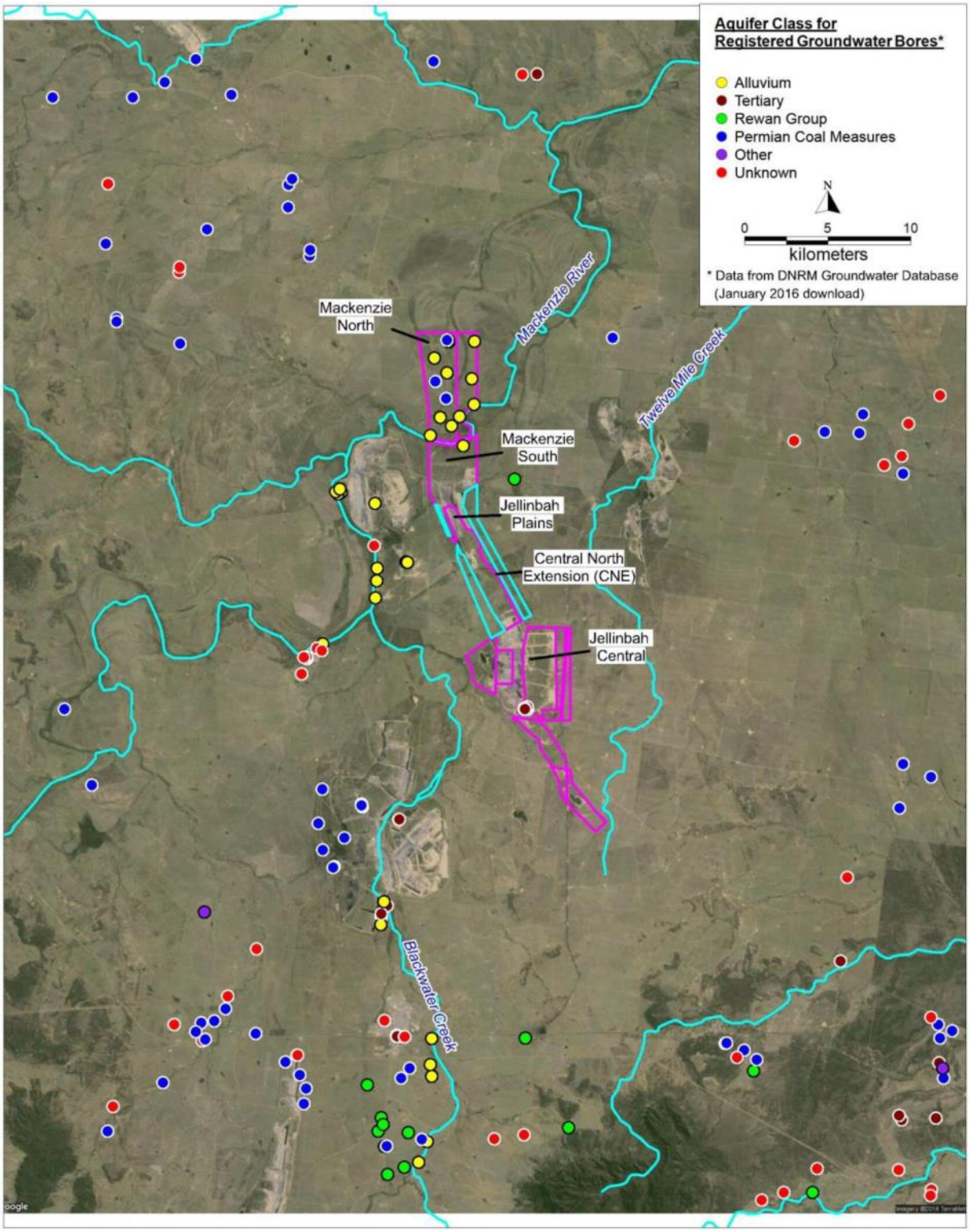
JBT (2016) conducted a review of groundwater data to determine groundwater conditions associated with the Central North Extension area. The following information was reviewed:

- Observations and data collected during a site visit conducted in December 2015;
- Available groundwater data from existing monitoring; and
- Available data from the Department of Natural Resources and Mines (DNRM) groundwater database.

The following conclusions were drawn as a result of this review:

- Groundwater within the Permian Coal measures tends to be saline and, based on salinity criteria, is generally unsuitable for stock use;
- A review of data from the DNRM groundwater database, as well as observations from the existing Central pit, indicated that groundwater yield within the Permian coal measures is low (74% of bores recorded an airlift yield of less than 1 litre per second (L/s));
- The Central pit was observed to be dry with generally no visible groundwater seepage from the coal measures;
- Groundwater within the overlying Triassic Rewan Group sediments is typically saline, based on available data from the DNRM groundwater database. Groundwater within this unit is therefore considered generally unsuitable for stock use;
- Rewan Group sediments were determined to be dry within the Central North Extension area, as were the overlying Tertiary sediments; and
- DNRM groundwater data and existing data from monitoring bores to the north of the Plains pit indicate that Quaternary sediments are the only unit in the area that contain useable volumes of stock-quality drinking water. No Quaternary alluvial deposits occur in the proposed mining area of the Central North Extension, although some occur in the north-east corner of MLA 700011. Groundwater conditions at the Central North Extension are expected to be similar to the Central pit.

The locations of DNRM registered bores are shown in Figure 8 by aquifer class.



Source: JBT (2016)

Figure 8 Location of Bores in DNRM Groundwater Database and Aquifer Class

2.4.3.2 Current Groundwater Monitoring Program

A number of groundwater monitoring bores were drilled for the Mackenzie South (Plains) operation in 2002; however, the majority of these have been lost to mining of the Plains pit. Currently, groundwater level monitoring is conducted at bores MSP0209 and MSP0213 (screened within the Mackenzie River alluvium) and MS0203 (screened within the Pollux Seam) at the Jellinbah Coal Mine in accordance with the EA. Groundwater levels at these bores are regularly monitored by site environmental personnel (JBT 2016). The locations of these monitoring bores are provided below in Table 11 and shown in Figure 9.

Table 11 Groundwater Monitoring Locations and Frequency

Monitoring Bore	Latitude	Longitude	Monitoring Frequency
MS0203	-23.2682°	148.9118°	Annual
MSP0209	-23.26839°	148.9136°	Annual
MSP0213	-23.26823°	148.9119°	Annual

Note: Coordinates are in GDA 94.

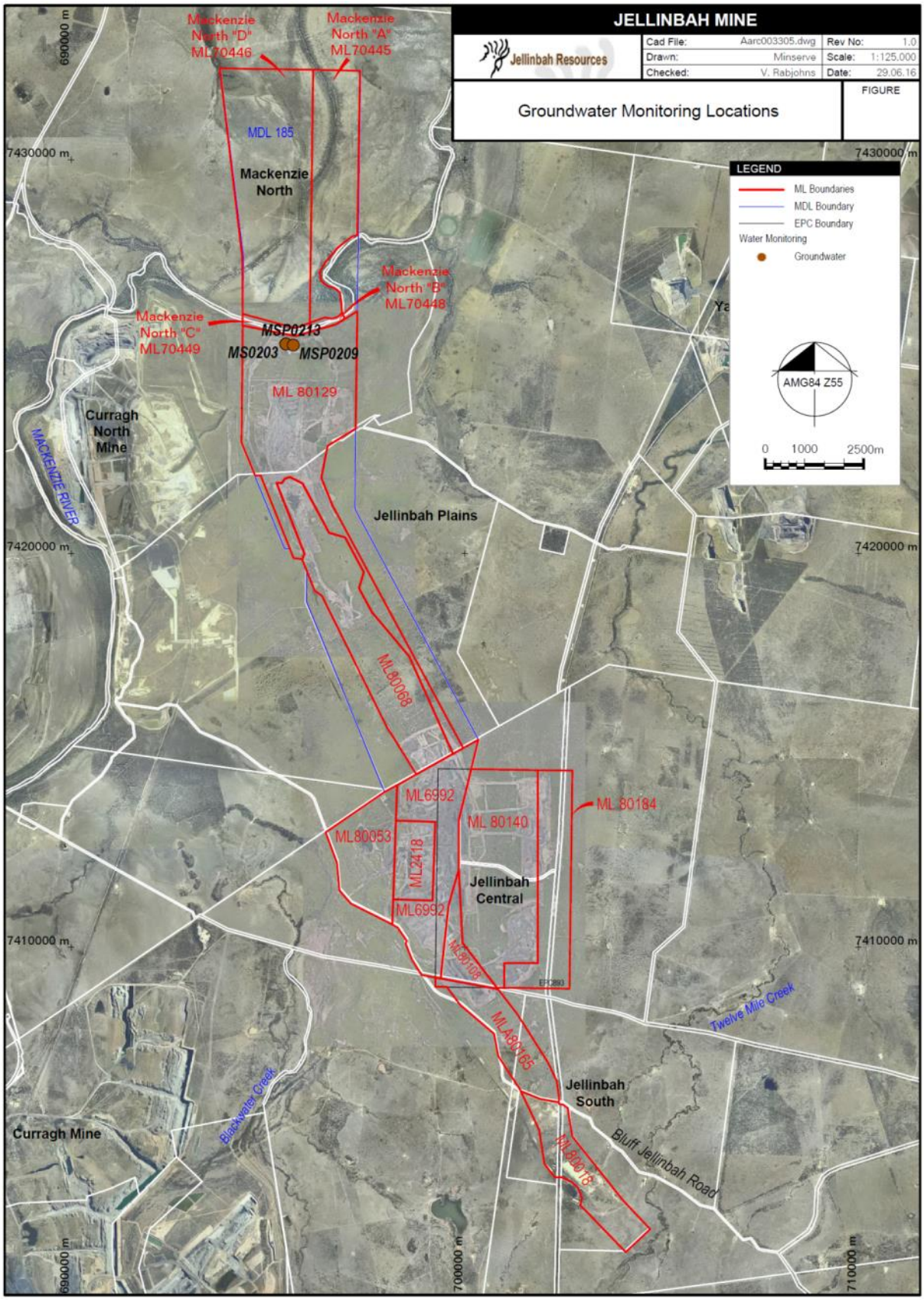


Figure 9 Groundwater Monitoring Locations

2.4.3.3 Groundwater Monitoring at the Central North Extension

Section 4.3.3.2 (Water Management Strategies – Groundwater) of the EA Amendment Application proposed the establishment of additional groundwater monitoring bores within the Central North Extension area to measure groundwater quality, levels and drawdown fluctuations. However, upon review of existing data and the local groundwater environment, JBT (2016) concluded that groundwater monitoring within the Central North Extension area is not warranted, for reasons outlined below.

Groundwater Occurrence

Four groundwater units have been identified within the Jellinbah Mine area: Quaternary alluvium, Tertiary sediments, Triassic Rewan Group and Permian coal measures. Of these, JBT (2016) determined that only the Permian coal measures could be monitored via groundwater bores. However, site observations and available groundwater data support the conclusion of a low yield within the Permian coal measures. Data indicate that the Tertiary and Triassic Rewan Group sediments are unsaturated. The observed groundwater level is below the base of the both the Tertiary and Triassic Rewan Group sediments. Tertiary and Triassic strata within the Central North Extension area are therefore considered to be dry, with groundwater only likely to occur within the Permian coal measures (JBT 2016).

Quaternary alluvial deposits occur only in the north-eastern area of the Central North Extension, which is not proposed to be mined. Monitoring of groundwater within the Quaternary alluvium is currently undertaken at the Jellinbah Plains, where alluvium is being removed by mining activities in the north (JBT 2016).

Environmental Values

Section 4.3.1.2 (Description of Environmental Values – Groundwater) of the EA Amendment Application indicated that the *Mackenzie River Sub-basin Environmental Values and Water Quality Objectives* document (EHP 2011) lists the following environmental values that may apply to groundwater in the local area:

- Protection of aquatic ecosystems;
- Suitability for irrigation;
- Suitability for farm supply and use;
- Suitability for stock water;
- Suitability for drinking water supply;
- Suitability for industrial use; and
- Protection of cultural and/or spiritual values.

Section 4.3.1.2 of the EA Amendment Application also stated that the environmental value of groundwater applicable to the proposed amendment is limited to the protection of aquatic ecosystems associated with alluvial aquifers associated with the Mackenzie River or other watercourses (AARC 2015).

Jellinbah site personnel have advised that groundwater occurrence is limited to the northern area of the Plains pit, coinciding with Quaternary alluvial deposits. While groundwater within Quaternary

alluvium may be of environmental value for ecosystem protection, Quaternary alluvium does not exist in the proposed mining area of the Central North Extension. Mining will occur approximately 2.24 km south of the Quaternary alluvium. On this basis, this environmental value is not considered applicable to groundwater at the Central North Extension.

Available data from the DNRM groundwater database indicate that groundwater within the Permian coal measures is saline. Mean and median EC were recorded in excess of 7,600 µS/cm. Available data from existing bores at the Jellinbah Mine indicate that the EC of groundwater within the Pollux seam varies from 18,000 – 34,000 µS/cm, while the shallower Castor seam records an EC of greater than 7,000 µS/cm. Groundwater within the Permian coal measures is marginal to unsuitable for use as stock drinking water due to its highly saline nature. Together with the lack of environmental value for ecosystem protection, groundwater within the Permian coal measures in the Central North Extension area is not considered to be of particular environmental value (JBT 2016).

Groundwater Drawdown

Mining at the Central North Extension is proposed to occur between the existing Central and Plains pits. A review of water level data from geological exploration bores within the Central North Extension area indicates that drawdown impacts from the existing mining operations may extend over a distance of approximately 1.5 – 2 km from the edge of the pit. As the distance from the Central pit to the Plains pit is approximately 4 km, it is considered probable that groundwater levels within the Central North Extension area are already experiencing cumulative impacts from existing mining operations (JBT 2016).

Mining within the proposed Central North Extension will occur in an area in which groundwater levels are already impacted by existing mining activities. Impacts will be limited to the Permian coal measures, which are not considered to be of particular environmental value (JBT 2016). Additional groundwater monitoring at the Central North Extension is therefore considered unnecessary.

2.5 ITEM 5 – GROUNDWATER MONITORING DATA

2.5.1 Issue / Concern

The amendment application states that groundwater monitoring is currently undertaken at Jellinbah Mine. However, the information provided to EHP does not include sufficient information regarding the current monitoring network or recent monitoring data.

The amendment application states that there are limited groundwater users for the area, however no date is given for when the census was undertaken (assume 2006). It cannot be assumed that no additional bores have been drilled since this census was completed. It is also noted that the Amendment Application states the existing monitoring data is limited (Section 4.3.1.2 of the Amendment Application). There is no detailed analysis of information gained since 2006 on how the aquifers are responding to mining activities either through monitoring networks or water level data from exploration bores, or water volumes extracted from the existing pits.

2.5.2 Information Requested

It is requested that the proponent provides the following information:

a) Details of the current groundwater monitoring being undertaken and provide this information relative to Jellinbah Mine and regional groundwater bores; and

b) Provide up-to-date information regarding other current groundwater users for the area.

2.5.3 Response

JBT was commissioned to undertake the following in relation to Item 5:

- Review available groundwater data in the area of the proposed amendment; and
- Collect additional groundwater data and observations during a site visit to the Jellinbah Coal Mine in December 2015.

A Groundwater Assessment Report (JBT 2016) is provided in Appendix B.

2.5.3.1 Groundwater Monitoring Program

Details of the current groundwater monitoring program are provided in Section 2.4.3.2. Groundwater level is currently monitored at bores MSP0209 and MSP0213 (screened within the Mackenzie River alluvium) and MS0203 (screened within the Pollux Seam), in accordance with the EA. The locations of these monitoring bores are provided in Table 11 in Section 2.4.3.2.

Table 12 provides the results of groundwater level monitoring at Jellinbah Plains over the period June 2009 – March 2016. The standing water level (SWL) is measured as depth from the top of casing and as depth in terms of the reduced level (RL). As discussed in Section 2.4.3.3, groundwater levels within the Central North Extension area are likely to be experiencing impacts from existing mining operations at Jellinbah Coal Mine (JBT 2016).

Table 12 Groundwater Levels 2009 – 2016

Date	Pollux Seam		Mackenzie River Alluvium			
	MS0203		MSP0209		MSP0213	
	Depth (m)	SWL (mRL)	Depth (m)	SWL (mRL)	Depth (m)	SWL (mRL)
16/06/2009	21.42	102.33	21.2	102.43	21.55	102.15
8/09/2009	21.2	102.55	21.34	102.29	21.22	102.48
1/12/2009	21.4	102.35	21.4	102.23	21.4	102.3
4/03/2010	21.3	102.45	21.3	102.33	21.4	102.3
2/09/2010	21.27	102.48	21.28	102.35	21.35	102.35
8/12/2010	19.62	104.13	19.73	103.9	19.91	103.79
24/05/2011	17.9	105.85	17.8	105.83	18	105.7
20/10/2011	18.26	105.49	18.18	105.45	18.29	105.41
29/02/2012	18.11	105.64	18.03	105.6	18.24	105.46
23/05/2012	18.2	105.55	18.2	105.43	18.32	105.38
3/09/2012	18.21	105.54	18.14	105.49	18.29	105.41
10/12/2012	18.42	105.33	18.3	105.33	18.38	105.32
13/03/2013	18.45	105.3	18.35	105.28	18.49	105.21
6/08/2013	18.57	105.18	18.45	105.18	18.62	105.08
2/10/2013	18.67	105.08	18.6	105.03	18.69	105.01
8/04/2014	19.35	104.4	19.07	104.56	19.45	104.25
4/09/2014	19.45	104.3	19.75	103.88	19.55	104.15

Date	Pollux Seam		Mackenzie River Alluvium			
	MS0203		MSP0209		MSP0213	
	Depth (m)	SWL (mRL)	Depth (m)	SWL (mRL)	Depth (m)	SWL (mRL)
2/12/2014	19.56	104.19	19.39	104.24	19.7	104
27/02/2015	19.78	103.97	19.51	104.12	19.89	103.81
28/05/2015	19.82	103.93	19.7	103.93	20.08	103.62
2/09/2015	20.08	103.67	20.04	103.59	20.23	103.47
3/12/2015	20.6	103.15	20.76	102.87	20.46	103.24
2/03/2016	20.25	103.5	20.27	103.36	20.51	103.19

2.5.3.2 Currency of Groundwater Information

Information provided by JBT (2016) has been sought from the DNRM groundwater database, last updated on 6th January 2016. Table 13 provides updated details of known groundwater bores in the region. A total of 183 registered groundwater bores were identified within approximately 25 km of the Central North Extension. Of these:

- 70 are located within Permian sediments;
- 17 are located within Triassic Rewan Group;
- 22 are located within Tertiary sediments; and
- 33 are located within Quaternary alluvium.

Table 13 Registered Groundwater Bores within 25 km of Central North Extension

Bore ID	Date Drilled	Status	Latitude	Longitude	Lot / Plan	Aquifer	Aquifer Class
22093	23/01/1960	EX	-23.123	148.712	-	-	Unknown
38315	1/01/1956	AD	-23.238	149.202	12 LR12	-	Unknown
38548	9/09/1973	AD	-23.124	148.819	5 TT242	Burngrove Formation	Permian Coal Measures
38917	5/11/1972	AD	-23.578	148.767	11 RP614154	Burngrove Formation	Permian Coal Measures
38998	6/11/1972	EX	-23.577	148.775	1 HT622	Burngrove Formation	Permian Coal Measures
43097	4/11/1972	EX	-23.57	148.781	7 HT622	Burngrove Formation	Permian Coal Measures
43459	1/01/1900	EX	-23.538	148.8	1 RP613729	-	Unknown
43461	2/11/1972	AD	-23.121	148.821	5 TT242	Rangal Coal Measures	Permian Coal Measures
43462	9/11/1972	AD	-23.162	148.831	5 TT242	Rangal Coal Measures	Permian Coal Measures
43463	25/11/1972	AD	-23.159	148.831	5 TT242	Rangal Coal Measures	Permian Coal Measures
43899	-	AD	-23.171	148.754	4 TT240	-	Unknown
44562	1/01/1920	EX	-23.169	148.754	4 TT240	-	Unknown
47040	4/06/1974	AD	-23.623	148.715	-	-	Unknown
47041	4/06/1974	EX	-23.636	148.712	-	German Creek Formation	Permian Coal Measures
47354	28/09/1967	AD	-23.064	148.956	-	-	Unknown
47355	28/09/1967	AD	-23.064	148.965	-	Duaringa Formation	Tertiary
84088	28/09/1987	EX	-23.61	148.745	-	German Creek Formation	Permian Coal Measures
84221	1/02/1988	EX	-23.584	148.799	56 HT460	Burngrove Formation	Permian Coal Measures
88824	5/04/1993	EX	-23.582	149.209	5 HT551	Gyranda Subgroup	Permian Coal Measures
88858	5/07/1993	EX	-23.445	149.197	4 HT58	Gyranda Subgroup	Permian Coal Measures
89025	1/01/1964	EX	-23.544	149.144	26 HT486	Basalt	Tertiary
89034	-	EX	-23.588	148.768	-	-	Unknown

Bore ID	Date Drilled	Status	Latitude	Longitude	Lot / Plan	Aquifer	Aquifer Class
89049	2/11/1985	AD	-23.148	148.771	5 TT242	Rangal Coal Measures	Permian Coal Measures
89050	3/11/1985	AD	-23.156	148.711	5 TT242	Rangal Coal Measures	Permian Coal Measures
89051	1/11/1985	AD	-23.136	148.818	5 TT242	Rangal Coal Measures	Permian Coal Measures
89319	8/10/1992	EX	-23.248	149.157	4 LR119	Gyranda Subgroup	Permian Coal Measures
89325	9/10/1992	EX	-23.258	149.134	4 LR119	Gyranda Subgroup	Permian Coal Measures
89440	6/12/1992	AD	-23.276	149.169	4 LR119	-	Unknown
89441	6/12/1992	AD	-23.259	149.154	4 LR119	Gyranda Subgroup	Permian Coal Measures
89442	6/12/1992	AD	-23.263	149.116	4 TT240	-	Unknown
90070	3/03/1993	EX	-23.196	148.717	4 TT240	Fair Hill Formation	Permian Coal Measures
90071	2/03/1993	EX	-23.198	148.717	-	Fair Hill Formation	Permian Coal Measures
90187	13/12/1993	AD	-23.563	148.783	7 HT622	-	Unknown
91406	4/08/1994	EX	-23.608	149.204	5 HT551	Gyranda Subgroup	Permian Coal Measures
91897	1/01/1900	EX	-23.586	149.202	5 HT551	Gyranda Subgroup	Permian Coal Measures
97558	9/07/1996	EX	-23.67	149.127	2 HT388	Rewan Group	Rewan Group
97709	12/03/1998	AU	-23.38	148.828	2 RP616770	-	Unknown
97710	13/03/1998	AD	-23.381	148.829	1 RP616769	-	Unknown
97711	13/03/1998	AD	-23.38	148.829	1 RP616769	-	Unknown
100076	29/10/1992	EX	-23.499	149.147	20 HT486	-	Unknown
100095	31/10/1992	EX	-23.635	148.983	9 HT663	-	Rewan Group
103241	1/01/1900	EX	-23.075	148.785	2 TT299	Burngrove Formation	Permian Coal Measures
103242	7/06/1993	EX	-23.068	148.746	1 TT299	Burngrove Formation	Permian Coal Measures
103243	17/08/1996	EX	-23.077	148.727	1 TT299	Burngrove Formation	Permian Coal Measures
111105	5/11/1992	EX	-23.271	149.18	11 LR12	-	Unknown
111106	5/11/1992	EX	-23.254	149.183	12 LR12	-	Unknown

Bore ID	Date Drilled	Status	Latitude	Longitude	Lot / Plan	Aquifer	Aquifer Class
111316	13/09/2001	EX	-23.175	149.13	8 LR114	Gyranda Subgroup	Permian Coal Measures
111552	11/10/2001	AD	-23.207	149.009	14 LE801034	Gyranda Subgroup	Permian Coal Measures
111553	12/10/2001	AD	-23.283	148.951	2 LR101	Rewan Group	Rewan Group
111579	6/11/2001	EX	-23.438	149.18	5 HT58	Gyranda Subgroup	Permian Coal Measures
111580	6/11/2001	EX	-23.462	149.178	5 HT58	Gyranda Subgroup	Permian Coal Measures
111661	20/01/2002	AD	-23.579	148.751	5 RP614154	-	Unknown
111709	21/01/2002	EX	-23.583	148.764	8 RP614154	Burngrove Formation	Permian Coal Measures
111877	28/04/2002	EX	-23.373	148.839	13 SP104404	Mackenzie River Alluvium	Alluvium
122470	-	EX	-23.617	149.221	100 RP882349	Tertiary – Undefined	Tertiary
132773	26/11/2011	EX	-23.607	148.903	32 HT447	Rewan Formation	Rewan Group
132774	29/11/2011	EX	-23.607	148.903	32 HT447	Blackwater Creek Alluvium	Alluvium
132775	29/11/2011	EX	-23.6	148.902	32 HT447	Blackwater Creek Alluvium	Alluvium
132776	29/11/2011	EX	-23.611	148.865	32 HT447	Rewan Group	Rewan Group
132777	27/11/2011	EX	-23.608	148.885	32 HT447	Rangal Coal Measures	Permian Coal Measures
132778	23/11/2011	EX	-23.629	148.873	32 HT447	Rewan Group	Rewan Group
132779	23/11/2011	EX	-23.629	148.873	32 HT447	Rewan Group	Rewan Group
132780	29/11/2011	EX	-23.637	148.889	1 RP620665	Rewan Group	Rewan Group
132781	29/11/2011	EX	-23.642	148.9	1 RP620665	Rewan Group	Rewan Group
132782	29/11/2011	EX	-23.642	148.9	1 RP620665	Blackwater Creek Alluvium	Alluvium
132783	29/11/2011	EX	-23.653	148.895	1 RP620665	Blackwater Creek Alluvium	Alluvium
132784	29/11/2011	EX	-23.636	148.871	67 HT445	Rewan Group	Rewan Group
132785	29/11/2011	AD	-23.645	148.875	1 RP620665	Rewan Group	Rewan Group
132827	13/04/2012	EX	-23.585	148.887	28 SP193689	Duaringa Formation	Tertiary
132828	12/04/2012	EX	-23.585	148.887	28 SP193689	-	Unknown

Bore ID	Date Drilled	Status	Latitude	Longitude	Lot / Plan	Aquifer	Aquifer Class
136126	29/06/2002	EX	-23.057	148.904	15 ROP172	Blackwater Group	Permian Coal Measures
136628	9/07/2007	EX	-23.077	148.68	4 TT269	Blackwater Group	Permian Coal Measures
151536	25/05/2011	AD	-23.63	149.18	2 RP616780	Duaringa Formation	Tertiary
151799	22/01/2013	EX	-23.575	149.197	5 HT551	Gyranda Subgroup	Permian Coal Measures
151800	23/01/2013	EX	-23.579	149.201	5 HT551	Blackwater Group	Permian Coal Measures
151856	1/03/2013	AD	-23.389	148.826	36 SP247242	-	Unknown
151857	4/03/2012	AD	-23.376	148.838	36 SP247242	-	Unknown
151858	6/03/2012	AD	-23.375	148.835	36 SP247242	-	Unknown
151918	13/05/2013	EX	-23.604	149.092	11 H4023	Rewan Formation	Rewan Group
151940	28/09/2013	EX	-23.579	149.201	5 HT551	Gyranda Subgroup	Permian Coal Measures
151941	28/09/2013	EX	-23.575	149.197	5 HT551	-	Unknown
158024	14/12/2011	EX	-23.633	148.874	54 HT407	Rewan Formation	Rewan Group
158138	4/07/2013	EX	-23.515	148.876	7 HT607	Blackwater Creek Alluvium	Alluvium
158139	2/03/2013	EX	-23.515	148.876	7 HT607	Duaringa Formation	Tertiary
158140	4/07/2013	EX	-23.52	148.873	4 HT607	Duaringa Formation	Tertiary
158141	5/07/2013	EX	-23.525	148.873	4 HT607	Blackwater Creek Alluvium	Alluvium
158142	5/07/2013	EX	-23.519	148.873	4 HT607	Tertiary – Undefined	Tertiary
158143	6/07/2013	EX	-23.512	148.875	7 HT607	Duaringa Formation	Tertiary
158144	6/07/2013	EX	-23.512	148.875	7 HT607	Blackwater Creek Alluvium	Alluvium
158145	12/07/2013	EX	-23.459	148.861	2 HT606	Rangal Coal Measures	Permian Coal Measures
158146	13/07/2013	EX	-23.461	148.862	2 HT606	Rangal Coal Measures	Permian Coal Measures
158147	13/07/2013	EX	-23.46	148.861	2 HT606	Rangal Coal Measures	Permian Coal Measures
158148	24/072013	EX	-23.484	148.839	4 HT607	Burngrove Formation	Permian Coal Measures
158153	25/07/2013	EX	-23.47	148.836	4 HT607	Burngrove Formation	Permian Coal Measures

Bore ID	Date Drilled	Status	Latitude	Longitude	Lot / Plan	Aquifer	Aquifer Class
158154	25/07/2013	EX	-23.452	148.838	2 HT606	Burngrove Formation	Permian Coal Measures
158155	26/072013	EX	-23.478	148.851	4 HT607	Rangal Coal Measures	Permian Coal Measures
158165	19/11/2012	EX	-23.209	148.928	3 TT422	Mackenzie River Alluvium	Alluvium
158166	22/11/2012	EX	-23.229	148.926	3 TT422	Mackenzie River Alluvium	Alluvium
158167	23/11/2012	EX	-23.243	148.928	3 TT422	Mackenzie River Alluvium	Alluvium
158168	24/11/2012	EX	-23.26	148.902	3 TT422	Mackenzie River Alluvium	Alluvium
158169	27/11/2012	EX	-23.25	148.919	3 TT422	Mackenzie River Alluvium	Alluvium
158170	2/12/2012	EX	-23.209	148.913	3 TT422	Mackenzie River Alluvium	Alluvium
158171	6/12/2012	EX	-23.229	148.926	3 TT422	Rangal Coal Measures	Permian Coal Measures
158172	9/12/2012	EX	-23.209	148.928	3 TT422	Rangal Coal Measures	Permian Coal Measures
158173	27/11/2012	EX	-23.408	148.957	100 SP230773	Duaringa Formation	Tertiary
158174	29/11/2012	EX	-23.408	148.959	100 SP230773	Duaringa Formation	Tertiary
158175	29/11/2012	EX	-23.407	148.959	100 SP230773	Duaringa Formation	Tertiary
158176	29/11/2012	EX	-23.408	148.958	100 SP230773	Duaringa Formation	Tertiary
158177	29/11/2012	EX	-23.408	148.958	100 SP230773	Duaringa Formation	Tertiary
158178	30/11/2012	EX	-23.265	148.921	3 SP213140	Mackenzie River Alluvium	Alluvium
158200	14/12/2009	EX	-23.255	148.914	3 TT422	Rangal Coal Measures	Permian
158201	14/12/2009	EX	-23.255	148.914	3 TT422	Mackenzie River Alluvium	Alluvium
158202	13/12/2009	EX	-23.25	148.908	3 TT422	Mackenzie River Alluvium	Alluvium
158203	12/11/2009	EX	-23.24	148.911	3 TT422	Mackenzie River Alluvium	Alluvium
158204	12/11/2009	EX	-23.24	148.911	3 TT422	Rangal Coal Measures	Permian Coal Measures
158206	29/11/2009	EX	-23.231	148.905	3 TT422	Mackenzie River Alluvium	Alluvium
158207	29/11/2009	EX	-23.23	148.905	3 TT422	Rangal Coal Measures	Permian Coal Measures
158208	30/11/2009	EX	-23.226	148.912	3 TT422	Rangal Coal Measures	Permian Coal Measures

Bore ID	Date Drilled	Status	Latitude	Longitude	Lot / Plan	Aquifer	Aquifer Class
158209	30/11/2009	EX	-23.226	148.912	3 TT422	Mackenzie River Alluvium	Alluvium
158210	11/12/2009	EX	-23.218	148.904	3 TT422	Rangal Coal Measures	Permian Coal Measures
158211	11/12/2009	EX	-23.218	148.904	3 TT422	Mackenzie River Alluvium	Alluvium
158212	10/12/2009	EX	-23.208	148.913	3 TT422	Mackenzie River Alluvium	Alluvium
158213	10/12/2009	EX	-23.208	148.912	3 TT422	Rangal Coal Measures	Permian Coal Measures
158263	30/11/2011	EX	-23.602	148.89	32 HT447	Rangal Coal Measures	Permian Coal Measures
158304	14/03/2012	EX	-23.644	148.876	1 RP620665	Rewan Formation	Rewan Group
158305	9/04/2012	EX	-23.645	148.876	1 RP620665	Rangal Coal Measures	Permian Coal Measures
158306	30/05/2012	EX	-23.641	148.897	1 RP620665	Rangal Coal Measures	Permian Coal Measures
158314	4/05/2013	EX	-23.593	149.087	80 SP232626	Blackwater Group	Permian Coal Measures
158315	5/05/2013	EX	-23.589	149.076	80 SP232626	-	Unknown
158316	8/05/2013	EX	-23.589	149.076	80 SP232626	Rangal Coal Measures	Permian Coal Measures
158365	19/09/2013	AD	-23.577	148.875	8 B33722	-	Unknown
158687	28/08/0202	EX	-23.656	148.887	1 RP620665	Rewan Formation	Rewan Group
158688	28/08/2012	EX	-23.66	148.877	1 RP620665	Rewan Formation	Rewan Group
158713	29/04/2014	AD	-23.64	148.94	3 RP620665	-	Unknown
158715	28/04/2014	AD	-23.638	148.957	3 RP620665	-	Unknown
158718	8/07/2013	EX	-23.468	148.884	7 HT607	Duaringa Formation	Tertiary
158719	9/07/2013	EX	-23.468	148.884	7 HT607	Duaringa Formation	Tertiary
158720	11/07/2013	EX	-23.289	148.849	1 SP161092	Mackenzie River Alluvium	Alluvium
158721	12/07/2013	EX	-23.29	148.849	1 SP161092	Mackenzie River Alluvium	Alluvium
158777	16/06/2014	EX	-23.585	148.887	28 SP193689	-	Unknown
158778	16/06/2014	EX	-23.585	148.887	28 SP193689	-	Unknown
158779	17/06/2014	EX	-23.585	148.887	28 SP193689	-	Unknown

Bore ID	Date Drilled	Status	Latitude	Longitude	Lot / Plan	Aquifer	Aquifer Class
158842	23/09/2013	EX	-23.449	148.703	6 SP127280	Back Creek Group	Permian Coal Measures
158848	15/11/2013	EX	-23.056	148.764	4 SP184275	Burngrove Formation	Permian Coal Measures
158940	25/11/2014	EX	-23.32	148.869	-	-	Unknown
158950	18/11/2014	EX	-23.494	148.845	4 HT607	Burngrove Formation	Permian
158951	18/11/2014	EX	-23.493	148.845	4 HT607	Burngrove Formation	Permian
158952	19/11/2014	EX	-23.328	148.888	6 LR94	Mackenzie River Alluvium	Alluvium
158953	20/11/2014	EX	-23.329	148.888	6 LR94	Mackenzie River Alluvium	Alluvium
158954	21/11/2014	EX	-23.291	148.848	1 SP161092	Mackenzie River Alluvium	Alluvium
158955	22/11/2014	EX	-23.297	148.869	1 SP161092	Mackenzie River Alluvium	Alluvium
158956	24/11/2014	EX	-23.339	148.87	6 LR94	Mackenzie River Alluvium	Alluvium
158957	25/11/2014	EX	-23.348	148.87	6 LR94	Mackenzie River Alluvium	Alluvium
158958	26/11/2014	EX	-23.332	148.871	6 LR94	Mackenzie River Alluvium	Alluvium
158959	27/11/2014	EX	-23.29	148.846	1 SP161092	Mackenzie River Alluvium	Alluvium
158960	25/11/2014	EX	-23.597	149.083	80 SP232626	-	Unknown
158961	15/08/2014	EX	-23.518	148.769	1 RP613729	Emerald Formation	Other
161025	21/02/2012	AD	-23.628	149.178	2 RP616780	Duaringa Formation	Tertiary
161067	24/09/2013	EX	-23.408	148.687	3 SP127278	Burngrove Formation	Permian Coal Measures
161138	16/08/2014	AD	-23.674	149.097	2 HT388	-	Unknown
161139	23/08/2014	AD	-23.657	149.13	2 HT388	-	Unknown
161140	23/08/2014	AD	-23.669	149.11	2 HT388	-	Unknown
161172	7/11/2014	AD	-23.671	149.196	2 HT388	-	Unknown
161175	8/11/2014	AD	-23.657	149.178	2 HT388	-	Unknown
161178	6/11/2014	AD	-23.668	149.197	2 HT388	-	Unknown
161204	16/06/2014	EX	-23.598	149.094	11 H4023	Rangal Coal Measures	Permian Coal Measures

Bore ID	Date Drilled	Status	Latitude	Longitude	Lot / Plan	Aquifer	Aquifer Class
161220	21/12/2014	EX	-23.602	149.204	5 HT551	Banana Formation	Other
161264	30/03/2015	EX	-23.599	149.201	5 HT551	Duaringa Formation	Tertiary
165025	2/03/2015	EX	-23.586	148.958	10 HT584	Rewan Formation	Rewan Group
165026	2/03/2015	EX	-23.586	148.903	-	Quaternary – Undefined	Alluvium
165127	21/07/2015	EX	-23.599	148.817	22 HT600	Rangal Coal Measures	Permian Coal Measures
165128	21/07/2015	EX	-23.595	148.824	22 HT600	Rangal Coal Measures	Permian Coal Measures
165129	21/07/2015	EX	-23.613	148.829	26 HT419	Rangal Coal Measures	Permian Coal Measures
165164	18/09/2015	EX	-23.585	148.882	720 HT596	Duaringa Formation	Tertiary
165165	15/09/2015	EX	-23.585	148.882	720 HT596	Duaringa Formation	Tertiary
165166	18/09/2015	EX	-23.585	148.882	719 HT596	Duaringa Formation	Tertiary
165177	10/09/2015	EX	-23.622	148.827	26 HT419	Rangal Coal Measures	Permian Coal Measures
165178	10/09/2015	EX	-23.606	148.825	22 HT600	Rangal Coal Measures	Permian Coal Measures
165179	11/09/2015	AD	-23.595	148.824	22 HT600	-	Unknown
13010002	7/10/2004	EX	-23.21	148.755	2 SP208190	Back Creek Group	Permian Coal Measures
13010006	26/10/2004	EX	-23.281	149.18	-	Blackwater Group	Permian Coal Measures
13010008	31/10/2004	EX	-23.629	149.2	-	Duaringa Formation	Tertiary
13010010	3/11/2004	EX	-23.587	148.769	9 RP614154	Blackwater Group	Permian Coal Measures

Codes: EX = existing; AD = abandoned and destroyed; AU = abandoned but useable. Source: DNRM Groundwater Database, January 2016.

2.6 ITEM 6 – BIODIVERSITY OFFSET OBLIGATION

2.6.1 Issue / Concern

The offset area proportionate to the impact area has been outlined in the amendment application with consideration to the *Environmental Offsets Act 2014* and subordinate legislation. During a recent discussion it was stated that the proponent may have underestimated the proposed total disturbance in terms of significant residual impacts to Matters of State Environmental Significance (MSES).

2.6.2 Information Requested

It is requested that the proponent provides the following information:

a) Quantify the maximum proposed disturbance (significant residual impacts) to MSES on MLA 700011, MLA 700012 and MLA 700013; and

b) Provide clarity to EHP concerning Jellinbah's commitment to meet offset obligations prior to commencing disturbance of the proposed amendment.

2.6.3 Response

2.6.3.1 Maximum Disturbance to MSES

A revised Environmental Offsets Strategy was provided with the EA Amendment Application (change to application), submitted to EHP in September 2015. The revised Environmental Offsets Strategy (AARC 2015) provided clarification of the maximum significant residual impacts to MSES resulting from the Central North Extension.

Table 14 provides a summary of impacts to prescribed environmental matters at the Central North Extension area. The maximum proposed disturbance to Endangered RE 11.4.8 is 14.65 ha. This RE is also an Endangered Brigalow (*Acacia harpophylla* dominant and co-dominant) community under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Table 14 Summary of Impacts to Prescribed Environmental Matters

Prescribed Environmental Matter	Maximum Extent of Impact
Endangered RE – 11.4.8 (*Eucalyptus cambageana* woodland to open forest with *Acacia*)	14.65 ha

As discussed in the Environmental Offsets Strategy (AARC 2015), no significant residual impacts to other MSES will occur as a result of the proposed amendment.

2.6.3.2 Commitment to Offset Impacts

Jellinbah recognises its obligation to deliver suitable offsets prior to commencing disturbance at the Central North Extension, in a manner agreed upon with EHP. Prior to extension of the approved Central North pit into new MLAs, Jellinbah will enter into an 'agreed delivery arrangement' with EHP and provide the following information:

- Offset delivery plan;
- Offset area details;

- Habitat quality details; and
- Details of staged offsets, if applicable.

Upon approval of the Central North Extension and grant of the amended EA, the impacts to MSES detailed in Table 14 will be added to 'Table G6: Authorised significant residual impacts to prescribed environmental matters' in the EA.

2.7 ITEM 7 – LEVEE CONSTRUCTION

2.7.1 Issue / Concern

The amendment application states that Jellinbah has an ongoing staged construction of a levee to protect mining operations at Jellinbah Plains from the Mackenzie River when in flood.

The amendment application states mining operations at Jellinbah Plains are protected from flooding by the Mackenzie River by the ongoing staged construction of a levee built to a 1:1,000 AEP flood event. However, the submitted application states that no additional levees are required for the Central North Extension. The proponent also does not provide maps of figure locations of proposed final voids which may require the construction and placement of diversion banks / levee systems to prevent or divert surface water in flows to final voids / pit.

2.7.2 Information Requested

It is requested that the proponent provides the following information:

a) Maps and figures of proposed final voids for the Central North Extension and Jellinbah Mine as a whole; and

b) Maps and figures of levee construction be supplied regarding the proposed placement of final voids in relation to surface water values and the measures that will be employed to mitigate adverse impacts.

2.7.3 Response

Approved Jellinbah Mine

Two levees are currently approved for the Jellinbah Coal Mine. The levee at Jellinbah Plains has been constructed in its final stage (Stage 3) and is shown in the final conceptual landform in Figure 10. The levee was originally approved following submission of the Environmental Management Plan in June 2006 (AARC 2006). Certified design reports and as-constructed designs have previously been submitted to EHP in accordance with the requirements of the EA.

In accordance with the hydrological design criteria for regulated levees provided in the *Manual for assessing consequence categories and hydraulic performance of structures* (ESR/2016/1933) (EHP 2016), the Plains levee is designed to provide flood protection sufficient to withstand a 1:1,000 AEP flood event, with 0.5 m freeboard. Figure 10 indicates the location of the Plains final void in relation to the approved levee.

No levees are required at Jellinbah Central. Mining of pits is progressing in a west-east direction, away from Blackwater Creek. The site is elevated above any potential flooding from either Blackwater Creek or the Mackenzie River (UDP 2016). Final voids are shown in Figure 11.

The final void at Jellinbah South (shown in Figure 11) is currently used for storing excess water from Jellinbah Central. The final void is not located within a flood plain and is not at risk of flooding.

A second levee has been approved to protect the pit at Mackenzie North following submission of the Environmental Management Plan in July 2013 (AARC 2013). Development at the Mackenzie North site has not yet commenced. Figure 10 shows the final conceptual landform for Mackenzie North, indicating the location of the final levee with respect to the final void.

Central North Extension

Figure 10 indicates the location of the proposed Central North Extension final voids in relation to the approved Plains levee. Mining operations within the proposed Central North Extension will be located between the current Plains and Central pits, forming an extension of the approved Central North pit to the east. The proposed location of the Central North final void is within 500 m of its current approved location.

As stated in Section 2.6.3.2 (Water Management Infrastructure) of the EA Amendment Application, no additional levees will be required for the Central North Extension. The existing Plains levee is designed to provide flood protection for a 1:1,000 AEP event, as per the requirements of the *Manual for assessing consequence categories and hydraulic performance of structures* (ESR/2016/1933) (EHP 2016).

Blackwater Creek is located to the west of the Jellinbah Coal Mine, and Mackenzie River to the north, between the Plains operation and Mackenzie North. As the Plains pit progresses northwards it encroaches on the flood zone of the Mackenzie River. During a large flood event, water would extend over the flat terrain of the floodplains either side of the river, in proximity to the Plains pit. The Plains levee, now in its final stage, has been constructed to protect operations from a flood event in the Mackenzie River. Elevation increases southwards from the Mackenzie River; operations at Jellinbah Central are elevated above any potential flooding from either the Mackenzie River or Blackwater Creek (UDP 2016). The pit at Central North will occur as part of a north-wards extension of the current Central pit. A levee is not required to protect mining operations at Central North from inundation due to the protection provided by the existing levee at Plains and the increasing elevation towards Central.

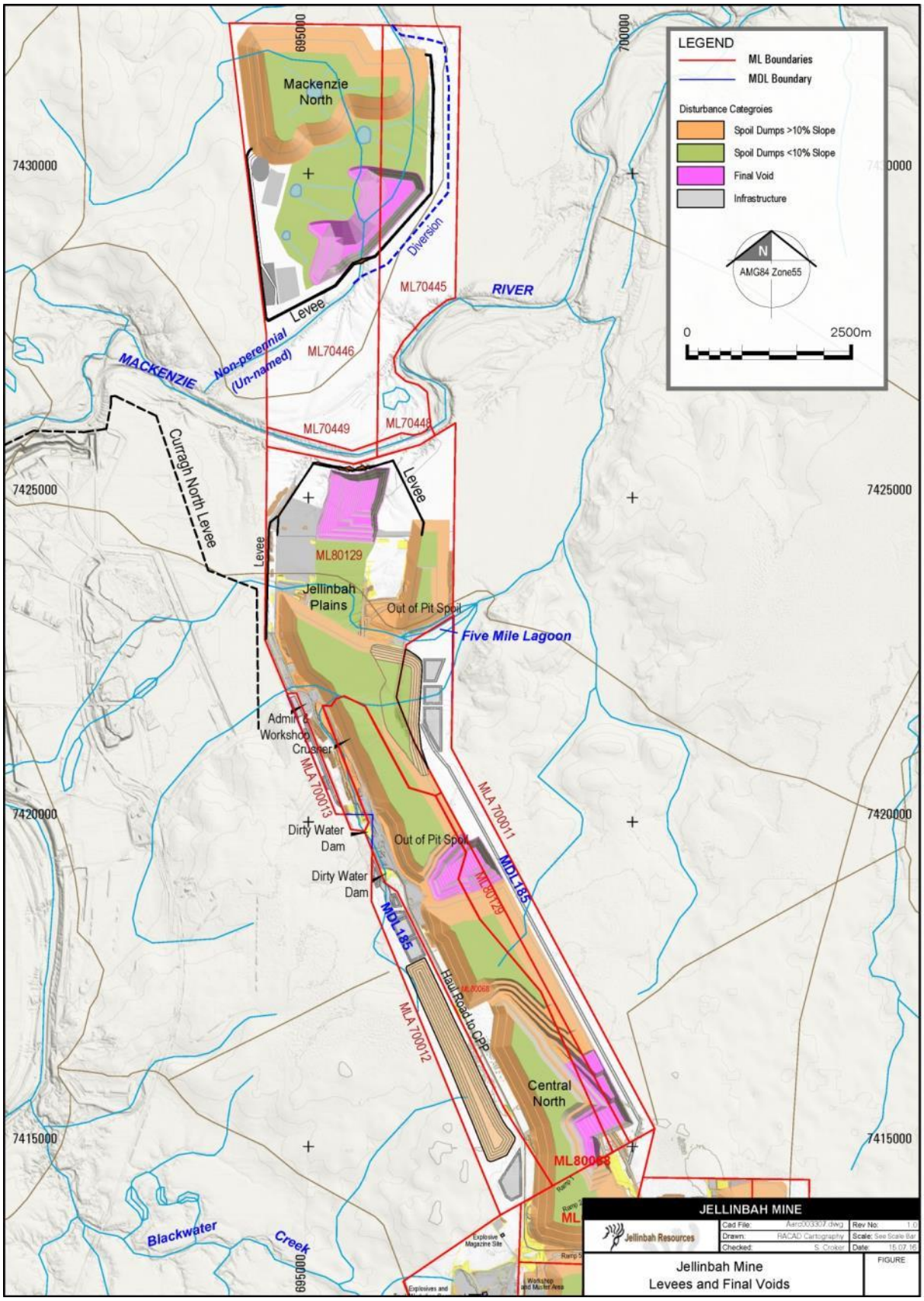


Figure 10 Final Voids and Levees – Mackenzie North, Jellinbah Plains and Central North Extension

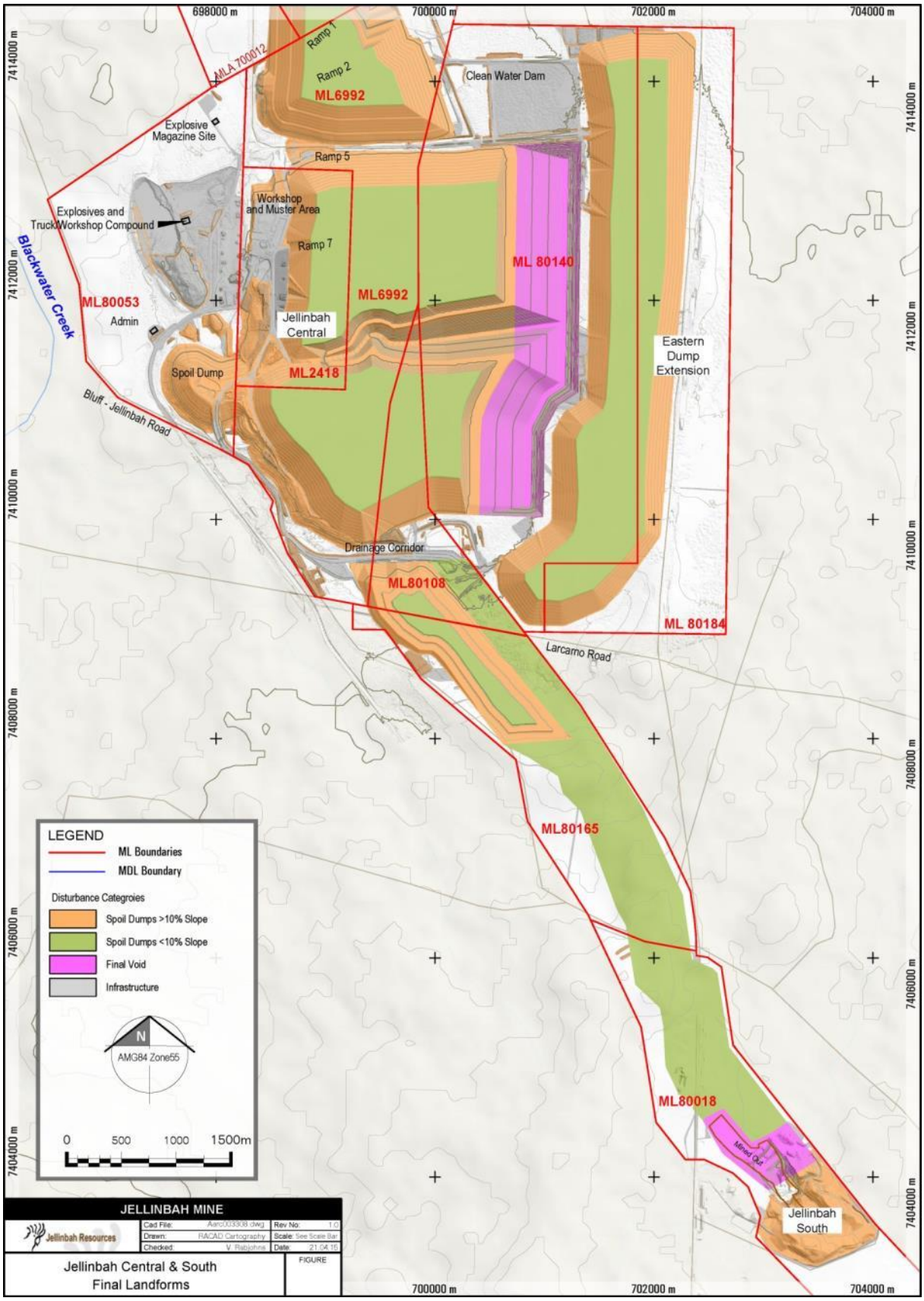


Figure 11 Final Voids – Jellinbah Central and Jellinbah South

2.8 ITEM 8 – RUN OF MINE TONNAGES

2.8.1 Issue / Concern

The amendment application states that the Central North operation is anticipated to augment the current production of the Jellinbah Coal Mine by an average of 1 million tonnes per annum (Mtpa) ROM coal in future years. Jellinbah is currently approved for 5 Mtpa of ROM product as per the Environmental Management Plan dated March 2012. As EHP approves coal mines based on annual extraction rates of ROM coal, it is requested that the proponent clarify the proposed annual ROM tonnage rates for Jellinbah Mine.

2.8.2 Information Requested

It is requested that the proponent provides the following information:

a) Provide clarity to EHP in regards to the proposed annual ROM tonnages for Central North and Jellinbah Mine as a whole.

2.8.3 Response

The Jellinbah Coal Mine is approved for 7.5 Mtpa of ROM coal in accordance with condition A5 of the EA. Condition A5 of the EA states:

> *The environmental authority holder is approved for a coal extraction rate of up to 7.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) ore in accordance with this environmental authority.*

Current operations at the Jellinbah Coal Mine produce approximately 4.5 – 5.0 Mtpa of pulverised coal injection and a minor amount of thermal coal. An *in situ* resource of approximately 17 million tonnes (Mt) is planned for extraction as part of the Central North operation. Extraction of this resource, however, will not increase the overall production or mining rate for the Jellinbah Coal Mine; rather, it will increase the Mine's overall production life by allowing mining operations to progress into the Central North MLs as other areas are exhausted.

3.0 REFERENCES

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UDP Group (UDP) 2016, *Jellinbah Mine Site: Site Water Management Plan Including Proposed Central North*, report no. JEL0007/R01, prepared for Jellinbah Group Pty Ltd, 5th September 2016.

Appendix A Site Water Management Plan

Appendix B Groundwater Assessment