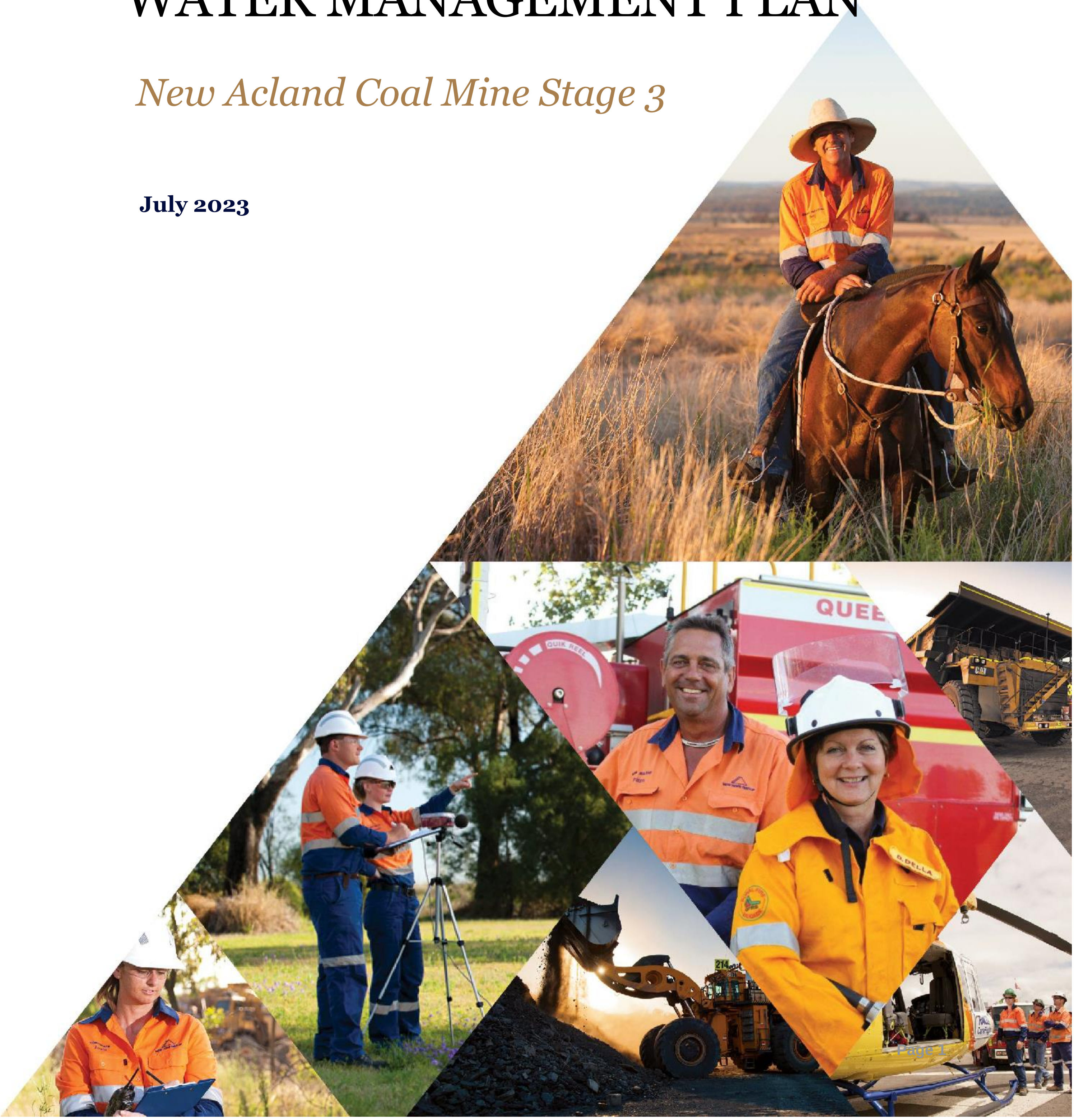
WATER MANAGEMENT PLAN

New Acland Coal Mine Stage 3

July 2023



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Document Review Frequencies	
Environmental Management Plans (EMP) have been created to manage site hazards identified from a Broad Brush Risk Assessment (BBRA), manage aspects and impacts identified in the Environmental Aspects & Impacts Register and to meet relevant statutory requirements. Statutory documents will be approved by the Document Owner. All documents shall be reviewed at regular frequencies based on risk or as otherwise directed by statutory documentation. WI-HSE-13 (Section 7, V4) lists triggers that will result in a document revision.	
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Record of Review

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Acknowledgement – Document Review Team		
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Document Owner Approval		
Name	**Signature**	**Date**
Troy Cook		

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1. Introduction

This Water Management Plan (WMP) addresses the water management at New Acland Coal (NAC) Mine (the Mine). This document integrates the operational and environmental requirements of the NAC Stage 3 Environmental Authority (EA) No. EPML00335713, which became effective on 21 July 2023.

1.1. Purpose

The purpose of the WMP is to ensure the effective management of the delivery, generation and use of water at the Mine. The WMP is designed to provide compliance with regulatory requirements and complement the Mine's Environmental Management System (EMS). The WMP also addresses the New Hope Group's (NHG)'s own internal standards and commitment to health, safety, protection of the environment and community relating to water management.

The WMP aims to meet the required objectives in the following ways:

- identify the Environmental Values (EVs) of the receiving waters and Water Quality Objectives (WQO) and demonstrate how they will be protected;
- document a risk-based management approach for scenarios such as flood, drought and changes in water quality;
- separate clean water (from undisturbed sources) from mine-affected water systems and management of stormwater discharge;
- develop and implement a system for emergency spills or discharges;
- manage the environmental impacts of any release of wastewater to the environment;
- manage and prevent soil erosion and acid drainage;
- manage site water quality and quantity during the mining development, operation and decommissioning phases including a site water balance which considers groundwater generated through mine dewatering; and,
- provide details of operational monitoring and monitoring of hydrological processes of the receiving environment.

The document addresses the requirements of the EA as outlined in **Table 1** below.

Table 1 EA Compliance Conditions addressed in this document

Condition number	Condition	Addressed in Document
C21	A Water Management Plan must be developed by an appropriately qualified person and implemented for all stages of mining. The Water Management Plan must be submitted to the administered authority for review and comment within 3 months upon the grant of ML50232 and ML700002.	This document provides the WMP. The document was developed by personnel with over 10 years of experience in Water Management and ESC at Mine sites.

Condition number	Condition	Addressed in Document
C22	The Water Management Plan must identify methods to: a) identify the environmental values of the receiving waters including Lagoon and Spring Creek and water quality objectives and how they will be protected; b) incorporate a risk management approach to how changing levels of flood, drought and water quality risks should be addressed; c) manage stormwater discharge; d) develop and implement a system for emergency spills or discharges including procedures to minimise extent and duration of release, staff training, investigation and reporting procedures; e) manage the environmental impacts of any release of wastewater to the environment so that any impacts are minimised including restricting any discharge to waters to occasions where there is flow in receiving waters to provide considerable dilution; f) separate clean water from undisturbed areas and water from disturbed areas; g) manage site water quality and quantity during the three (3) phases of mining: development, operation and decommissioning and include a site water balance including groundwater generated through mine dewatering; h) safeguard against the potential for soil erosion and acid drainage; and i) provide details of operational monitoring and monitoring of hydrological processes including associated performance indicators.	Addressed within : a) **Section 3.2** and **Section 3.3**; b) **Section 6** and **Section 8**; c) **Section 4.1** and **Section 5.1**; d) **Section 8** and **Section 9**; e) **Section 5**; f) **Section 4.1** g) **Section 6**; h) **Section 4.2**; and i) **Section 3.3, Section 7** and **Section 9**

1.2. Definition of types of water management

The EA guides the Mine's approach to water management. The EA also creates and defines water categories stipulating different management obligations for each. The three water categories referred to in the EA are:

1. **Mine Affected Water (MAW):** which includes pit water, tailings water, process water;
2. **Stormwater:** rainfall runoff which has been in contact with disturbed areas other than those considered as Mine Affected Water; and
3. **Clean Water:** stormwater from undisturbed areas or substantially rehabilitated areas.

This document addresses all three types of water noting that the management of stormwater which is permitted to be released to water from erosion and sediment control structures is outlined in detail in the Environmental and Sediment Control Plan (ESCP) New Acland Coal Mine Stage 3 (NAC, 2023).

The full definition of MAW as per the EA is provided in **Table 2** below. The EA does not define stormwater but refers to Sediment Dams and their purpose for capturing of Stormwater and excludes rainfall runoff discharging from erosion and sediment control structures in accordance with the ESCP in the MAW definition.

Table 2 EA Definitions Mine Affected Water

Definitions	Condition
Mine Affected Water	means the following types of water: a) Pit water, tailings dam water, processing plant water; b) Water contaminated by a mining activity which would have been an environmentally relevant activity under Schedule 2 of the Environmental Protection Regulation 2008 if it had not formed part of the mining activity; c) Rainfall runoff which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated, excluding rainfall runoff discharging through release points associated with erosion and sediment control structures that have been installed in accordance with the standards and requirements of an Erosion and Sediment Control Plan to manage such runoff, provided that this water has not been mixed with pit water, tailings dam water, processing plant water or workshop water; d) Groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated; e) Groundwater from the mines dewatering activities; f) A mix of mine affected water (under any of the paragraphs I-v), above, and other water. Does not include surface water runoff which, to the extent that it has been in contact with areas disturbed by mining activities that have not yet been completely rehabilitated, has only been in contact with: a) Land that has been rehabilitated to a stable landform and either capped or revegetated in accordance with the acceptance criteria set out in the environmental authority but only still awaiting maintenance and monitoring of the rehabilitation over a specified period of time to demonstrate rehabilitation success; or b) Land that has partially been rehabilitated and monitoring demonstrates the relevant part of the landform with which water has been in contact does not cause environmental harm to waters or groundwater, for example: (i) Areas that have been capped and have monitoring data demonstrating hazardous material adequately contained within the site; (ii) Evidence provided through monitoring that the relevant surface water would have met the water quality parameters for mine affected water release limits in this environmental authority, if those parameters had been applicable to the surface water runoff; or (iii) Both.
Sediment Dam	means a structure for the capture and treatment of stormwater runoff contaminated only by sediments from disturbed areas and which discharge off- site once full.

1.3. Risk Management

As part of the approval for Stage 3 NAC has conducted a Broad Brush Risk assessment which aims to identify, analyse, evaluate and mange the Health Safety and Environment (HSE) risks across the site. The risk assessment scope includes: production; geotechnical; CHPP; maintenance; environmental monitoring; cultural heritage; compliance; weather events; fire; community impact and security. The assessment includes a register of hazards, risks and action plan.

The following risks have been identified regarding Mine operations and potential water quality impacts and have been included in NAC's Broad Brush Risk Assessment. Risks include:

- Severe weather event causing flooding;
- impacts resulting from the accumulation of salts and metals in waterways and their sediments including as the discharged water evaporates;
- impacts through drawdown and contamination on local and regional aquifers and the associated environments; and
- impacts associated with cumulative effects of other industries (such as agriculture and grazing) discharging into the same waterways.

Risks to the system are further managed by the application of the sites Trigger Action Response Plan, provided in **Section 9**.

2. Project Description

The New Hope Group (NHG) has commenced the Stage 3 Project which has the potential to generate up to ~7.5 million tonnes (product coal) per annum (Mtpa) from open cut mining activities located on mining lease (ML) 50170, ML 50216, ML 50232 and ML 700002 (ML700002 relating to associated infrastructure only), under the approval of EA No. EPML00335713 (effective 21 July 2023). The Mine will progressively develop three new resource areas, namely, Manning Vale East, Manning Vale West, and Willeroo utilising a strip-mining process with disturbed areas progressively rehabilitated. This expansion will extend the life of the Mine by approximately 12 years, at which stage the current coal resource will be depleted. Final rehabilitation of the disturbed areas will continue for another five to ten years following the completion of extraction activities.

The Mine site is located within southeast Queensland's Darling Downs region, approximately 14 km north-northwest of Oakey, approximately 35 km northwest of Toowoomba in Queensland. The Mine is subject to undulating terrain that spans the Lagoon Creek Catchment. Lagoon Creek flows into Oakey Creek which is part of the larger Condamine River Catchment. The Upper Condamine River catchment has an area of approximately 13 000 km^2. The Upper Condamine is part of the Balonne-Condamine Basin which includes most of the Darling Downs and forms part of the Murray Darling Basin Catchment.

The Mine location and surrounding waterways are shown in **Figure 1**. Figure 2 provides detail on the Mine site and relevant water management infrastructure.

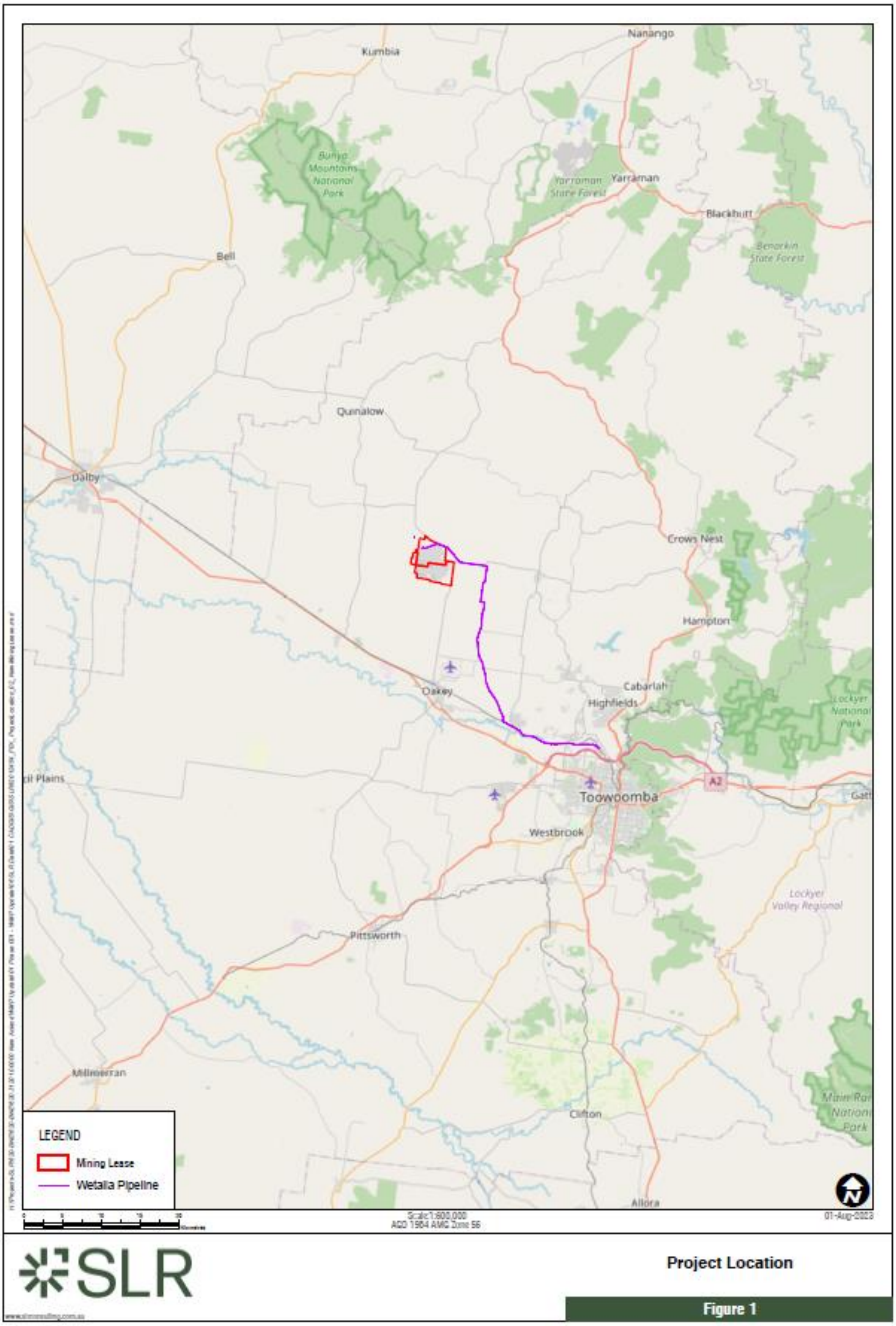


Figure 1 Project Location

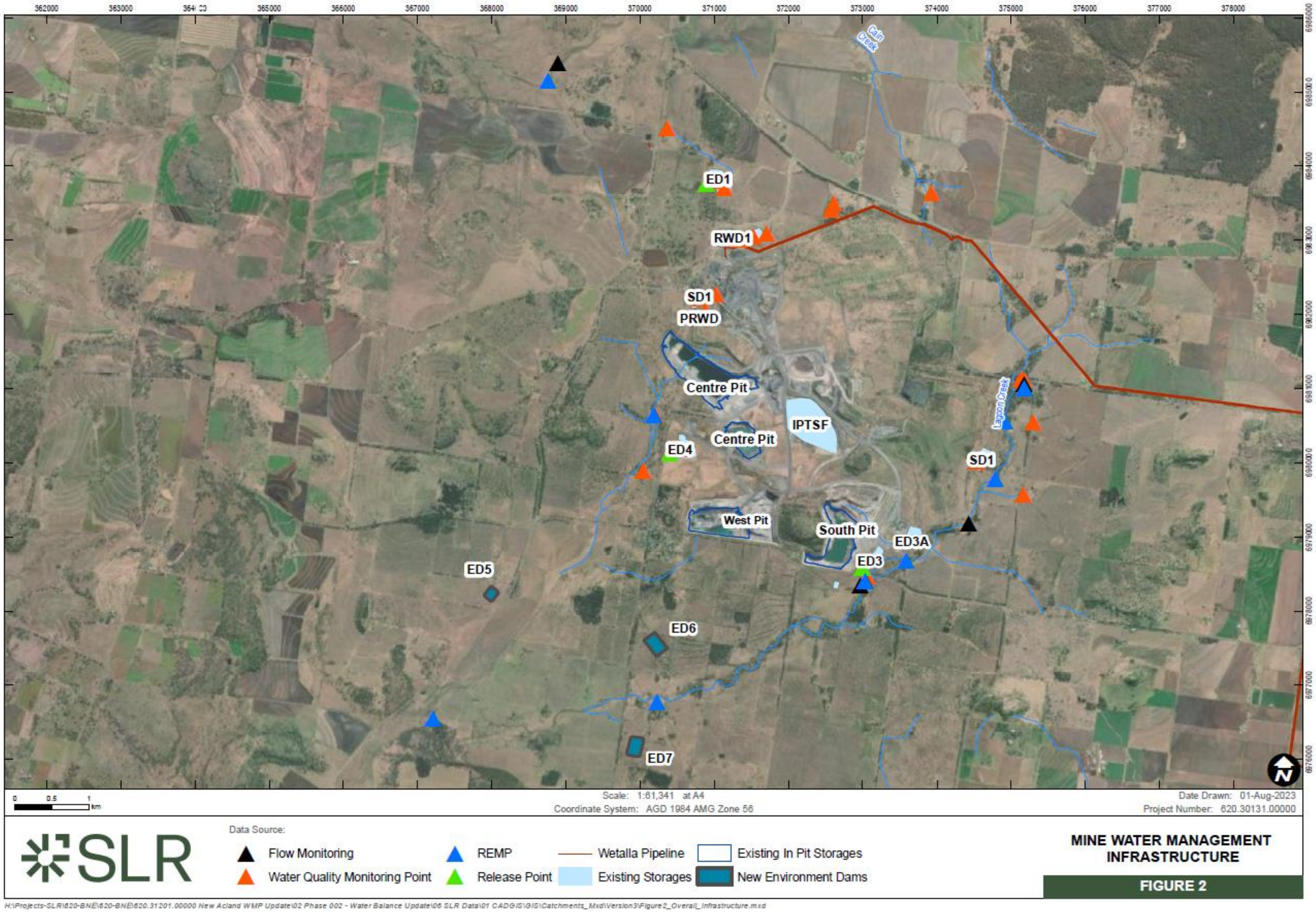


Figure 2 Project Site

2.1. Water Management Strategy

The philosophy of the water management strategy is to provide adequate water to the Mine to operate successfully while minimising environmental impacts by collecting and managing mine-affected runoff water. The strategy has been developed with consideration for the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (EPP Water and Wetland Biodiversity). Management hierarchy for surface or groundwater and aims to manage the release of wastewater or contaminates to waters in the order of preference of schedule 14, reduce, prevent, treatment & recycle and disposal. This includes the following key principles.

- **Reduce:** runoff from undisturbed areas, both on and surrounding the Mine site, will be diverted away from disturbed areas and released directly into adjacent waterways.
- **Prevent:** Systems are implemented to manage flood, drought and infrastructure failure scenarios.
- **Treat:** A proportion of the MAW will be treated through a Reverse Osmosis Plant. Stormwater runoff will be treated through appropriate ESC structures/measures.
- **Recycle:** Disturbed area runoff will be captured in in pit sumps, sediment and environmental dams and used preferentially for dust suppression or as process water in the CHPP. MAW is reused as process water, for dust suppression.
- **Recycled:** Recycled water from the Toowoomba Regional Council's (TRC)'s Wastewater Reclamation Facility (WWRF) will continue to be used by the Mine as a water supply source for process water requirements.
- **Disposal:** Releases to water from stormwater will occur in accordance with the ESCP or conditions of the EA or discharged off-site in accordance with conditions of the EA.

The water management strategy is based on a water balance model which provides strategic and operational decision-making. The water balance model determines the operational water needs and the overall management of water captured at the Mine Site. The water balance model determines supply and shortfall for different climatic conditions and is designed to meet the requirements of the EA.

Figure 4 illustrates the mine water management system. The system is operated in accordance with the site's Trigger Response Action Plan (TARP, (NAC, 2020) refer to Section 8. The philosophy of the TARP is to provide adequate water for the mine to operate successfully while minimising environmental impacts from collecting and managing mine affected runoff water. The TARP actions are based on trigger levels identified for each of the key storages and are prioritised as follows:

- Compliance with the sites EA;
- risk of spills from connected storages, with higher priority to storages which spill offsite and / or storages with poorer water quality;
- maintaining water supply to production; and,
- reducing site water inventory through water collected on site.

2.2. Operational Water Requirements

An important aspect of the water management system is to manage the storage inventory efficiently. This is to ensure there is sufficient water resources of appropriate water quality to meet operational requirements, particularly during extreme climatic conditions (very dry or very wet years). The system considers all external raw water supplies in addition to water captured within the MLs.

2.2.1. Water supply

A maximum supply allocation to the Mine of 5,650 Megalitres per annum (MLpa) is available from two water sources. The major source is via a long-term contract to the year 2035 with the TRC for the Mine to purchase up to 5,500 MLpa of Class A^+ recycled water from the WWRF. Class A^+ is the highest class of recycled water for non-drinking purposes in Queensland. The 45 km pipeline and associated infrastructure was constructed in 2009 and is currently operational. When pumping from the Wetalla pipeline, water is currently received at the rate of up to 9.1ML/d (3,000 ML/year) and is delivered to Raw Water Dam 1 (RWD1.)

In addition to the water sources noted, licensed capacity is available from the Marburg (Hutton) aquifer via a series of groundwater bores. This capacity is available as an emergency supply for process water. Since 2011, usage has generally amounted to between 0.5 and 1.0 ML/month for potable supply from only the Main Range Volcanics aquifer as well as sporadic usage associated with maintenance of the borefields for emergency water supply. The current usage of the Main Range Volcanics aquifer potable supply, approximating 0.7 ML/month, is anticipated to continue into the future. Further information on groundwater bore usage is available in the New Acland Groundwater monitoring and Management Program, June 2013.

Potable water originates from shallow basalt aquifers and is sourced from licensed groundwater bores on-site and treated by a Reverse Osmosis Treatment Plant on-site. The potable water demand is projected to a maximum of 50 MLpa.

2.2.2. Water Use

The Mine's raw water demand at a production rate of up to 7.5 Mtpa is outlined in Table 3. The raw water demand varies depending on a range of factors including rainfall/runoff and groundwater inflow within the mine pits. The projected water demands have been updated by NAC based on averages over the last six years with consideration for future planned production.

The Mine's water requirements for dust suppression will be periodically supplemented by rainfall runoff captured in water management structures, such as the sediment and environmental dams, and from operational mine pit areas. NHG will continue to recycle water from its Tailing Storage Facilities (TSF's), water captured in pit (and transferred in various storages to process water dams), and water reporting to sediment and environmental dams to supplement the Coal Handling and Processing Plant (CHPP)'s water supplies.

Table 3 Projected Water Demands

Water Supply Activity		Estimated Usage (approximately) (ML/year)
Operation of the CHPP Precinct	(~550 L/RoM tonne)	5,280
Wash down of machinery		
Fire suppression		
Shower and ablution use		
Dust suppression (~ 88 L/RoM tonne)		844
TOTAL USAGE		6,124

Water Supply Activity	Estimated Usage (approximately) (ML/year)
Estimated recovery Tailings Storage Facilities (50%)	2,640
Estimated water collected at site (rainfall runoff & groundwater inflows)	589 –4538
TOTAL NET WATER USAGE (~200 L/RoM tonne)	2895 to -1054

3. Baseline Environment

3.1. Climate

Historical rainfall data was sourced for the site from the Scientific Information for Landowners (SILO) database for 1900 to 2021. The SILO database is a database hosted by the Queensland Department of Environment and Science (DES) developed in collaboration with the Bureau of Meteorology (BoM). A gridded data point was selected from SILO to represent the Mine due to its correlations with nearby gauges and the length and quality of the gauged record. The centroid of the SILO grid selected was -27.3, 151.7.

Mean annual rainfall and mean annual evaporation are said to be 628mm and 1772 mm, respectively. Rainfall associated with intense thunderstorms can result in 1hr rainfall depths of 28mm to 78mm for events up to the 1% AEP event. This can result in localised flooding and erosion of exposed soils.

Monthly rainfall and evaporation averages are presented in **Figure 3**. The results are indicative of a dry climate showing evaporation exceeding average rainfall for every month of the year. These results also illustrate the seasonal variation of rainfall in the area.

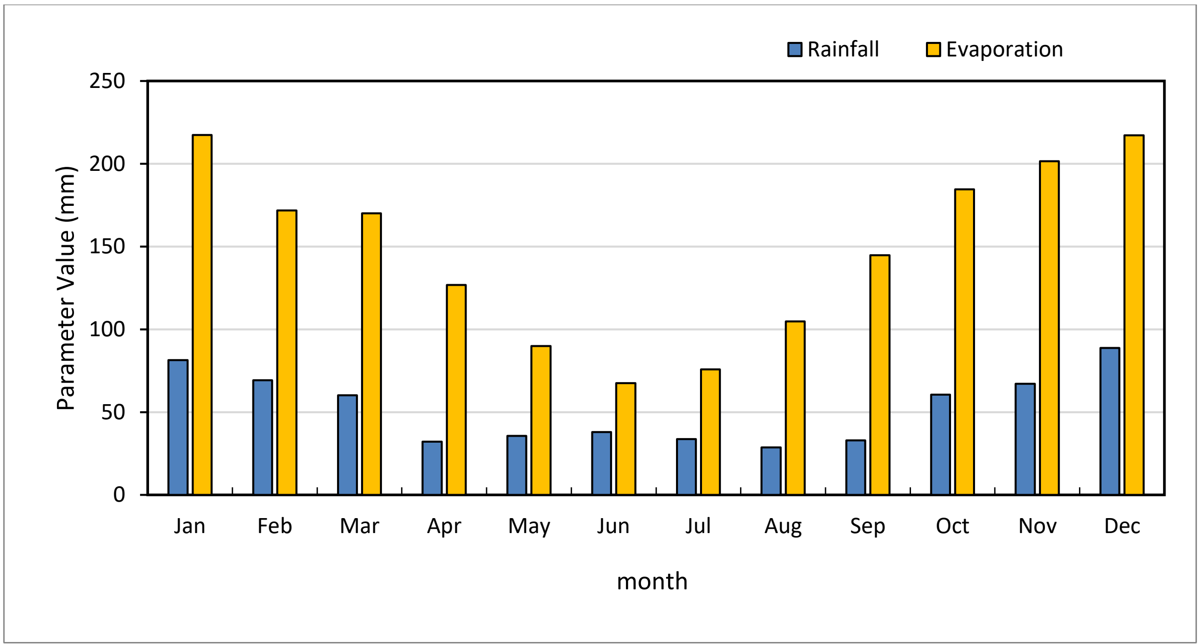


Figure 3 Average Monthly Rainfall Data and Evaporation Data (SILO: -27.3, 151.7)

3.2. Environmental Values

The EPP Water and Wetland Biodiversity was developed under the Environmental Protection Act 1994 (EP Act) in conjunction with Environmental Protection Regulation 2019 (EP Regulation) to identify environmental values to be protected, and to manage specific aspects of Queensland's environment. A key objective of the EPP Water and Wetland Biodiversity is to protect Queensland's water environment while allowing for development that is ecologically sustainable.to identify environmental values to be protected, and to manage specific aspects of Queensland's environment. A key objective of the EPPs is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, and maintains The EPP Water and Wetland Biodiversity is intended to prevent activities that harm the environment or waterway without due regard to the provisions of the EP Act. The EPP Water and Wetland Biodiversity provides a framework for identifying environmental values to be protected for Queensland waters and deciding the water quality objectives to protect or enhance those environmental values, including their biological integrity and suitability for drinking, stock watering, recreational, agricultural and industrial uses. One or all of the EVs in the EPP Water and Wetland Biodiversity can be chosen for a particular water body.

EVs and WQOs for surface water in the Condamine River Basin are provided in the Condamine River Basin EPP (2020). These were used to determine the environmental values for Lagoon Creek. These values would also apply to Spring Creek. The draft environmental values that apply to Lagoon Creek were those identified for the upper Oakey Creek sub-catchment and are listed in Table 4.

Table 4 Draft environmental values and description identified for Lagoon Creek

Environmental Value		Description
	Aquatic Ecosystems	A community of organisms living within or adjacent to water, including riparian or foreshore area. Levels of protection are defined for aquatic ecosystems with the Mine considered to be: • Slightly to moderately disturbed (SMD): waters that retain biological integrity but are affected by human activity.
	Irrigation	Suitability of water supply for irrigation-for example, irrigation of crops, pastures, parks, gardens and recreational areas.
	Farm Water Supply	Suitability of domestic farm water supply, other than drinking water. For example, water used for laundry and produce preparation.
	Stock Watering	Suitability of water supply for production of healthy livestock.
	Human Consumers of Aquatic Foods	Health of humans consuming aquatic foods-such as fish, crustaceans and shellfish (other than oysters) from natural waterways.
	Visual Recreation	Amenity of waterways for recreation which does not involve any contact with water-for example, walking and picnicking adjacent to a waterway.
	Drinking Water	Suitability of raw drinking water supply. This assumes minimal treatment of water is required-for example, coarse screening and/or disinfection.
	Industrial Use	Water quality to industry is suitable for use, with an appropriate level of treatment. Industries usually treat water supplies to meet their specific needs. There are no WQOs specified in the EPP schedule document for industrial use
	Cultural, Spiritual and ceremonial values	The management goal is suitable water for use in cultural, spiritual and ceremonial values and uses of water Queensland Murray-Darling Basin.

All relevant EVs need to be considered when evaluating a water body. The level of environmental and water quality protection must be determined to maintain each of the EVs. Management goals that are established to protect the EVs should reflect the specific problems and/or threats to the values, desired levels of protection and key attributes that must be protected (ANZECC &

ARMCANZ, 2000).

The EVs that are relevant to the Mine upon which the WQOs are based are:

- the protection of SMD aquatic ecosystems; and
- stock watering.

3.3. Surface Water

Lagoon Creek and Spring Creek are part of the greater Condamine and Balonne Catchment. The Condamine River is regulated under the Commonwealth Water Act (2007) and the Water Act 2000 (QLD) and its subordinate legislation of the Water Plan (Condamine and Balonne) 2019. The Water Act (2007) provides the legislative framework for managing the waters of the Murray Darling Basin and establishes the Murray Darling Basin Authority.

The Water Plan (Condamine and Balonne) 2019 defines the availability of water and provides a framework for sustainably managing water, forecasting future water requirements and the general protection of the natural ecosystem. The NAC mine receives raw water from the Wetalla Pipeline for use in processing. Important aspects of this WMP relative to the Water Plan includes managing water sustainably through re-use of water and reduction of demand from raw water sources including the protection of the Lagoon Creek through managing release quantities and qualities.

There are two downstream water supply schemes within the Condamine River Catchment being the Chinchilla Weir Water Supply Scheme and St George Water Supply Scheme. At the peak of mining operations, the Mine's water management system will capture rainfall runoff from up to 10 km^2 of the Lagoon Creek catchment. This constitutes less than 0.1 % of the catchment to the Chinchilla Weir Water Supply Scheme and less than 0.001 % of the catchment to the St George Water Supply Scheme. Therefore, any reduction of overland flow to the downstream water supply schemes caused by capture of run-off on the Mine, will be negligible. Furthermore, the Project is compliant with the Environmental Flow Objectives (EFO's) and Water Allocation Security Objectives (WASO) for the region.

Impacts to Spring Creek are negligible with the proportion of catchment which intersects the mine lease area being very small. The catchment reporting to Spring Creek via ED1 is also largely rehabilitated.

3.3.1. Water Quality Objectives

A Receiving Environmental Monitoring Program (REMP) was prepared for the New Acland Mine in February 2019. This REMP includes sampling of water at points along Lagoon Creek and Spring Creek upstream and downstream.

The EA conditions and water quality guidelines adopted for the relevant water quality parameters within the waterways surrounding the Mine are outlined in the Mine's REMP and replicated in **Table 5**. The REMP monitors against the water quality parameters listed in Table C4 of the EA – Receiving Waters Contaminant Trigger Levels.

Table 5 Water quality guidelines for the protection of aquatic ecosystems.

Parameter	Units	Water Quality Guidelines				
		EA[1]	Aquatic Ecosystem Water Quality Guidelines EPP Water and Wetland Biodiversity Condamine[2]		ANZECC/ ARMCANZ[3]	
		Trigger Levels	Base flow <10.9 m³/s	Event flow >0.9 m³/s	95% species protection	default trigger values – SE Australia
EA Triggers for protecting the EVs for Aquatic Ecosystem Protection						
Ammonium N	µg/L	-	10	Insufficient data (ID)	-	13
Ammonia	µg/L	900	-	-	900	-
Nitrate	µg/L	1100	-	-	700	-
Oxidised N	µg/L	-	5	ID	-	15
Total N	µg/L	-	1000	1300	-	250
Filterable Reactive P	µg/L	-	45	90	-	15
Total P	µg/L	-	110	340	-	20
Chlorophyll-a	µg/L	-	5	ID	-	NA
Dissolved Oxygen	% saturation	-	60-110%	60-110%	-	90-110%
	mg/L	-	-	-	-	-
Turbidity	NTU	-	13	55	-	-
Suspended Solids	mg/L	65	14	65	-	-
pH		6.5- 9.0	7.7-8.3	7.4-8.1	-	6.5-7.5
Conductivity	µS/cm	510	510	380	-	-
Sulfate	mg/L	250	7	7	-	-
Alkalinity	mg/L CaCO3	-	130	85	-	-
Fluoride	µg/L	2000	-	-	-	-
Petroleum hydrocarbons (C6-C9)	µg/L	20	-	-	-	-
Petroleum hydrocarbons (C10-C36)	µg/L	100	-	-	-	-
Aluminium	µg/L	55	-	-	55 (if pH>6.5)	-
Arsenic	µg/L	13	-	-	13	-
Boron	µg/L	370	-	-	370	-

Parameter	Units	Water Quality Guidelines				
		EA[1]	Aquatic Ecosystem Water Quality Guidelines EPP Water and Wetland Biodiversity Condamine[2]		ANZECC/ ARMCANZ[3]	
		Trigger Levels	Base flow <10.9 m^3/s	Event flow >0.9 m^3/s	95% species protection	default trigger values – SE Australia
Cadmium	µg/L	0.2	-	-	0.2	-
Chromium	µg/L	1	-	-	1	-
Cobalt	µg/L	90	-	-	-	-
Copper	µg/L	2	-	-	1.4	-
Iron	µg/L	300	-	-	-	-
Lead	µg/L	4	-	-	3.4	-
Manganese	µg/L	1900	-	-	1900	-
Mercury	µg/L	0.2	-	-	0.06^	-
Molybdenum	µg/L	34	-	-	-	-
Nickel	µg/L	11	-	-	11	-
Selenium	µg/L	10	-	-	5^	-
Silver	µg/L	1	-	-	0.05	-
Uranium	µg/L	1	-	-	-	-
Vanadium	µg/L	10	-	-	-	-
Zinc	µg/L	8				
EA Triggers for protecting the EVs for Livestock Protection						
Fluoride	µg/L	2000	-	-	-	-
EA Triggers for protecting the EVs for Drinking Water Aesthetic Value (Taste threshold)						
Sulfate	mg/L	250	7	7	-	-

1 Limits as per Table C4 of the EA.

2 Flow measured at Oakey Creek at Fairview (gauge 422350A). WQGs for indicators shown as a single value to be achieved as the 50th percentile (median) of the test data. For pH, WQGs are shown as lower and upper limits.

3 Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystem (Upland River), as per Table 3.3.2 of the ANZECC/ARMCANZ (2000) guideline. Regional trigger values should be used in preference to the default trigger values.

^ ANZECC/ARMCANZ (2000) guideline values are for 95% species protection, except for mercury and selenium which are 99% species protection as recommended in ANZECC/ARMCANZ (2000).

TBD = To be determined ID = Insufficient Data

The location of the monitoring locations and the monitoring frequencies are in Lagoon Creek are outlined in **Table 6**, with the authorised release points listed in **Table 7**.

Table 6 Receiving Environment Monitoring Locations

Monitoring Point	Latitude (GDA94) (S)	Longitude (GDA94) (E)	Monitoring Parameters	Monitoring Frequency
Lagoon Creek upstream (LCU1)	27°17'9.772"	151°44'23.136"	Physical Parameters pH, total suspended solids (mg/L) electrical conductivity µS/cm, sulphate (SO4) (mg/L), time of day, water temperature, flow rate (m/s) **Metal and Non-Metal Elements:** • Aluminium • Arsenic • Boron • Cadmium • Chromium • Cobalt • Copper • Iron • Lead • Manganese • Mercury • Molybdenum • Nickel • Fluoride • Sulphate • Selenium • Silver • Uranium • Vanadium • Zinc	Daily during the release **Metal Elements:** Commencement of release and thereafter weekly during release
Lagoon Creek downstream 1 (LCD1)	27°18'35.64"	151°43'4.3536"		
Lagoon Creek downstream 2 (LCD2)	27°18'37.36"	151°43'1.8768"		
Spring Creek upstream (SCU1)	27°14'18.77"	151°41'31.28"		
Spring Creek downstream (SCD1)	27°14'47.364"	151°40'36.2028'		
Downstream boundary of ML50232 (DS1)	27° 19' 26.68" S	151° 41' 7.02 E		

Table 7 Authorised Release Points

Monitoring Point	Latitude (GDA94)	Longitude (GDA94)	Monitoring Parameters	Monitoring Frequency
ED1	27°18'29.40"S	151°42'50.5"E	pH (pH Unit) Electrical conductivity µS/cm Total suspended solids (mg/L)	**pH and EC:** Real time telemetry for. Daily grab samples if telemetry not available. If telemetry is unavailable, the first sample must be taken within 2 hours of commencement of release. **TSS:** Daily during release (the first sample must be taken within 2 hours of commencement of release).
ED3	27°18'29.40"S	151°42'50.5"E		
ED4	27°17'41.49"S	151°41'33.5"E		
ED5	TBC	TBC		
ED6	27°19'0.23"S	151°41'16.4"E		
ED7	27°19'49.20"S	151°41'7.53"E		

It is noted that ED2 was mined out in 2018, however the EA still includes a release point to be reinstated should the Dam be reconstructed.

3.3.2. Baseline Surface Water Quality

Historical water quality information for Lagoon Creek is limited. The quality of mine storage and receiving waters is monitored regularly as required by the Mine's EA and REMP. The REMP outlines the monitoring plan, procedures and results of water quality sampling. The REMP document also provides the latest information on water quality monitoring.

3.4. Groundwater

A large number of groundwater investigation studies have been completed for the Mine. To date these have:

- identified and characterised the groundwater system and its relevant aquifers;
- identified and evaluated potential impacts from mining operations; and
- develop a monitoring program so that adverse impacts can be identified.

The outcomes of this work are documented in the NAC03 Associated Water License Application Report and its supporting appendices including the NAC03 Groundwater Monitoring and Impact Management Plan. This identified the following aquifers immediately adjacent to the Mine:

- Quaternary alluvium;

- Main Range Volcanics (Basalt);
- Coal Seam Aquifers of the Walloon Coal Measures:
    - Waipanna Coal Sequence;
    - Acland Coal Sequence;
    - Balgowan Coal Sequence; and
- Marburg Sandstone; and,
- Helidon Sandstone (lies at significant depth in relation to the Mine).

There is intensive use of groundwater by local landholders within a 5km radius of the mine, mainly from the Main Range Volcanics and Walloon Coal Measures aquifers.

The key potential impacts on aquifers are identified as follows:

- Mine dewatering and depressurisation with greatest impacts to the mined Acland Coal Sequence of the Walloon Coal Measures, and the Main Range Volcanics northwest of NAC03; and
- Potential drawdown impacts from mine dewatering and depressurisation propagating to nearby landholder bores, particularly those installed into the Acland Coal Sequence and the Main Range Volcanics.

A groundwater monitoring program, designed to collect data in relation to the key potential impacts, was developed and has been implemented. Monitoring data is periodically reviewed to identify any unacceptable risks.

4. Water Quality Impacts

4.1. Sources of Contamination

The sources of contamination which present a risk to water quality include but not limited to:

- Pit water – causing impact to regional surface water or groundwater. Risk considered low as water is contained within the pit.
- Runoff from mine affected areas – causing impact to downstream users and the environment from runoff. Risk is considered to be low as all areas affected by mining will be diverted to mine-affected water dams or back into the Pit.
- Runoff from disturbed areas not classified as MAW areas will be directed to appropriate erosion sediment control structures in accordance with the ESCP. While the Stage 3 areas are under development (2023-2025) temporary sediment ponds adjacent to the new pit development areas will be directed back to the pit and not released to the environment. or Sediment Ponds (permanent or temporary).
- Runoff from Infrastructure Areas – causing impact to downstream users and the environment. Risk is considered to be low as appropriate management such use of oil and water separators, emergency controls, impervious runoff surfaces and sufficient capture within the MAW structures to prevent impacts.
- Flood Ingress Protection – causing flooding of mine area which results in releases from site. Risk is considered to be low as sufficient levee banks have been/will be constructed to prevent Lagoon Creek flooding entering the mine affected areas, up to the 1% AEP event.

MAW runoff is typically high in suspended solids, dissolved solids (sodium, chloride and sulphate), higher/lower pH and metals. However, recent monitoring of MAW in NAC pits indicate water quality is generally good compared to other mine sites with EC values of approximately EC 2,600 µS/cm and $SO4^{2-}$ of 600 mg/L Detail on the latest water quality monitoring for all water types can be found in the NAC REMP.

Other uses on site such as sewage treatment plants and industrial areas can also have the potential to release hydrocarbons and pathogenic micro-organisms.

4.2. Saline Drainage and Acid Rock Drainage

The REMP will provide routine monitoring of the mine-affected water dams to provide early detection of elevated salinity levels.

Acid rock drainage has not been observed to date and generally is not expected to occur within the remaining life of mine due to the shared geological and depositional formation.

4.3. Water Quality Impacts

The quality of mine storage and receiving waters is monitored as required by the Mine's EA and REMP. Further details of the monitoring requirements are provided in the REMP and the *Environmental Monitoring Plan*.

5. Water Management System

5.1. Water Management Infrastructure and Operation

The key components of the mine water management system are the:

- Wetalla pipeline
- Raw water dams
- Environmental dams
- Sedimentation dams (Permanent and temporary)
- In-pit sumps
- In-pit tailings storage facilities (IPTF)
- Flood protection infrastructure (Catchment Drains, Swales, Levee bank and bunds)

The location of water management infrastructure is provided in **Figure 2**, with catchment progression and land use maps provided in **Appendix A**. The sections below outline the purpose of each component of the water management system, during site operations. This includes additional mention to the Mine Water and Sewage Treatment Plants.

Where practical, the stormwater runoff from clean, undisturbed catchments is diverted around disturbed areas using bunds and channels to direct water into adjacent gullies and waterways. Runoff from disturbed areas including un-rehabilitated spoil areas is collected. Spoil area runoff reports to environmental dams for storage before release as described below.

The mine pits are generally located within the upper sections of the Lagoon Creek catchment. As a result, the area of catchment (both disturbed and undisturbed) upstream of the Mine and associated mine pits is minimal. The majority of water that collects on the site accumulates in the pits as a result of direct rainfall runoff and minor groundwater interception. Water that collects in pit will be used directly for dust suppression or will be pumped to the Pond Return Dam so that it can be recycled back to the CHPP precinct.

5.1.1. Raw Water Supply

Raw water may be supplied through the Wetalla Pipeline at a rate of 9.1 ML/day; and is supplied to local users and the raw water dams (RDW1 and RWD2) to supply process water to the CHPP precinct.

A maximum supply allocation to the Mine of 5,500 Megalitres per annum (MLpa) is available from two water sources. The major source is via a long-term contract to the year 2035 with the TRC to purchase up to 5,500 MLpa of Class A+ recycled water from the WWRF. Class A+ is the highest class of recycled water for non-drinking purposes in Queensland. The 45 km pipeline and associated infrastructure was constructed in 2009 and is currently operational. When pumping from the Wetalla pipeline, water is received at the rate of up to 9.1ML/d (3,000 ML/year) and is delivered to RWD1.

In addition to the water sources noted, an additional 77 MLpa of licensed capacity is available from the Marburg (Hutton) aquifer via a series of groundwater bores. This capacity is available as an emergency supply for process water and is subject to the successful future renewal of licences.
Potable water originates from shallow basalt aquifers and is sourced from licensed groundwater bores on-site and treated by a Reverse Osmosis Treatment Plant on-site. The potable water demand is projected to a maximum of 50 MLpa.

5.1.2. Sediment Dams

The mine area currently has Sediment Dams 1 and 2. Sediment Dams are required to entrap soil and other particles contained in runoff from moderately disturbed areas due to high rainfall within the mine site. Sediment Dam 1 collects overland flow from the CHPP, Maintenance and workshop areas. Water captured in Sediment Dam 1 is used to supplement the Pond Return supply water.

Sediment Dam 2 receives runoff from the current Mine out-of-pit dumps that have been progressively rehabilitated and a small area from unformed access tracks utilised to manage water pumping infrastructure. Clean water captured in Sediment Dam 2 is pumped throughout the system depending on demand and the potential for off-site releases in periods of surplus water supply. Water from the sediment dams is also used for dust suppression and to supplement the CHPP Precinct's process water demands.

Temporary Sediment Dams are covered under the ESCP. The water balance modelling has been undertaken assuming no Temporary Sediment Dams. This is a conservative assumption and illustrates that the water management system is able to operate without these storages. It is envisaged that for the initial stages of the mine development overflows from the Temporary Sediment Dams may be directed back to the pit until there performance as an appropriate ESCP mitigation measure is confirmed.

5.1.3. Environment Dams

The EDs provide additional storage and treatment for water in significant rainfall events and mitigate against uncontrolled releases to the downstream environment. The water captured in the EDs is used to supplement mine water requirements. Water from the sediment dams may be transferred to EDs to supplement water demand for dust suppression or coal washing. Stage 2 has ED1, ED3 ,ED3A, and ED4 located in the upstream catchment.

Stage 3 water management system includes three new additional Environment Dams. These are ED5, ED6 and ED7, and receive water that is captured in the adjacent mine pits of Manning Vale West, Manning Vale East and Willeroo Pit, respectively.

5.1.4. In-Pit Sumps

In-pit sumps allow for the collection of MAW from the pit catchment at a nominated location within the pit. The purpose of the in pit sumps is to minimise flood risks to the pits. Water collected from the in-pit sumps may be transferred back to the water management system for reuse. In pit sumps are located in the existing Centre Pit, South Pit and West Pit.

Stage 3 includes the development of Manning Vale East, Manning Vale West, and Willeroo utilising a strip-mining process with disturbed areas progressively rehabilitated. This expansion will extend the life of the mine by approximately 12 years. The water management system for Stage 3 has been designed to reduce the potential for the site to create MAW, with disturbed areas outside of the pits minimised and as such, the in-pit sumps will form a key component of the mine pits.

The location of in pit sumps will change as the mine progresses and move with the mine plan. Should the capacity of in pit sumps be exceeded, water will overflow to the full mine pit and as such all water will be contained within the pit. This will not result in any release to the environment but does have the potential to disrupt production. **Section 6.8** presents on the expected frequency of this occurring.

NAC envisages to continue with the strategy of progressive rehabilitation of the out of pit spoil. Runoff generated from the rehabilitated areas will be directed to temporary Sediment Dams (discussed in **Section 2.6.2**). Rehabilitation of the disturbed areas will continue for another 5 to 10 years following the completion of extraction activities.

5.1.5. Tailings Storage Facilities

The mine's tailings strategy involves progressive construction of in-pit tailings cells as part of the dump design. The out-of-pit tailings dam is no longer used and is fully rehabilitated. The In-pit-Tailings Storage Facility 3 (IPTSF 3) is currently in operation, while with IPTSF 4 is proposed for construction within the existing Centre Pit.

5.1.6. Sewage Treatment Plant & Water Treatment Plant

The mine operates a Water Treatment Plant (WTP) and Sewage Treatment plant (STP) in ML50170. The WTP is a multi-bed prefiltration and reverse osmosis plant and treats volumes of water taken from shallow basalt bores to provide potable water to offices and infrastructure.

The STP is an aerated activated sludge treatment plant and outputs treated effluent to Sediment Dam 1. Management of sewage treatment is undertaken by an external supplier, Aqualyng, and is in compliance with the EA. Effluent quality targets are specified in the EA to ensure that quality of treated effluent is fit for dust suppression and irrigation. Currently, no treated effluent is utilised for dust suppression or irrigation at NAC.

5.1.7. Flood protection infrastructure

Flood protection infrastructure includes structures which are designed to separate runoff from undisturbed areas from entering areas that are disturbed and potentially becoming MAW. The existing flood protection infrastructure includes a Approx. 3 m high and 3 km long levee which provides protection to South Pit from Lagoon Creek ingress. Over the next three years additional flood protection infrastructure in the form of flood bunds will be constructed to protect the Willeroo and Manningvale East pits from inundation. This is discussed further in **Section 8.1**.

Flood protection infrastructure in the form of minor drains, bunds and swales will be developed as the mine pits develop such that the catchment area reporting to the pit is reduced to as small as practical and runoff from undisturbed areas directed away from areas that are disturbed.

5.1.8. Initial Storage Volume

The storage initial volumes were provided by NAC for each existing and proposed storages. The combined initial volume for the site is approximately 5700 ML and was provided for January 2023.

Table 8 Mine Storages Initial Volumes

Dam	Volume (ML)
ED1	66.9
ED3	0
ED3A	73.8
ED4	23.0
ED5	TBA

Dam	Volume (ML)
ED6	TBA
ED7	TBA
SD1	27
SD2	15.8
Pond Return	45.6
Duck Pond	0
IPT3	54.25
RWD1	90
RWD2	69.5
South Pit	1196.1
West Pit	385.4
IPTF4	2506.9
Centre Pit	1167.8
Total Initial Volume	**5722.0**

The Stage 2 and Stage 3 water management infrastructure and operational philosophies are summarised in **Table 3** and presented in **Figure 4.**

Table 9 Stage 2 and Stage 3 Water Management Infrastructure Capacity Summary

Structure	Storage Capacities	Operation
ED 1	178 ML	Captures overland flow from undisturbed and rehabilitated land and gravity overflow from RWD2. Water can be pumped to RWDs, or to APC for irrigation.
ED 3A	417 ML	Receives stormwater from South Pit rehabilitation area, gravity discharge from SD2 and MAW from Centre and Willeroo Pit. Water can be pumped to SD 2, which can then be fed back to the CHPP via RWD2. ED3 is sustainably smaller than ED3 and located within the ED3A catchment.
ED3	61ML	Receives overflow from ED3A and overflows to South Pit.
ED 4	156 ML	Receives stormwater from rehabilitation areas and MAW from the Manningvale East Pit. ED4 allows for water to be pumped to the Pond Return dam for use in the CHPP.
ED 5	129 ML	Receives water from Manningvale West Pit. Water can be pumped to ED6. Water can be released from this storage in accordance with the EA conditions.
ED6	365 ML	Receives water from Manningvale East Pit and water from EDs 5 and 7. Water can be released from this storage in accordance with the EA conditions.
ED7	313 ML	Receives water from Willeroo Pit. Water can be pumped to ED6. Water can be released from this storage in accordance with the EA conditions.

Structure	Storage Capacities	Operation
Sediment Dam 1	94 ML	Receives water from CHPP Precinct and treated effluent discharge from STP. Water can be pumped to Pond Return for use in the CHPP. Overflows report to the Centre Pit via a spillway drain.
Sediment Dam 2	55 ML	Receives water from Pit rehabilitation areas and from EDs. Water can be pumped to RWDs and then used in the CHPP. Water overflows from SD2 to ED3A.
Temporary Sediment Dams	<5 ML	Receives water from rehabilitated pits behind the operational pit and cleared land for progressive pit location.
Pond Return Water Dam (PRWD)	77 ML	Dam operates at 30 – 70 ML storage range. Pond Return Dam is the primary source of supply to the CHPP Precinct. The Pond Return Dam receives water recycled from the IPTSFs, Environmental Dam 4 and Sediment Dam 1 and In-pit waters. Receives de-watering from Centre and West Pit.
Raw Water Dam 1	136 ML	RWD1 supplies the site fire water tank. RWD1 takes water from WWRF, Environment Dam 1, RWD2 and direct rainfall. Balance pipe between RWD1 & 2 to equalise water levels.
Raw Water Dam 2	172 ML	Receives overflows from RWD1 and can pump back to RWD2. Accepts water from reticulation network between ED3A, SD2.
Tailings Dam (In-Pit) TSF 3	1,614 ML (plus 5236 ML of tailings solids)	Active. Water received by CHPP and recycled to the CHPP (via Pond Return) for coal washing. Overflows to TSF4.
Tailings Dam (In-Pit) TSF 4	To be determined.	Overflows to Centre pit void.
South Pit In-Pit Sump	7,234 ML	Pumped to ED3A and ED3. Can receive water from West Pit.
Centre Pit In-Pit Sump	11,461 ML	Pumped to PWRD. Can receive water from Manningvale West Pit.
West Pit In-Pit Sump	6,864 ML	Pumped to PWRD and Centre Pit.
Manning Vale West Pit	150 ML	Pumped to Centre Pit.
Manning Vale East Pit	150 ML	Pumped to west pit or south pit.
Willeroo Pit	150 ML	Pumped to centre pit.
Lagoon Creek Flood Bund	Approx. 3 m high and 3 km long	Prevents inundation of South Pit area.
Lagoon Creek Flood Levee 2	Approximately 3.5 m high and 1.5 km long	Will prevent inundation of Manning Vale East Pit area.

Structure	Storage Capacities	Operation
Lagoon Creek Flood Levee 3	Approximately 3.5 m high and 2 km long	Will prevent inundation of Willeroo Pit area.
Wetalla Tank	Not applicable	Trunk main to CHPP fire water system and into CHPP fire water ring main.
RWD1 Seepage Trench	3ML	Collects water that may potentially seep from RWD1 so that this water can be returned to the system.

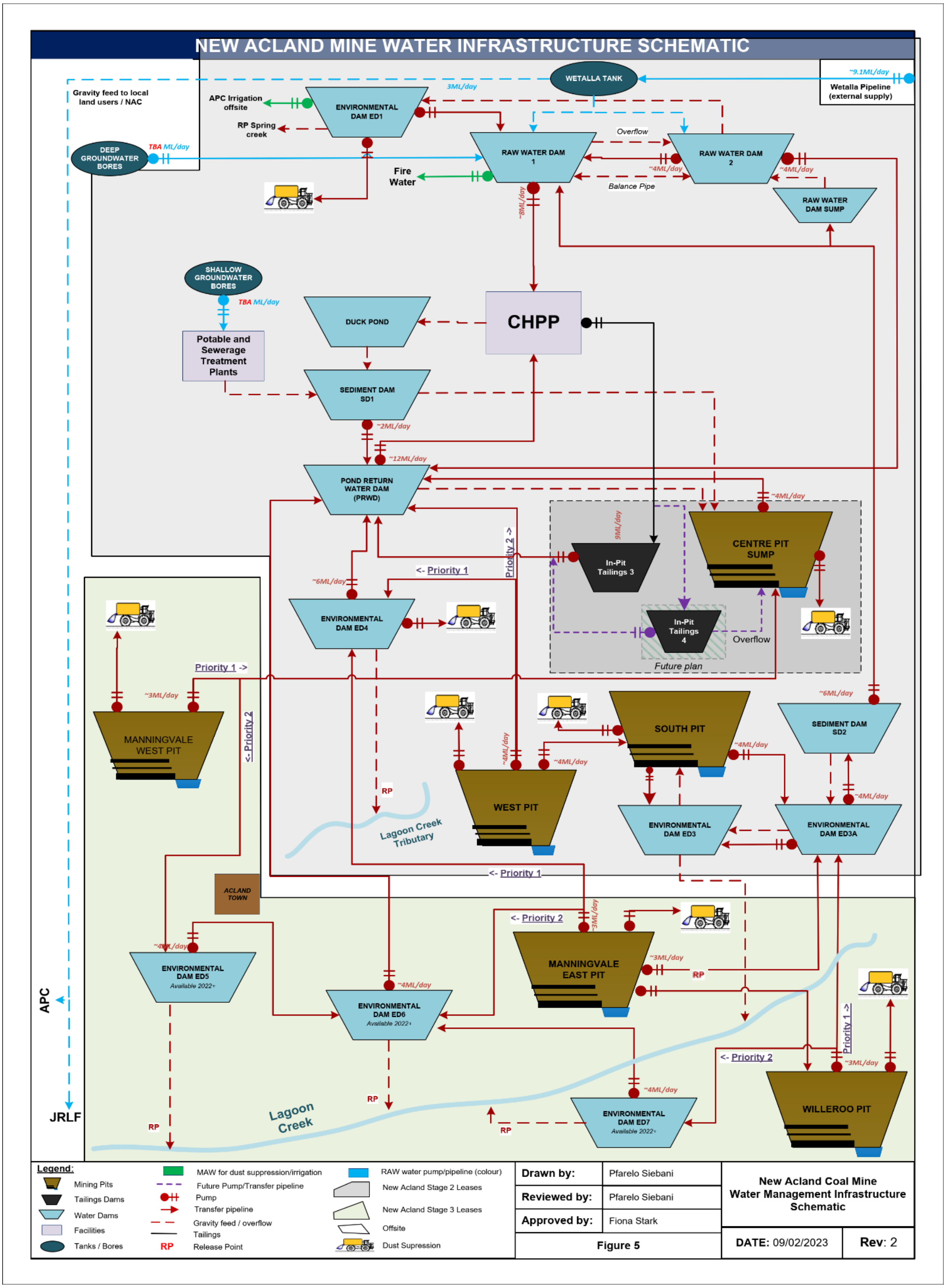


Figure 4 Water Management System

6. Water Balance Model

6.1. WBM Methodology and Approach

The WBM aims to predict that mine's water management infrastructure to adequately manage mine water and minimise risks and adverse impacts on the downstream environment. The objectives of the WBM are aligned to the mine's water management philosophies and they include:

- Controlled release of water from the storages in a manner that minimises impacts on downstream users and the environment;
- Management of storage facilities below the maximum operating level to minimise spills and maintain water requirements in the Mine;
- Maximisation of pits operability through bunding and transferring water to out of pits storage facilities; and,
- Controlled and managed separation and use of clean and mine-affected water.

This chapter describes the components of the water management system updated as part of this scope of work.

6.2. Overview

The performance of the mine's water management system was assessed using GoldSim modelling package (version 14.0). GoldSim is a software program developed by the GoldSim Technology Group which can analyse complex time-dependent systems and has the ability to assess stochastic systems resulting in probabilistic outcome ranges.

The Goldsim WBM for the site was updated to reflect the two year mine plan. This update included consolidation of the previous WBM developed by GHD Group (GHD, 2018) during the Stage 3 planning phase and represented the combined stage 2 and 3 operations as a single system. The model reflects the site schematic presented in **Figure 4** and was developed in consultation with the NHG and updated to reflect current system operations.

6.2.1. Simulation Settings

The WBM is simulated at a daily resolution and developed to predict the operation of the Mine's Stage 2 and Stage 3 water management system. For the purpose of this assessment, a three-year simulation period starting from 01/01/2023 to 31/12/2025 has been selected, this is consistent with the current two year mine planning horizon, future iterations of the model will continue to extend the simulation as the mine planning horizon extends. This is identified in Section 10 which outlines future WMP updates and reviews. The model was run for 500 different climatic realizations as described below, resulting in 1500 modelled years.

6.2.2. Climate

Historical rainfall and evaporation data was sourced for the site from the Scientific Information for Landowners (SILO) database for 1900 to 2023. The SILO database is a database hosted by the Queensland Department of Environment and Science (DES) developed in collaboration with the Bureau of Meteorology (BoM). A gridded data point was selected from SILO to represent the mine due to its correlations with nearby gauges and the length and quality of the gauged record. The centroid of the SILO grid selected was -27.3, 151.7.

The WBM was based on conservative estimates of 500 stochastic rainfall replicates. The use of stochastic rainfall replicates allows a wide range of climatic conditions to be simulated, which then gives the mean and median of the assessment. The assessment also yields percentiles which are interpreted as a percentage exceedance probability (i.e., the risk of an event occurring). The 5th, 50th and 95th percentiles (adopted in this report) represent the dry, average and wet climate, respectively.

6.2.3. Runoff Model

The WBM utilises the Australian Water Balance Model (AWBM) rainfall-runoff module to calculate the rainfall and runoff inflows in each catchment. The AWBM modules in the WBM representing the runoff response for the following land use types:

- Industrial;
- Mine Pits;
- Rehab Spoil;
- Spoil;
- Undisturbed; and,
- Cleared Land.

Table 10 Adopted AWBM Parameters

Parameter	Abbreviation	Landuse				
		Industrial	Pits	Rehabilitated Spoil	Spoil	Undisturbed
Small storage capacity (mm)	C1	2	5	7	40	7
Medium storage capacity (mm)	C2	10	10	120	220	120
Large storage capacity (mm)	C3	40	25	150	300	150
Small partial area portion	A1	0.33	0.134	0.134	0.134	0.134
Medium partial area portion	A2	0.33	0.433	0.433	0.433	0.433
Large partial area portion	A3	0.33	0.433	0.433	0.433	0.433
Baseflow Index	BFI	0	0.1	0.1	0.1	0.1
Baseflow recession	K_b	0	0.8	0.5	0.5	0.5
Daily streamflow recession	K_s	0	0	0	0	0

Catchment areas were delineated for each mine pit (pits for Stage 2 and Stage 3) to reflect the progression of the mine plan between 2023 and 2025. The delineated catchments were categorised into land-use as advised by NAC. The specific land-use modules were applied in the AWBM to relate daily rainfall and evapotranspiration to soil moisture and runoff. The AWBM module parameters within the WBM have been adopted from the previous model (GHD, 2028). Land-use catchments areas for the simulation period are presented in **Appendix A**.

Controlled release in the mine occurs in the environmental dams; ED4 releasing to Lagoon Creek Tributary and ED5, ED6 and ED7 into the Lagoon Creek. The release of MAW in the mine to the environment is in accordance with condition C6 of the EA. Condition C6 indicates that the release rate of the MAW must not exceed the Maximum Release Rate (for all combined release point flows) for each receiving water flow criterion for discharge specified in **Table 5**.

The EA requirements include minimum flow thresholds and water quality requirements on both the release and the receiving waterways (including 150 µS/cm Electrical Conductivity for Lagoon Creek). The model represents these flow and water quality conditions. As outlined above the potential releases are expected to be very small and only to occur in very wet conditions in excess of the 1% exceedance probability.

Table 11 Mine Affected Water Release Conditions During Flow Events

Receiving Water	Approximate % of Lagoon Creek Streamflow	Maximum Release Rate	Electrical Conductivity Release Limits (µs/cm)
Lagoon Creek	Low Flow <46.3 L/sec for a period of 28 days after natural flow events that exceed 4ML/d	<17.4 L/sec	700
	Medium Flow (low) >46.3 L/sec	<17.4 L/sec	1500
		<8 L/sec	2500
		<5.8 L/sec	3500
	Medium Flow (high) >133 L/sec	<48.6 L/sec	1500
		<23 L/sec	2500
		<15 L/sec	3500
	High Flow >405 L/sec	<144.7 L/sec	1500
		<92.6 L/sec	2,500
		<69.4 L/sec	3,500

To enable modelling of the release conditions and water quality limits the water balance modelling includes a salt balance which predicts the movement of salt load throughout the system and potential accumulation within storages. Releases are only made from EDs where the predicted water quality is in accordance with the EA conditions and receiving water limits outlined in **Table 11**.

6.3. Assumptions and Limitations

The following was assumed for the water balance model:

- The AWBM parameters for surface runoff estimation were adopted from the previous water balance model (GHD, 2018).
- Salinity is based off an assumed salinity from different land use areas in accordance with the Stage 3 EIS. These assumptions are generally considered to be conservative.

- Groundwater inflows are assumed based on the available groundwater modelling inflow serries over the life of the mine.
- Storage and pump properties for ITSP4 such as stage storage, surface areas and pump rates were assumed to be similar to those for IPTSF3.
- This assessment was based on the scope and general water flow in the mine as agreed upon by NAC. It is assumed that the latest Schematic presented to NAC in February 2023 still represent the logic of water movement within the mine.
- There was no calibration data for mine storage, therefore no calibration of results was undertaken. The initial volumes for storages were provided by the Client and they assumed to accurately represent the mine total initial volumes.

6.4. Water Balance Result

6.4.1. Demand Reliability

The WBM predicted the reliability of the demands for the operations including the clean water, process water and dust suppression demand from varying water sources. The WBM predicted zero days of deficit for the CHPP and dust suppression supply. The results indicate that the proposed configuration for the dust suppression supply of water from EDs and pit water storages is sufficient to meet the required demands.

6.4.2. Raw Water Use

The total allocation for the site is 5,500 ML per annum through the Wetalla Pipeline. The water balance assessment predicted that the actual allocation use over this period is between 2220 ML in dry season and 2100 ML in wet season. This is well within the available allocation for the site.

6.5. Total Mine Site Wide Inventory

The water balance was updated with key changes surrounding the additional storages and resources pits. The total mine water inventory stored in the mine over the period of simulation was assessed and the model reports a slight decrease in total mine inventory in dry climate (5^{th} percentile) and average (50^{th} percentile) climate occurring from April 2024 till the end of simulation. This decrease may be attributed to decrease in dirty water catchments due to progressive rehabilitation.

The model indicates that the initial volumes of the mine storages significantly influence the total mine water inventory. The total mine inventory contained in the mine over the next three years are presented in **Figure 5**. The results indicate that under average climatic conditions the mine water inventory is likely to decline by approximately 3 GL over the year. After a year the increased catchment area from the progression of the mine has the potential to capture additional water and the water inventory stabilises.

This inventory may be further reduced by the release of treated MAW from the newly commissioned Reverse Osmosis Plant. This is discussed further in **Section 6.6**.

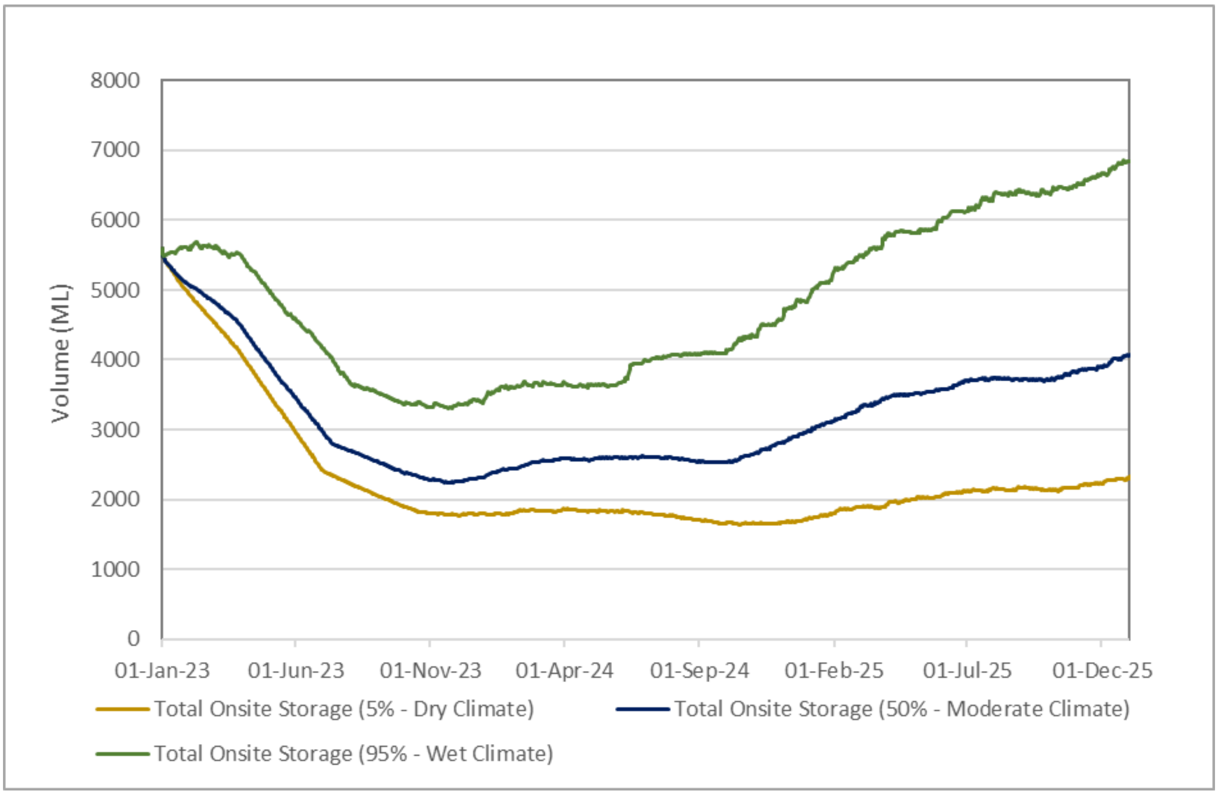


Figure 5 Total Mine Storage Inventory

6.6. Controlled Releases

Controlled releases were assessed in the water balance model. The model assumes controlled releases of MAW can only occur from the EDs. Releases were assessed based on flow regime for the Lagoon Creek as condition of the EA. This is further restricted by an assumed infrastructure constraint of 4 ML/d per release point. The release condition allows for good quality water to be released off site following periods of significant rainfall. This approach prevents good quality water increasing in salinity through evaporation and maximises the available storage within the mine site to manage climatic extremes.

NAC have recently amended the EA to allow for the release of treated MAW. This water will be treated through Reverse Osmosis in accordance with EA conditions C25 to C29. The treated MAW will be blended with other onsite water to meet background water quality conditions (as the Reverse Osmosis unblended permeate is too pure for release) and released to Lagoon Creek. The water balance modelling has conservatively not included this controlled release volume. Controlled releases are expected to maintain or reduce the current legacy water stored in existing pits as presented in **Section 6.8**.

The model reports-controlled releases from the EDs in the wet climate for the three years of simulation. Releases increase over time as the catchment to the pits increases with the mining footprint. The annual controlled release of the mine show that release volumes are less than 0.5% of the Lagoon's Creek annual flow, and result in predicted downstream salinity of less than 700 µs/cm. The annual controlled releases are expected to be:

- In the order of 30 to 60 ML per annum
- Volumes of each release event will range from 1.5 ML/d to 6 ML/d
- This represents less than 0.03% of the Lagoon Creek Flow

6.7. Potential for Uncontrolled Releases

The new EDs (5, 6 and 7) have minimal catchments and largely receive water from pit dewatering. Therefore they have a low risk of uncontrolled overflows as they are managed and maintained at an operating level of 90% of capacity to reduce the likelihood of spills. The spill probability was determined by the number of spills in the 1500-year simulation (500 replicates by 3 years). The spill probability of storages that overflow offsite are reported in **Table 12** below.

ED5 has a greater spill risk due to the out of pit spoil dump catchment in this area. The storage still maintains an AEP in the order of 5%. While this structure is not a significant consequent category. This is consistent with the wet season containment performance requirement for significant consequence structures as per the Department of Environment and Science (DES) Manual for assessing consequence categories and hydraulic performance of structures (DES, 2016).

ED3A currently overflows to ED3. These storages are located behind the Lagoon Creek flood bund and any overflows are contained onsite, flowing back to South Pit. Overflows to the existing ED1 and ED4 are predicted to be rate <0.1% and 1.5% AEP respectively.

Table 12 Overflow Probability

Dam	AEP (%)
ED1	**<0.1%**
ED3A	**23%**
ED3A	**15%**
ED4	**1.5%**
ED5	**5%**
ED6	**<0.1%**
ED7	**<0.1%**

Overflows are predicted to occur during periods when Lagoon Creek is in flow with overflow volumes constituting a very small proportion <5% of the total Lagoon Creek flow volume. This indicates that the water management infrastructure has sufficient storage volume to attenuate the MAW and the risk of spills offsite.

6.8. Potential Lost Production – Pit Flooding

Over the next three years water will be managed through in pit sumps within the Manning Vale East, Manning Vale West, Centre, West, South and Willeroo Pits. These sumps will prevent the active mine area from being impacted by containing MAW in designated pit areas referred to as 'in pit sumps'. When water exceeds the capacity of these sumps there is the potential for water to impact access to the mine pit and is flagged as a potential lost production day. There is no potential for this water to overflow to the environment with the pit capacity well in excess of any overflow volume.

The model assessed the potential lost production for the pits. A lost production day is considered when the volume exceeds the in-pit sump capacity. The in-pit sump capacity is currently not defined but expected to be in the order of 150 ML.

The model indicates that there is no loss in production days as a result of this capacity being exceeded in the Manning Vale East, West and Willeroo Pits. This indicates that the proposed dewatering system and transfers for use elsewhere on site are sufficient to manage the site water during this period. **Figure 6** presents the predicted volume in the active pits indicates that volumes in each in pit sump is likely to be well below 150 ML.

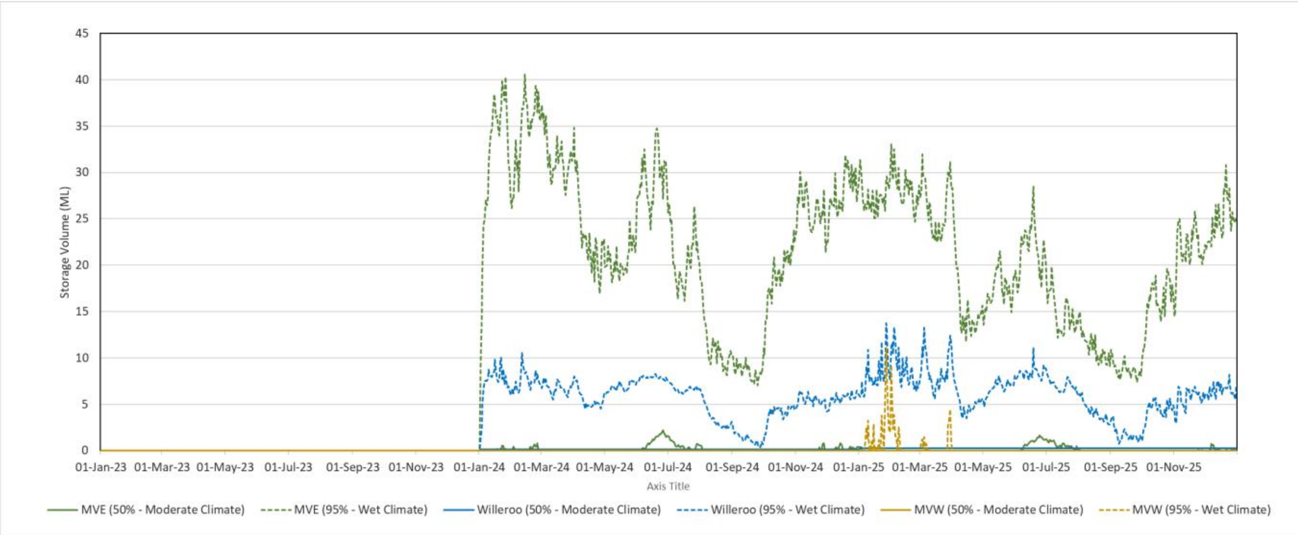


Figure 6 Stage 3 Pits Sumps Volumes

The MAW inventory in the existing pits of Centre, South and West is illustrated in **Figure 7** for the moderate and wet climates. The results indicate that volumes in the storages are of similar magnitude to that of the current pit inventory and well below the total storage capacity of 11,400 ML, 7,230 ML and 8,790 ML for Centre, South and West Pit respectively. Water is being stored preferentially in these in-pit sumps which are no longer active such that out of pit MAW storages can be maintained at lower levels to both provide capacity for dewatering of active pits and reduce risks of uncontrolled overflows. These pits are connected to the mine water management system and water can be used as a supply for the Mine's CHPP and dust requirements.

NAC have recently amended the EA to allow for the treatment of legacy MAW through Reverse Osmosis and release of this treated water to Lagoon Creek. This release of treated waters was not modelled and is considered likely to further reduce the risk of potential accumulation of MAW in legacy pits presented in **Figure 7**.

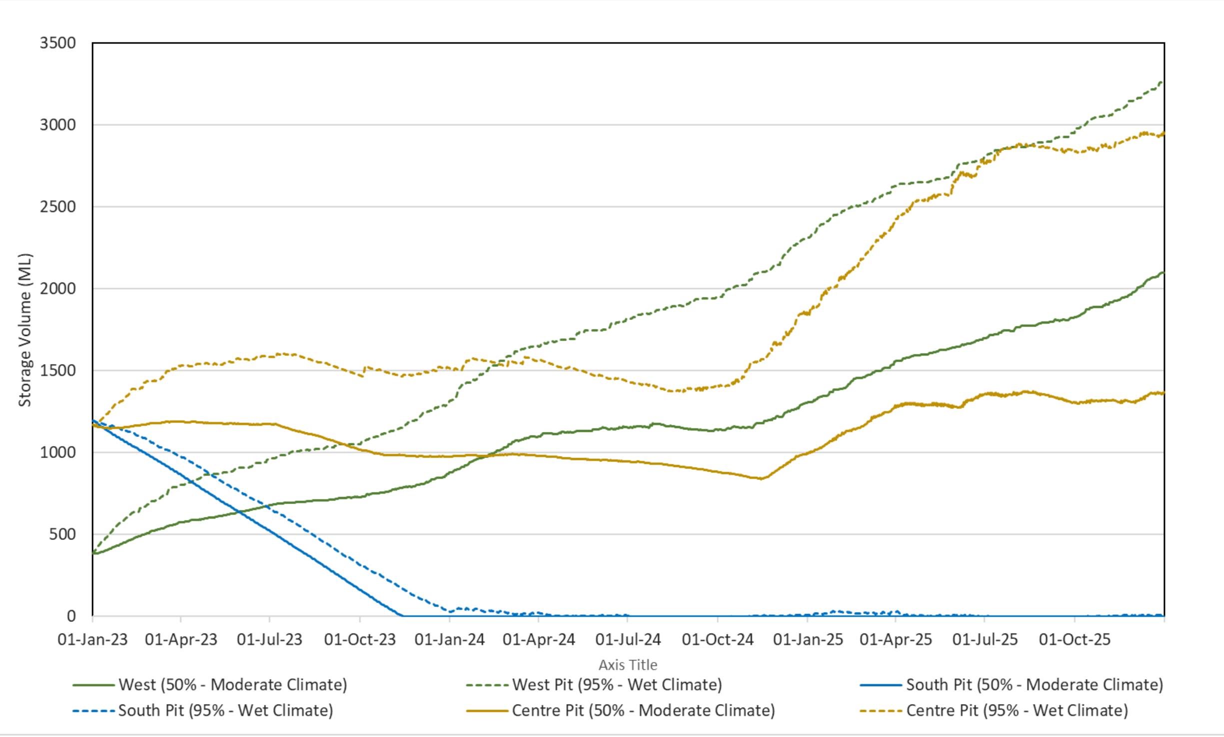


Figure 7 Existing Mine Pits Sumps Volumes (Centre, West and South pits)

6.9. Conclusions

The model indicates the following:

- The water management system is able to operate in accordance with since water is the TARP and EA release conditions.
- The mine receives sufficient water from the Wetalla Pipeline to satisfy the sites water demands. There is a significant volume of the Wetalla Pipeline annual allocation remaining after allocation to raw water usage in the mine.
- The mine will have enough water to meet the dust and CHHP demand throughout simulated period.
- The mine has sufficient storage to use, store or attenuate MAW; thus, there are no days that result to loss production.
- The progressive rehabilitation strategy reduces the dirty water catchments and proves to be sufficient in managing MAW.
- The mine is able to manage water in accordance with the TARP and associated EA conditions.
- Releases during wet weather events from the MAW system are small and constitute a very small proportion of the concurrent Lagoon Creek flow.
- The releases of mine affected water will not have notable impacts in the Lagoon Creek in terms of water quality and quantity, with predicted volumes of controlled and uncontrolled releases being small, infrequent and a very small proportion of the concurrent lagoon Creek flow.
- Controlled releases of treated MAW through the Reverse Osmosis plant have not been modelled. All releases will be in accordance with the EA conditions and used to reduce the potential accumulation of water in legacy pit storages.
- Releases to Spring Creek are not predicted in the simulation.

7. Water Monitoring

Water quality monitoring provides the mechanism for assessing performance against the requirements of the EA relating to contaminate release, water storage quality, and receiving environment.

The REMP monitoring is conducted on a bi-annual basis. The REMP presents an assessment of background conditions, findings of ongoing monitoring and relevant water quality limits to protect the downstream environment.

All monitoring shall be carried out in accordance with the REMP.

In addition to the REMP, which focuses on the receiving environment, NAC have implemented a surface water monitoring program to monitor water quality of onsite water storages. This surface water monitoring is outlined in the NAC Environmental Monitoring Plan. The primary purpose of the surface water monitoring program is to establish water quality characteristics in the event of discharge of water from NAC's EA authorised release locations.

The monitoring program provides a risk-based approach to surface water management by providing information on the water quality in various storages on-site and allowing an assessment of the likelihood of any potential release exceeding discharge limits. Monitoring is undertaken monthly, accessibility dependent.

8. Emergency and Contingency Planning

Several emergency situations may arise during the life of the Mine. Preparation for a range of scenarios is essential with each scenario requiring an appropriate response relative to the urgency of the emergency. For example, a flood emergency will require a rapid response with drought requiring careful observation and management over a long period of time.

8.1. Flood Preparedness

The Mine will include flood defences in the form of levees for Lagoon Creek. All flood defences will have annual inspections after each wet season and significant flow events. Levees will not be to be altered or interfered with unless there has been thorough consultation with a professional engineer.

All flood defences for the Mine have been designed for a 1 in 1,000 AEP flood immunity in accordance with the EA. However, all flood defence structures have risks associated with the uncertainty in the flood estimates and structural integrity of the bund. Although very unlikely, evacuation of the pit could be required to ensure the safety of workers. The Mine's Industrial Area will be located on higher ground and will serve as a suitable evacuation point during a flood event. Management of this type of event will be based on a thorough risk assessment process and will be detailed in the Mine's safety and health system and emergency response procedure.

Rainfall events have the potential to cause rapid inflow to the pits and pit pumping will be required to ensure continuity of operations. Testing of pit flood pumps should be undertaken in preparation for each wet season and the pumps should remain in a location that they are accessible during flood events and be immune from flooding where possible. Positioning of pumps in in pit sumps and connecting pipeline should occur prior to the start of the wet season to allow a rapid recovery from any forecasted or unexpected rainfall events.

NAC will also monitor 3-month rainfall outlooks provided by the BoM to manage the risk of high to extreme rainfall events.

8.2. Drought Planning

Drought planning will be proactive with a reduction of water use being a key element of the plan. The Mine's use of recycled water provides a reliable source of water and a highly reduced dependency on rainfall events. Furthermore, under the agreement between the NHG and TRC, the NHG possesses an option to increase its allocation from the WWRF, which provides further drought security.

The mine water balance will be reviewed annually at the end of every water year to assess the system reliability for the upcoming season and to identify potential efficiency gains. This approach will include a review of the BoM published 3-month outlook for the chance of above or below average rainfall. This approach will also allow adequate time for alternative strategies to be sought and water use minimisation techniques to be implemented.

Drought planning will involve monitoring and review of existing water use. Monitoring of existing water users and analysis of the data will allow inefficiencies in the system to be identified and targeted for reduction in forward planning.

8.3. Emergency Response Action Plans

NAC's Environmental Emergency Response Plan (EERP) includes a section on actions to be taken in response to an environmental emergency. The discharge of water from water management structures are included as an individual issue with specific requirements outlined in the EERP, which will be reviewed and updated as required. NAC's emergency response plans also include incident reporting. As new or changed risks are identified, the EERP and other relevant site emergency documents will be updated accordingly.

8.4. Management of Water Management Structures

8.4.1. Dams Containing Hazardous Waste

IPTSF's 3 (IPT3) is the only storage at NAC containing Hazardous Waste. This storage is inspected annually by a Registered Professional Engineer (RPEQ), in accordance with the EA requirements. Dams containing hazardous waste (regulated structures) are managed under the Regulated Structures Operations and Monitoring Plan (EMP03). On exhaustion of IPT3 capacity, IPT4 is proposed for operation in Stage 3. It is proposed to be located in Centre Pit and will be managed as required under relevant legislation and EA conditions.

The Lagoon Creek Levees are also considered to be regulated structures. Management of these structures will be undertaken in accordance with the EA requirements and include annual inspections by an RPEQ.

More detailed information on regulated structures yet to be constructed will be provided as design documentation becomes available.

NAC is currently in the process of preparing the sites Progressive Rehabilitation and Closure Plan which will include discussion on the decommissioning of regulated structures

8.4.2. Proposed Maintenance Actions

Maintenance of the water management infrastructure, pipelines, pumps, levees and storages is the responsibility of the Maintenance, Production and CHPP Departments, who will provide 24-hour support across the site. Maintenance is determined by plant specifications and availability.

8.4.3. Water Pumping Equipment

The site has a range of suitable equipment to support the current operations with options to supplement this through suppliers as required. In 2017 NAC began metering of key transfers and has collected measurements on pumped volumes which has and will be used to support calibration of the water balance model into the future.

8.4.4. Water Treatment Methods

Water quality in the NAC mine voids is generally good (EC 2,600 µs/cm & $SO4^{2-}$ 600 mg/L) as such it is not envisaged that any highly contaminated water would be released to the environment. The system has been designed to contain many inherent treatment techniques, including the settling of suspended sediments, and biological remediation offered by the natural vegetation in many of the storages.

In addition to this NAC have facilities to treat MAW through a Reverse Osmosis Water Treatment Plant (ROWTP). Water treated through the ROWTP is of a purity greater than the receiving waterways and as such any water from the ROWTP will be blended to achieve water quality results that are consistent with the sites EA conditions. The release of this water is conditioned under the EA Condition C25 through to C29 which controls the quantum, quality AND release and reporting of any treated MAW water. of the EA NAC is permitted to release treated MAW.

All discharges off site will comply with the EA.

9. Trigger Action Response Plan

A Trigger Action Response Plan (TARP) has been developed for the site, based on the water balance assessment and priority transfer requirements.

The philosophy of the TARP is to provide adequate water for the mine to operate successfully while minimising environmental impacts from collecting and managing mine affected runoff water. The TARP actions are based on trigger levels identified for each of the key storages and are prioritised as follows:

- Compliance with the sites EA;
- risk of spills from connected storages, with higher priority to storages which spill offsite and / or storages with poorer water quality;
- maintaining water supply to production; and,
- reducing site water inventory through water collected on site.

Levels denoted in the TARP have been defined through NAC site staff experience and typical TARP levels at mine sites (e.g. the 80% full trigger which seeks to balance containment with spill risk). The TARP is outlined in the table below.

Dam	Trigger	Action	Notes
Pond Return	>3.5m	• No additional inputs possible • Cease inputs if Mandatory Reporting Level will be breached • Ensure bias is toward PR • Inspect daily	Priorities for inputs to Pond Return: 1. IPT3 2. Environmental Dam 4 if a release is possible & EA conditions may be breached. 3. Sediment Dam 1 4. South or Centre Pit 5. Raw Water Dam 1
	2.5 - 3.5m	• Additional inputs possible • Inspect daily	
	<2.5m	• Ensure bias is toward RWD • Inspect daily	
Raw Water Dam 1	≥70%	• Cease inputs • Ensure bias is towards RWD • Inspect Daily	Priorities for inputs to Raw Water Dam 1: 1. Sediment Dam 2 if >80% 2. Environmental Dam 1 (if a discharge is possible & EA conditions may be breached) 3. Sediment Dam 2 4. Raw Water Dam 2 5. Wetalla WRF
	50 – 70%	• Additional inputs possible • Inspect weekly	
	<50%	• Additional inputs possible • Inspect weekly	
Raw Water Dam 2	≥60%	• No additional inputs possible • Cease inputs if dam could overflow • Pump to Raw Water Dam 1 or Pond Return if possible • Inspect Daily	Priorities for inputs to Raw Water Dam 2: 1. Sediment Dam 2 2. Balance Pipe 3. Wetalla off-take
	40 - 60%	• Additional inputs possible • Inspect weekly	
	<40%	• Inspect weekly	
In-Pit Tailings 3	Water level <0.3m below Mandatory Reporting Level	• Pump to Pond Return if possible • No inputs possible • Survey water level • Inspect daily	

Dam	Trigger	Action	Notes
	Water level >0.3m below Mandatory Reporting Level	• Survey water level • Inspect daily	
Proposed In-pit Tailings 4	TBA	TBA	Proposed in-pit tailings cell 4. Actions to be included post construction.
Environmental Dam 1	>60%	• Pumping must occur from dam to RWD1 or RWD2 • Inspect daily during periods of rainfall, weekly otherwise	Priorities for inputs to ED1: 1. Sediment Dam 2 2. Raw Water Dams Pumping offsite may be an option. Consult the NAC Environmental Authority for release criteria.
	0-60%	• Pumping to occur from dam if predicted rainfall may cause a discharge • Pumping to occur from dam if Raw Water Dam 1 can accept • Inspect weekly	
	>25mm of rain in a 24-hour period	• Inspect	
Environmental Dam 3 & Environmental Dam 3A	>60%	• Pumping must occur from dam • Inspect daily	Priorities for inputs to ED3A / ED3: 1. Sediment Dam 2 2. South Pit 3. Manning Vale East Pit Pumping offsite may be an option. Consult the NAC Environmental Authority for release criteria. *Note that ED3 & ED3A will both overtop to South Pit, no discharges are likely. *Note that releases off-site may only occur from ED3, as per the EA.
	0-60%	• Pumping to occur from dam if predicted rainfall may cause a discharge • Pumping to occur from dam if Sediment Dam 2 can accept • Inspect weekly	
	>25mm of rain in a 24-hour period	• Inspect	
Environmental Dam 4	>80%	• Pumping must occur from dam • Inspect daily	Priorities for inputs to ED4: 4. Manning Vale East Pit Pumping offsite may be an option. Consult the NAC Environmental Authority for release criteria.
	0-80%	• Pumping to occur from dam if predicted rainfall may cause a discharge • Inspect weekly	

Dam	Trigger	Action	Notes
	>25mm of rain in a 24-hour period	• Inspect	
Proposed Environmental Dam 5, 6 and 7	>80%	• Pumping must occur from dam • Inspect daily	
	0-80%	• Pumping to occur from dam if predicted rainfall may cause a discharge • Pumping to occur from dam if Sediment Dam 2 can accept • Inspect Monday, Wednesday & Friday	
	>25mm of rain in a 24-hour period	• Inspect	
Sediment Dam 1	>80%	• Pumping to occur from dam if Pond Return water level allows • Inspect daily	Overflows will report to Centre Pit via spillway drain.
	0-80%	• Pumping to occur from dam if Pond Return water level allows • Inspect Monday, Wednesday & Friday	
	>25mm of rain in a 24-hour period	• Inspect	
Sediment Dam 2	>80%	• Pumping to occur from dam if Raw Water Dam water level allows • Inspect daily	Overflows will report to ED3A and subsequently South Pit.
	0-80%	• Pumping to occur from dam if Raw Water Dam water level allows • Inspect weekly	
	>25mm of rain in a 24 hour period	• Inspect	
Proposed Permanent Sediment Dams	>80%	• Pumping to occur from dam if Raw Water Dam water level allows • Inspect daily	

Dam	Trigger	Action	Notes
(Including SD3 and SD4)	0-80%	• Pumping to occur from dam if Raw Water Dam water level allows • Inspect Monday, Wednesday & Friday	
	>25mm of rain in a 24-hour period	• Inspect	
Temporary Sediment Dams (5ML)	>25mm of rain in a 24-hour period Or > 10 mm in a 3-hour period	• Inspect • Pumping to create sufficient freeboard within the storage within 5 days of event	
In Pit Sump Storages	>80%	• Assess transfer constraints and pump out of sump if available storage elsewhere. Otherwise prepare additional in pit sump capacity or for risk of broader pit inundation. • Inspect daily	
	0-80%	• Pumping to occur to other storages if allowed. • Inspect weekly	
	>25mm of rain in a 24-hour period	• Inspect	

10. Implementation of the Water Management Plan

The Water Management Plan is a live document and subject to regular updates and reviews.

10.1. Operational Monitoring and Review

10.1.1. Water Balance Updates

Water balance updates are undertaken following any significant changes to the mine plan to ensure that the model is representative of the true operating system. This approach will also enable the water balance model to act as a predictive tool. The water balance will be reviewed regularly, and/or whenever significant changes have taken place to the water management system. Monitoring is essential to the success of these updates. Calibration data will be collected for use in any future updates.

The WMP will be updated every 2 years or within 12 months of the modelling horizon presented in this plan, whichever is sooner.

This WMP may be reviewed after any event involving the uncontrolled release of water to the environment. The review will consider any updates to the system, predictions from the water balance model and any changes to regulatory or licensing conditions.

10.1.2. Performance Monitoring

Monitoring of performance will involve the testing and gauging of a number of different systems.

Outputs of some of this monitoring will be used in updating the water balance model and the WMP so that the modelling tool can be thoroughly calibrated and be used as a predictive tool for mine water management operations.

The EA outlines monitoring locations, methods and frequency. The monitoring program is designed to:

- ensure compliance with the EA and water licences
- ensure that no unacceptable impacts to surface and groundwater systems are occurring as a result of activities
- ensure that any regulatory non-compliance is detected and managed in accordance with procedures and regulatory requirements
- support operational control and update on-site water balances and off-site catchment models
- assess current and cumulative impacts of on the environment
- meet corporate and regulatory reporting requirements
- maintain safety and environmental inspection procedures, including the verification of identified hazards and compliance with licence conditions, for all licensed water control facilities

10.2. Performance Measurement

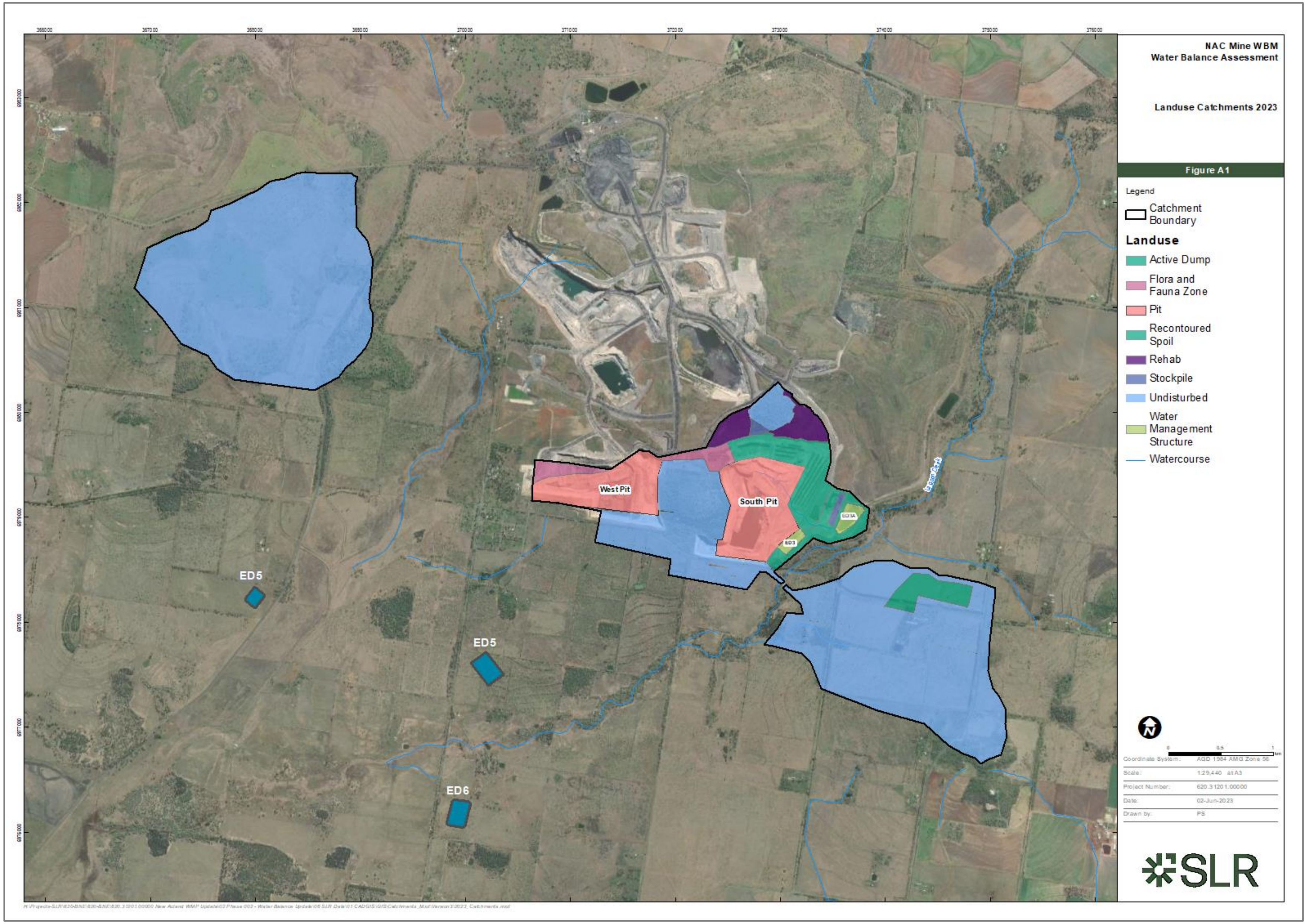
The key items that will be used to gauge performance of the WMP will include:

- performance of water conservation measures such as management of dust suppression demands
- controlled transfers between dams and dam levels are within appropriate limits
- releases to receiving waterways are controlled to the requirements of the EA

- appropriate actions have been taken when problems are detected, which may include situations such as structural issues detected in dams, water quality levels exceeding set levels or water levels in dams are greater than set limits.

Appendix A Landuse Catchments Maps

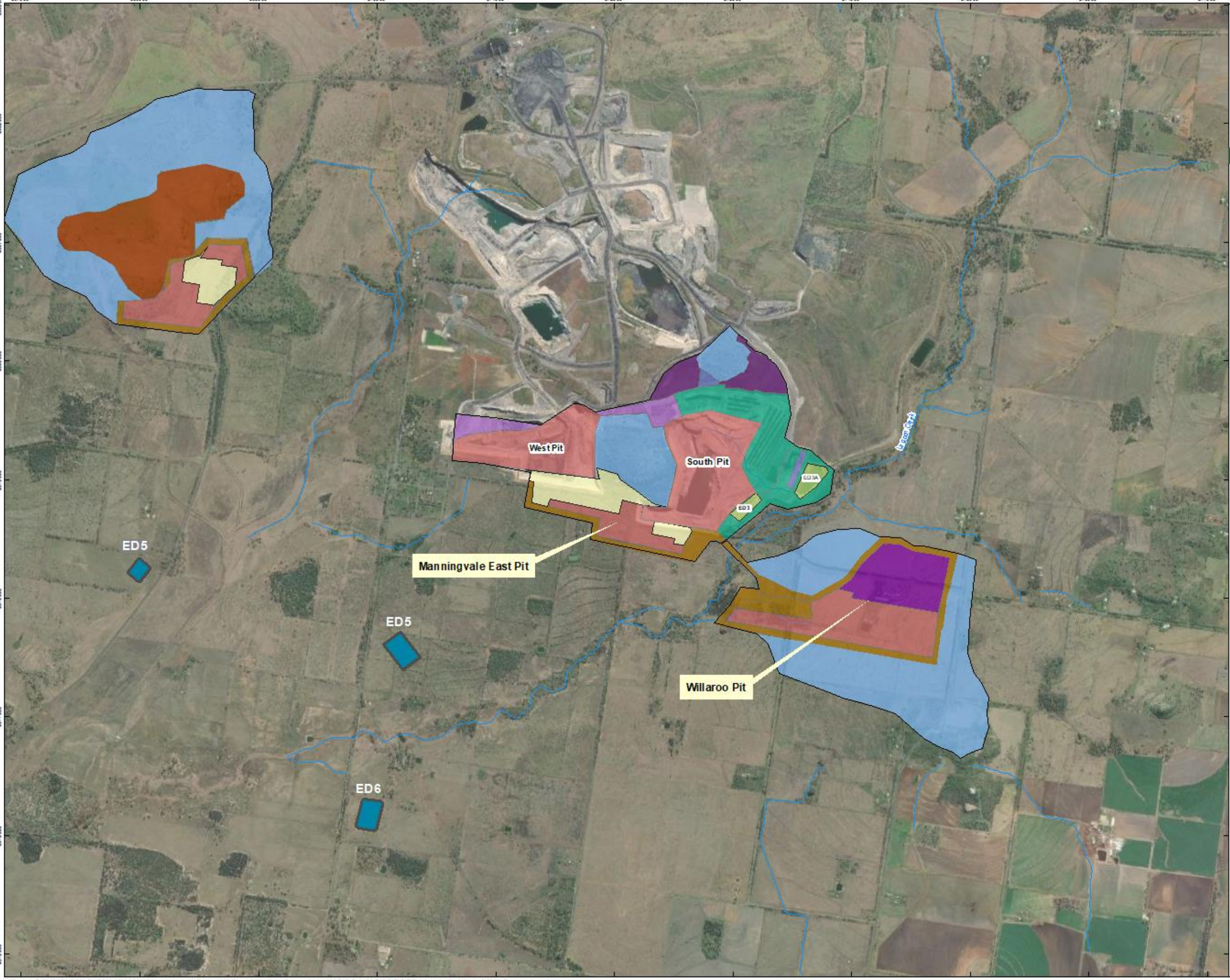
Appendix A-1 Feb 2023 Landuse


NAC Mine WBM
Water Balance Assessment
Landuse Catchments 2023
Figure A1
Legend
Catchment Boundary
Landuse
Active Dump
Flora and Fauna Zone
Pit
Recontoured Spoil
Rehab
Stockpile
Undisturbed
Water Management Structure
Watercourse
West Pit
South Pit
ED5
ED5
ED6
0
0.5
1
km
Coordinate System: AGD 1984 AMG Zone 56
Scale: 1:29,440 at A3
Project Number: 620.31201.00000
Date: 02-Jun-2023
Drawn by: PS

Appendix A-2 2024 Landuse


NAC Mine WBM
Water Balance Assessment
Landuse Catchments 2024
Figure A2
Legend
Watercourse
Landuse
Active Dump
ED3
ED3A
Flora and Fauna Zone
Haul Road
Haul Road and Topsoil
Pit
Pit Floor
Recontoured Spoil
Rehab
Stockpile
Undisturbed
West Pit
South Pit
Manningvale East Pit
Willaroo Pit
ED3
ED3A
ED5
ED5
ED6
0 0.5 1 km
Coordinate System: AGD 1984 AMG Zone 56
Scale: 1:29,440 at A3
Project Number: 620.31201.00000
Date: 12-Jun-2023
Drawn by: PS
SLR

Appendix A-3 2025 Landuse



NAC Mine WBM
Water Balance Assessment

Landuse Catchments 2025

Figure A3

Legend

- 2025_CatchmentBoundary

Landuse

- Active Dump
- Flora and Fauna Zone
- Haul Road
- Haul Road and Topsoil
- Out of Pit Dump
- Pit
- Pitfloor
- Recontoured Spoil
- Rehab
- Stockpile
- Topsoil
- Undisturbed
- Water Management Structure
- ED_Locations
- Watercourse
- World Imagery

Coordinate System:	AGD 1984 AMG Zone 56
Scale:	1:29,172 at A3
Project Number:	620.31201.00000
Date:	12-Jun-2023
Drawn by:	PS