Delta coal

Environmental Management System

Mannering Colliery

Water Management Plan

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1 Introduction

1.1 Purpose and Scope

The primary objective of the Mannering Colliery (MC) Water Management Plan (WMP) is to satisfy the requirements set out in Project Approval (PA) MP06_0311. The WMP outlines the requirements to be undertaken to ensure compliance with statutory requirements and to ensure appropriate water management at MC through the separation of clean and dirty water and the effective management of water through collection, treatment and discharge.

The purpose of this WMP is to:

- provide a description of the mitigation and management measures to be implemented by Delta Coal (DC) and its contractors to minimise and mitigate the potential for impacts on the environment and comply with the relevant conditions of MP06_0311 and Environment Protection Licence (EPL) 191, including the water relevant pollution reduction programs (PRP's);
- guide the management of surface and groundwater resources throughout the operational life of the mine;
- detail the impact assessment criteria applying to the site;
- detail the water monitoring and reporting requirements;
- identify the requirements for incident reporting and reviews of the document; and
- provide a mechanism for assessing and reporting of water monitoring results against the impact assessment criteria.

The WMP incorporates the following components as required by the project approval:

- a Water Balance;
- erosion and sediment control;
- surface water monitoring; and
- groundwater monitoring.

The scope of the plan applies to the Mannering Colliery's existing and future operations. The plan applies to DC employees and contractors.

1.2 Background

Mannering Colliery (MC) is an underground coal mine located on the southern side of Lake Macquarie approximately 60 km south of Newcastle and 80 km north of Sydney (see **Figure 1)**. The pit-top is located 3 km south of the township of Mannering Park at the southern extent of Lake Macquarie, as shown on **Figure 1**.

Development of the mine (known as Wyee Mine) began in 1960 in conjunction with the construction of Vales Point Power Station (VPPS) and was operated by Powercoal Pty Ltd. Production commenced in 1961 with extensive mining (first workings and secondary extraction) having taken place in both the Great Northern and Fassifern Seams. Coal operations temporarily ceased on 30 June 2002 when the operation was placed on care and maintenance.

Centennial Coal acquired control of Powercoal on 7 August 2002 and the Colliery remained on care and maintenance. Wyee Mine was renamed Mannering Colliery (MC) and production was recommenced in December 2005, mining the Fassifern Seam to gain access to greater than 5 million tonnes of recoverable reserves beneath Lake Macquarie and surrounding lands. MC was once again placed on care and maintenance in November 2012. In 2013 the owners of MC and Chain Valley Colliery (CVC) entered into an agreement which enabled LakeCoal to operate MC. LakeCoal became the operator of MC effective 17 October 2013. The underground link road between CVC and MC was completed in October 2017.

LakeCoal was placed into Voluntary Administration on 3 October 2018. The receivers continued operation of the mines in the period 3 October 2018 to 1 April 2019.

As of 1 April 2019, Great Southern Energy Pty Ltd (trading as Delta Coal) own and operate the two underground coal mines, CVC and MC. Mining is currently undertaken at CVC, with the coal being transported via underground conveyors to MC where the coal is crushed and screened and sent directly to VPPS via an overland conveyor.

1.3 Operations

MC was granted PA 06_0311 on 12 March 2008 which has since had five modifications, the most recent being an administrative modification approved in June 2020 (MOD 5). The MC was originally granted approval for the continued production of up to 1.1 million tonnes per annum (Mtpa) of run of mine (ROM) coal. With the approval of MOD 5, the mining operations are permitted to occur until 31 December 2027 and additionally coal transportation of up to 2.1 Mtpa is permitted to allow for the transfer of coal from the CVC. All coal from MC is required to be transported via a dedicated overland conveyor to VPPS for domestic energy generation.

DC is currently seeking approval for a modification (MOD 5) to MP 06_0311 to allow for an increase in the rate of ROM coal handled at MC and transported to VPPS via overland conveyor from 1.3 Mtpa up to the approved extraction limit at CVC of 2.1 Mtpa, an extension to the approved end date for mining operations to 31 December 2027 and allow for the use of alternate bord and pillar mine designs. There is increase in disturbance area or increase in stockpile area in this modification. A dewatering system is being installed underground in 2020 which will reduce ROM coal moisture.

1.4 Consultation

The original Water Management Plan (WMP) was prepared by Centennial Coal in March 2009. The WMP was previously prepared in consultation with the then Department of Water and Environment (DWE) and following amendments, was approved on the 24 March 2010 (Revision 2).

This revision has utilised the approved WMP as a basis for this document. It has been updated, contemporised and addresses the requirements from the PA (as modified), EPL 191 and the Independent Environmental Audit (IEA) conducted in 2022.

Endorsement of individuals undertaking the review of this management plan was received from Department of Planning and Environment (DPE) on the 13 September 2022.

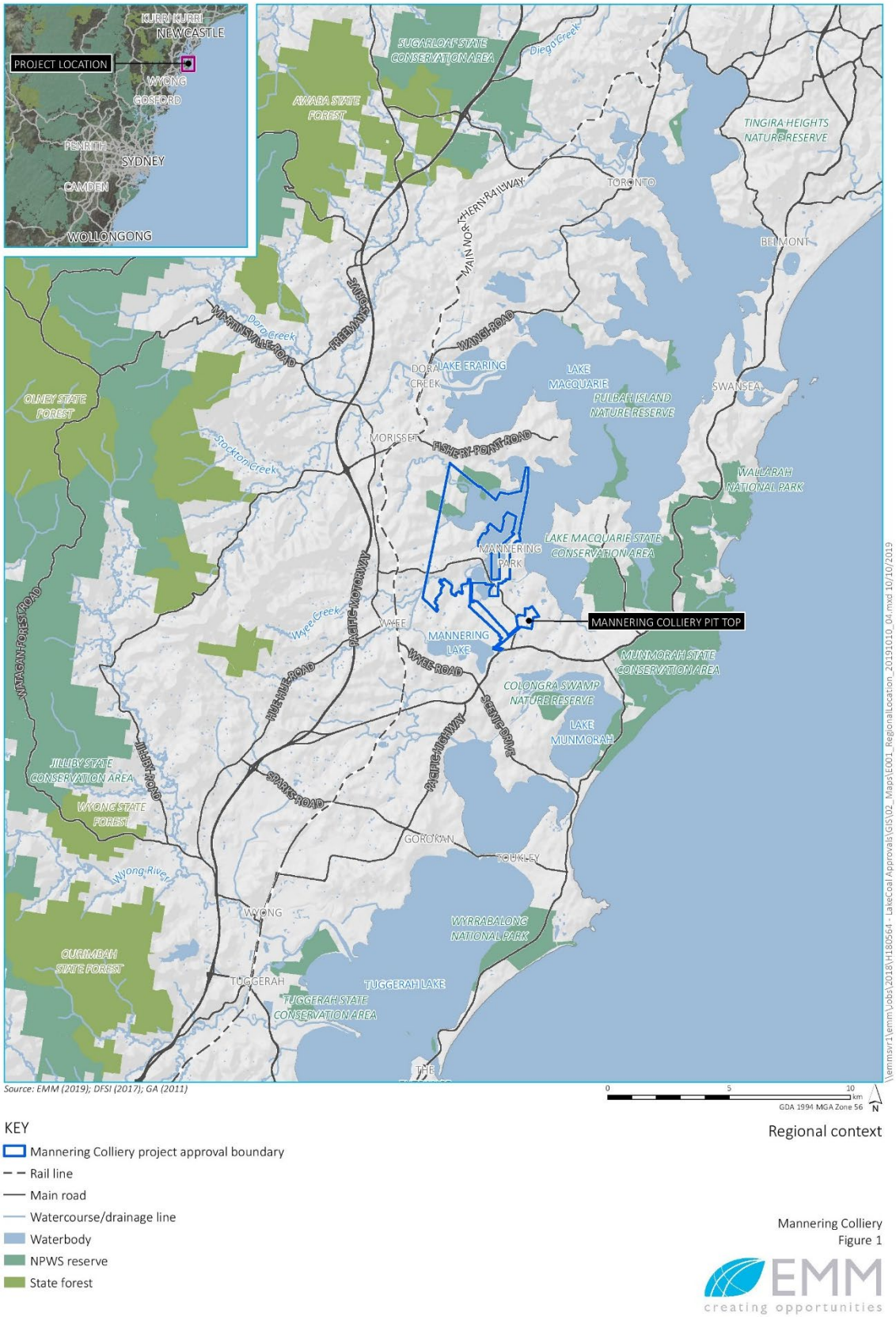
No specific consultation requirements for the development of the WMP are required under PA 06_0311. The WMP was previously provided to Department of Primary Industries (DPI), Natural Resources Access Regulator (NRAR), NSW Environment Protection authority (EPA) and the Department of Planning, Industry and Environment (DPIE) on 1 December 2019 for their review and comment.

Following review of the WMP in 2022, the document has been submitted to the DPE via the Major Projects Planning Portal for review and approval.

Table 1: Consultation Summary

Stakeholder	Comments	Response/Action
NSW EPA	No response (2019)	Nil
NSW DPE	TBD	TBD
DPI	No comments (2019)	Nil
NRAR	No response (2019)	Nil

Figure 1: Regional Context



2 Statutory Requirements

2.1 Key Legislation, Policy and Guidelines

A number of legislative requirements, government policies and guidelines relating to water management are applicable, the key items of legislation and the relevant approval documents to this WMP are:

- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Water Act 1912;*
- *Water Management Act 2000*; and
- *Mining Act 1992*.

Key policies and guidelines which are relevant to the preparation and implementation of this WMP include:

- National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000a);
- National Water Quality Management Strategy Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC 2000b);
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments (ANZG 2018);
- Department of Environment and Conservation, Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (March 2004);
- Managing Urban Stormwater: Soils and Construction (the Blue Book), Volume 1 and Volume 2E – Mines and Quarries (Landcom, 2004 and Department of Environment and Climate Change (DECC), 2008);
- NSW Aquifer Interference Policy (Office of Water 2012);
- NSW Water Quality and River Flow Objectives (September 1999);
- NSW State Rivers and Estuaries Policy (NSW Water Resources Council 1993);
- The NSW Groundwater Quality Protection Policy, adopted in December 1998;
- The NSW State Groundwater Dependent Ecosystems Policy, adopted in 2002;
- The NSW Groundwater Quantity Management Policy (Department of Land & Water Conservation 1997); and
- Australian Government, Charter: National Water Quality Management Strategy (2018).

2.2 Project Approval 06_0311 Requirements

This WMP has been prepared to satisfy the requirements of Schedule 3, Conditions 6 to 12, which includes the requirements of the WMP and what it must address. **Table A1** in **Appendix 2** details the PA conditions and where in this document the requirements are addressed.

In accordance with Schedule 2, Condition 2, in addition to carrying out the works in accordance with the conditions of the PA (06_0311), DC will also carry out works generally in accordance with the Environmental Assessment (EA), EA (Mod 1), EA (Mod 2), EA (Mod 3), EA (Mod 4), Statement of Environmental Effects (SEE) (Mod 5), Project Layout Plans, and Statement of Commitments.

2.3 Mining Leases

Mining Lease (ML) 1782, issued to Great Southern Energy Pty Ltd (T/A Delta Coal) and registered on 24 January 2022 is the most relevant lease to this WMP as ML1782 includes the surface facilities at Mannering Colliery. The mining lease does not contain provisions for surface water management at Mannering Colliery.

2.4 Environmental Protection Licence 191

MC operates under EPL 191 issued by the Environment Protection Authority (EPA) under the POEO Act. The EPL has been modified a number of times, most recently on the 1 April 2019 for the transfer from LakeCoal Pty Ltd to Great Southern Energy Pty Ltd (trading as Delta Coal).

Water related requirements of the EPL, including specific requirements that are to be addressed in this management plan and section references within the WMP are detailed in **Appendix 2**. MC has a single Licensed Discharge Point (LDP) under EPL 191 defined in the EPL as Point 1 and referred to herein as Licensed Discharge Point 1 (LDP1).

A 5 year anniversary review of EPL191 is being undertaken during the review of this document. This review has mainly corrected some typographical errors and the water monitoring points, limits and conditions have generally remained the same.

2.5 Maximum Harvestable Right Dam Capacity

Under the NSW *Water Management Act 2000*, landholders are permitted to capture, store and use a portion of the rainfall runoff on their property. The right to harvest rainfall is determined by geographic location and is typically 10% of the total rainfall runoff for the property and storage is calculated under the Maximum Harvestable Right Dam Capacity (MHRDC) provision. Dams that exceed this capacity or are greater than a certain size must be licenced.

Where dams are used to control pollution or effluent, there are exemptions to the licencing requirements. This is the case for the pollution control dams at MC where the dams are exempt from the MHRDC calculation.

3 Surface Water Management

3.1 Water Management Review

MC completed a Surface Water Quality Assessment (GHD, 2013a) and Water Balance Assessment (GHD, 2013b) to satisfy the requirements of:

- Project Approval MP 06_0311, Appendix 3 Statement of Commitments; and
- Condition U1.1 of Environmental Protection Licence (EPL 191) – PRP 1 Assessment of Potential Impacts of Metals.

The current EPL 191 (dated 1 April 2019) shows that PRP 1 Assessment of Potential Impacts of Metals condition was completed 26 June 2013, as per Condition 7, G2.1 Completed Pollution Studies and Reduction Programs (PRPs).

Information from the surface water quality assessment (GHD, 2013a), water balance assessment (GHD, 2013b) and the earlier water management assessment (GHD, 2011) have been utilised, where relevant, and key information incorporated into the WMP.

3.2 Overview of Water Management System

The MC site surface water management system, as shown in Figure 2, comprises both clean and dirty water catchments. A number of water management diversions direct clean water around the site to avoid increased hydraulic load on the sedimentation dams that treat the site dirty water prior to discharge.

Within the water management system there are five categories of water including clean water, dirty water, underground (mine) water, potable and wastewater. The sediment dam system comprises a total of four main dams, labelled Pond 1, Pond 2, Pond 3 and Pond B. (References to “Pond” and “Dams” are interchangeable and refer to the same water management structures).

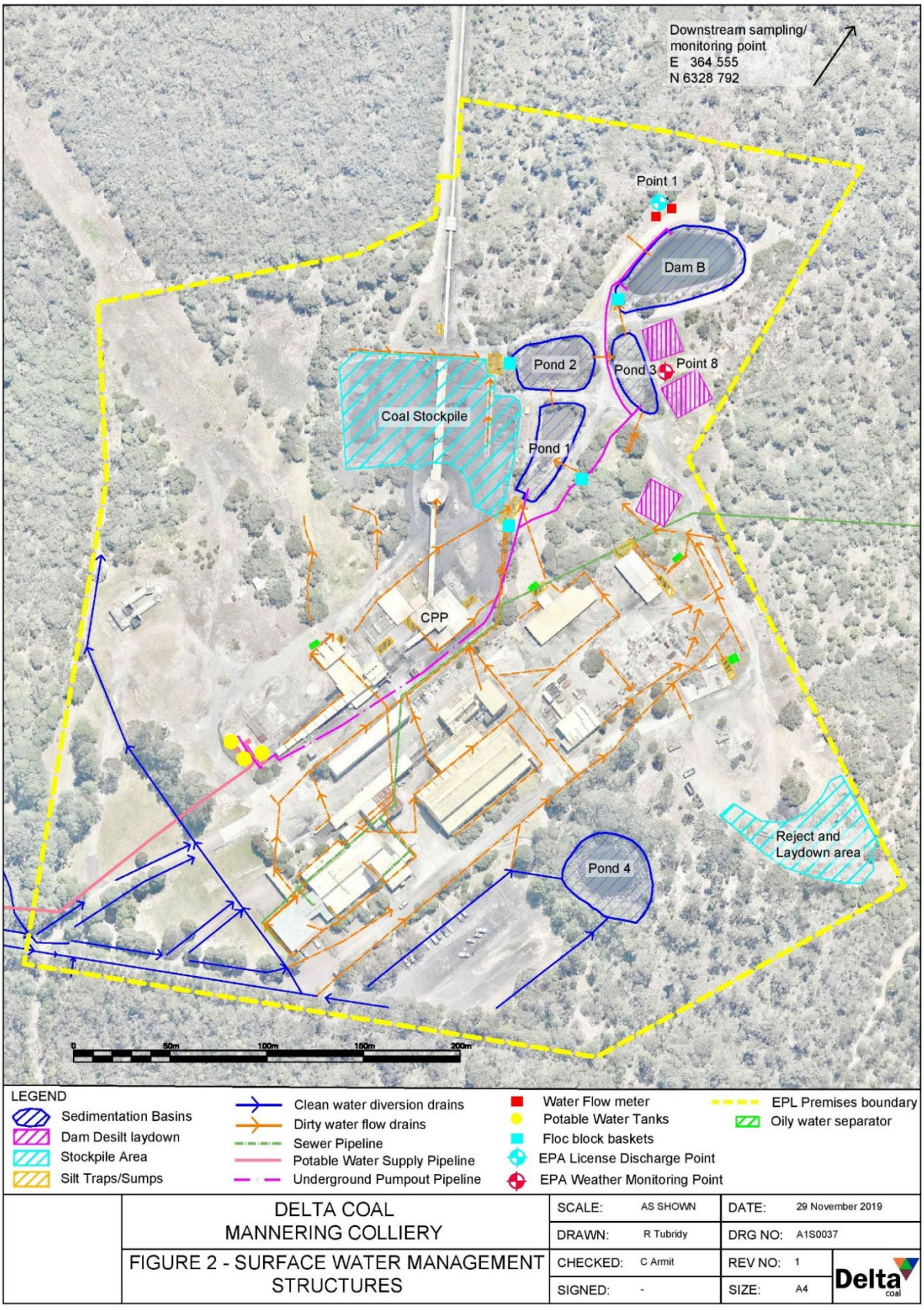
The various components of the water management system are described below.

3.3 Clean Water

Clean water from upslope areas unaffected by the operational activities and runoff reporting to the site from surrounding land, i.e. primarily areas to the south and east, are diverted through clean water management structures (such as diversion drains and culverts under roads), and ultimately report to Pond 4. The clean water channels with their flow paths are shown in **Figure 2**.

A main diversion along the south-west boundary of the Colliery diverts clean water around the site to the west and north. The clean water diversions are maintained and kept well-vegetated to enhance channel stability and limit erosion impacts from storm flows. Where required, stabilisation works have been undertaken to keep sediments loads to a minimal.

Figure 2: Surface Water Management Structures



3.4 Dirty Water Management

The dirty water management system comprises of both surface and subsurface management structures to control and divert the flow of water and runoff and into the site sediment dams.

Dirty water management at MC includes use of the following infrastructure:

- settlement Ponds 1, 2 and 3;
- Pond B;
- oil and water separators; and
- drive-in sumps/silt traps to capture coarse sediment.

Water from the dirty water catchments enters Pond 1 or Pond 2. When both these dams are full, water overflows into Pond 3. Once Pond 3 reaches capacity it subsequently overflows into Pond B. Finally, when Pond B reaches capacity it overflows out LDP1.

The carpark has a resident stormwater management system in the form of a pit and pipe network. The carpark is crested with half the catchments contributing to the dirty water management system via surface water inlet pipes that collect runoff which directs stormwater to one collection point. The remaining half of the car park has surface water directed towards the fire dam.

Settlement ponds 1, 2 and 3 make up a cascading system of ponds. Inflows are directed to Settlement Pond 1 which, once full, spills into Settlement Pond 2. Settlement Pond 2 has a stockpile area as its catchment and once full spills into Settlement Pond 3. Settlement Pond 3 receives some catchment inflow and discharges to Pond B once full. The dirty water Settlement Ponds, channels/flow paths and sumps/silt traps are shown on **Figure 2**.

Pond B receives only direct rainfall and overflows from Settlement Pond 3. Pond B has a riser pipe outlet which is where LDP1 discharges are recorded.

A wetland area located adjacent to Settlement Pond 1 and 3 captures a portion of southern catchment where mine equipment and plant is being stored. This wetland area overflows to Settlement Pond 1.

Each of the settlement ponds has a floating boom to capture any oil residue if present within surface water runoff, in the event this was not previously captured and removed by the oil and water separators.

The dirty water management dams at MC are consistent with the requirements of Managing Urban Stormwater: Soils and Construction – Volume 2E (DECC, 2008) for storage sizing, with the storage capacity of the onsite dams being sufficient to meet a 90 percentile rainfall event of 58.7 mm over a five day management period.

A series of interconnecting pipes and valves also allows Pond 2 to be drained into Pond 3, Pond 3 to be drained into Pond B and Pond B to be discharged via LDP1. These valves are generally kept shut to maximise storage capacity of the dams, but are opened after rainfall events, once water quality is suitable for discharge, to minimise water the volume of water stored and again increase storage capacity of the dams for the next rainfall event.

3.5 Underground Water

Water in the underground workings is derived from two sources: excess process water generated from mining operations and groundwater which is released from the strata into underground mine workings.

The collected water is pumped through an extensive goaf system that allows settling of fines prior to being pumped to the surface. Dewatering from the underground workings is pumped from a central location to the surface where it is discharged to Settlement Pond 1, 3, Pond B, or directly to LDP1. Dewatering is preferentially undertaken directly to LDP1 as this allows all storage dams to be maintained at low levels to provide storage for rainfall runoff.

3.6 Water Supply

Potable water is provided to MC by Central Coast Council through a direct metered pipeline which delivers water to three surface storage tanks. The potable supply provides water on demand to the underground workings, administration and bath house facilities area, for dust suppression and wash-down areas.

3.7 Water Savings

MC seeks continual improvement in relation to water consumption, potential improvements in water efficiency and alternative water sources (where practicable) and options for recycling and reuse. The following measures are implemented on site:

- continued maintenance of pumping infrastructure to ensure efficient operations;
- repair works to aging pipelines to reduce losses from leakage and
- trial use of chemical dust suppressant to reduce water cart usage.

The primary use of potable water is to supply underground activities and accordingly will vary significantly with the levels of production and activity at MC. The water storage within the dirty water dams is not suitable for supply to underground machinery.

3.8 Wastewater

Wastewater at MC includes grey water and sewage. Each of these wastewater streams are directed to the sewage system which is pumped to the Central Coast Council run Mannering Park Wastewater Treatment Works via a dedicated private pump station and rising main at a rate of up to 2 L/s.

4 Water Balance

In 2013 a comprehensive Water Balance Assessment (GHD, 2013b) was prepared for the site. This section of the WMP provides a summary of the current site water balance for MC site operations and surface water infrastructure arrangements. Where relevant, information from the GHD (2013b) water balance assessment has been utilised. Site water management is summarised above in **Section 3**.

4.1 Water Balance Model

The 2013 water balance assessment (GHD, 2013b) included the development of a GoldSim (GoldSim Technology 2007) model to represent the MC water balance, including both operational and natural water flows and contributions across the site. The structure of the water balance assessment includes only the dirty water flow and storage components of the surface water management system, i.e. clean water flows are not represented.

The water balance assessment was modelled at a daily time step; daily rainfall data was the shortest period data, and runoff from local catchments to the water management system was represented using the Australian Water Balance Model (AWBM) (Boughton, 2004).

A current schematic of the MC water flow diagram is presented in **Figure 3**, which reflects the site's water management flows and stores. The site layout of surface water management infrastructure, including both dirty and clean water flows and storage, are shown in **Figure 3**. It is noted that discharge to the environment from Pond A (at LDP2) as presented in the 2013 water balance assessment (GHD, 2013b), is no longer included in the site water management system.

4.2 Data (Model Inputs and Outputs)

4.2.1 Surface Water Management System

Surface water consists of runoff that contributes to surface water storage. At MC these include Pond B, Settlement Pond 1, Settlement Pond 2 and Settlement Pond 3.

The inputs into the surface water system consist of:

- potable water used for wash-down, bath house and dust suppression activities;
- runoff from the contributing catchment areas (both clean and dirty) as a direct result of runoff; and
- transfer of underground water to the surface.

The outputs from the surface water system are:

- sewer flows from domestic water use;
- evaporation from ponds and stores;
- water captured by pollution control measures such as sumps and oil water separators; and
- discharge through LDP1 from Pond B.

The facilities that manage surface water are listed in **Table 2**.

Table 2: Surface Water Storages and Capacity

Location	Total Capacity (ML)	Capacity at Discharge Invert (ML)
Pond B	3.27	1.63
Settlement Pond 1	1.47	1.12
Settlement Pond 2	1.71	1.11
Settlement Pond 3	1.07	0.52
Total Dirty Water System Capacity	**7.52**	**4.38**

4.2.2 Rainfall

The rainfall series developed for the water balance assessment (GHD, 2013b) adopted historic daily rainfalls recorded at the Bureau of Meteorology's (BoM) Wyee Farms Rd climate station, located approximately 9.5 km west of MC. This station was selected for the assessment due to the proximity to the MC and the length of the continuous daily record. The station opened in 1899 and continuous rainfall data are from 1901 through to 2017. Daily rainfall data for the Wyee Farms Rd climate station have been extracted from the SILO[1] database (DES, 2019) for the period June 2017 to July 2019 to provide an infilled series.

Rainfall statistics for the period July 1960 to June 2019 (based on a July-June rainfall year) are summarised in **Table 3** below. Annual average rainfall for the 1961 to 2019 period is approximately 1,240 mm.

Table 3: Monthly Rainfall Statistics for Wyee Farms Road Climate Station (July 1961 to June 2019)

Statistic	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
Median	41	38	51	70	89	82	91	130	122	85	72	97	1,203
Average	57	63	66	81	102	99	122	153	149	118	105	124	1,239
Maximum	191	267	205	263	374	269	414	682	377	503	471	489	1,993
Minimum	0	1	1	2	13	16	7	13	17	2	5	3	509

Monthly rainfall distributions are presented in **Figure 4**, including average, maximum and minimum monthly estimates of Class A Pan evaporation estimates. Monthly rainfall averages reflect a slight seasonal rainfall pattern with a wetter late summer/autumn and a drier winter period with highest average rainfall experienced in February (153 mm) and March (149 mm) and lowest rainfall occurring in July (57 mm) and August (63 mm). Monthly rainfall variability is highest for the months from January through to June.

Annual rainfall (for a July to June water year) are presented in **Figure 5**, including the annual rainfalls measured at the MC climate station (summarised below). Maximum annual rainfall for the 1961–2019 period was 1,993 mm (1988-89) and the minimum annual rainfall was 509 mm (1964-65).

The annual rainfall record indicates higher annual rainfall and inter-annual rainfall variability across the study area for the period up to the early 1990s. Below average rainfall years were consistently recorded for the period 1991-2 to 2005-06, also reflected as a dominant drying trend in the cumulative departure from the mean curve. Annual average rainfall is estimated to be 1,312 mm for the period July 1961 - June 1991 period and reduces to 1,173 mm for the July 1991 - June 2019 period.

[1] SILO is a database of Australian climate data from 1889 to the present and is hosted by the Queensland Department of Environment and Science (DES)

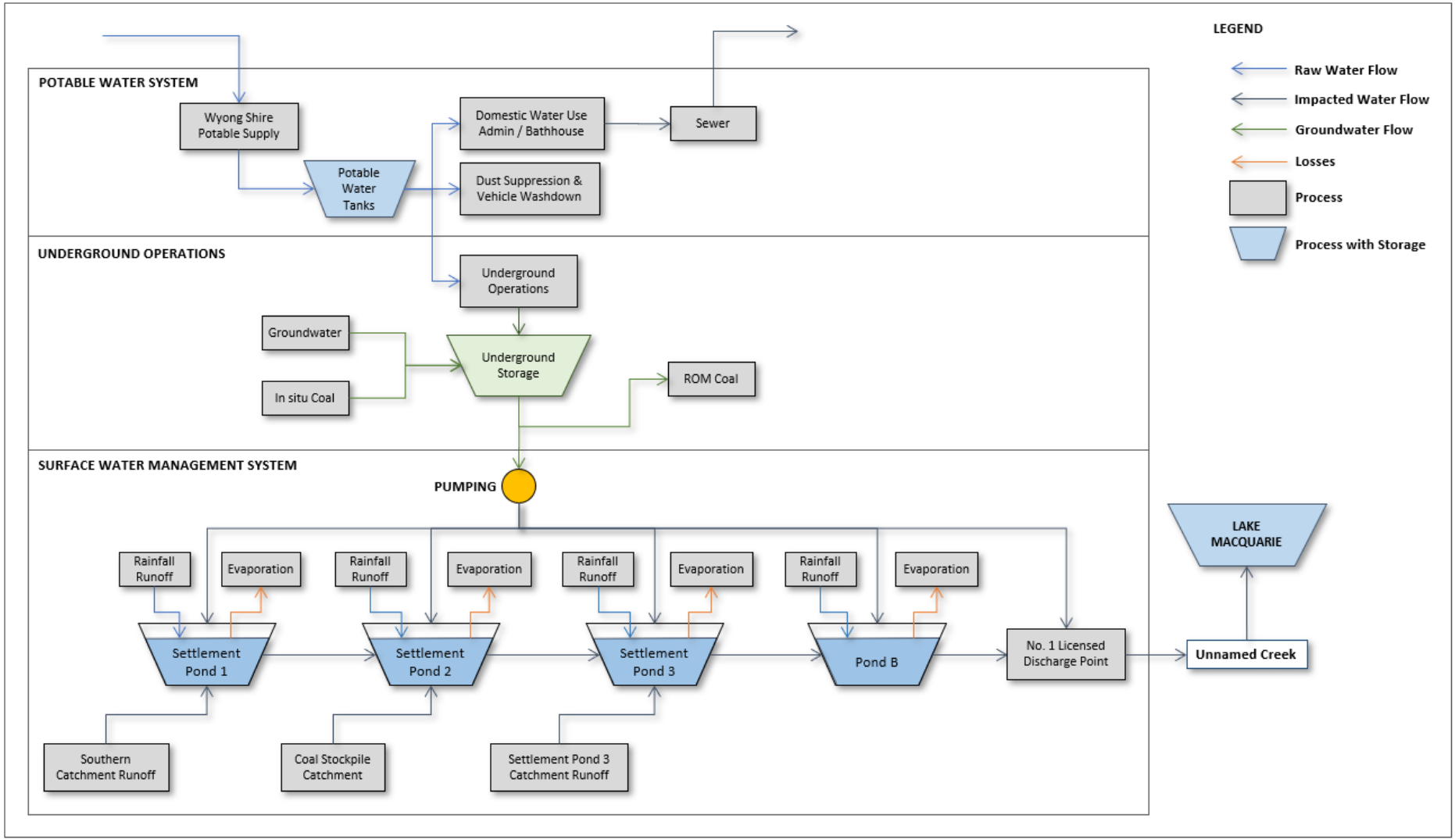


Figure 3: Water Cycle Schematic (adapted from Water Balance Assessment (GHD, 2013b)

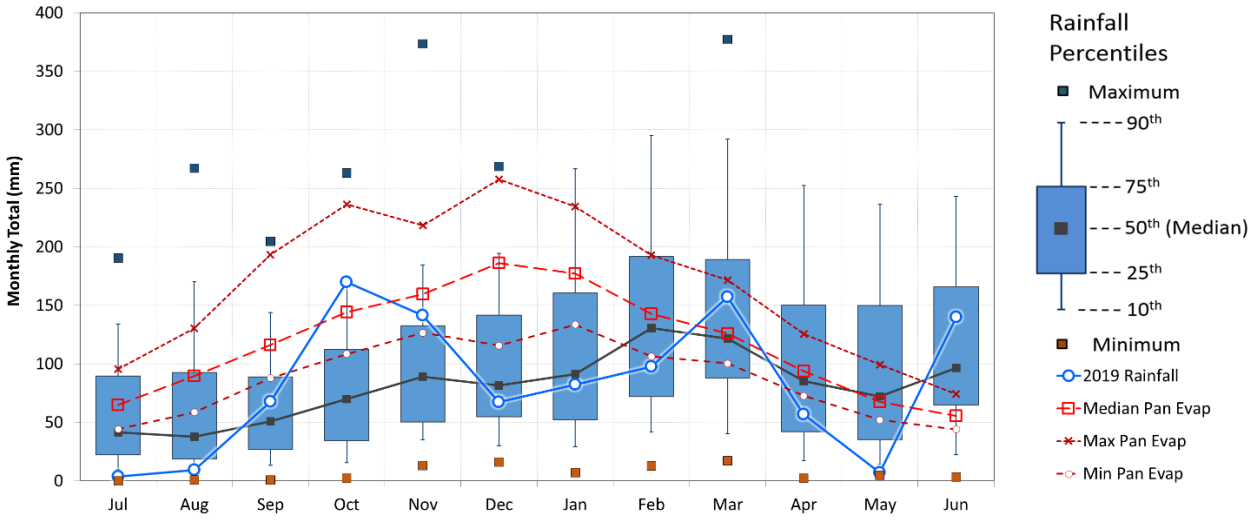


Figure 4: Monthly Rainfall and Class-A Evaporation Pan Statistics at Wyee Farms Road climate station (July 1960 to June 2019)

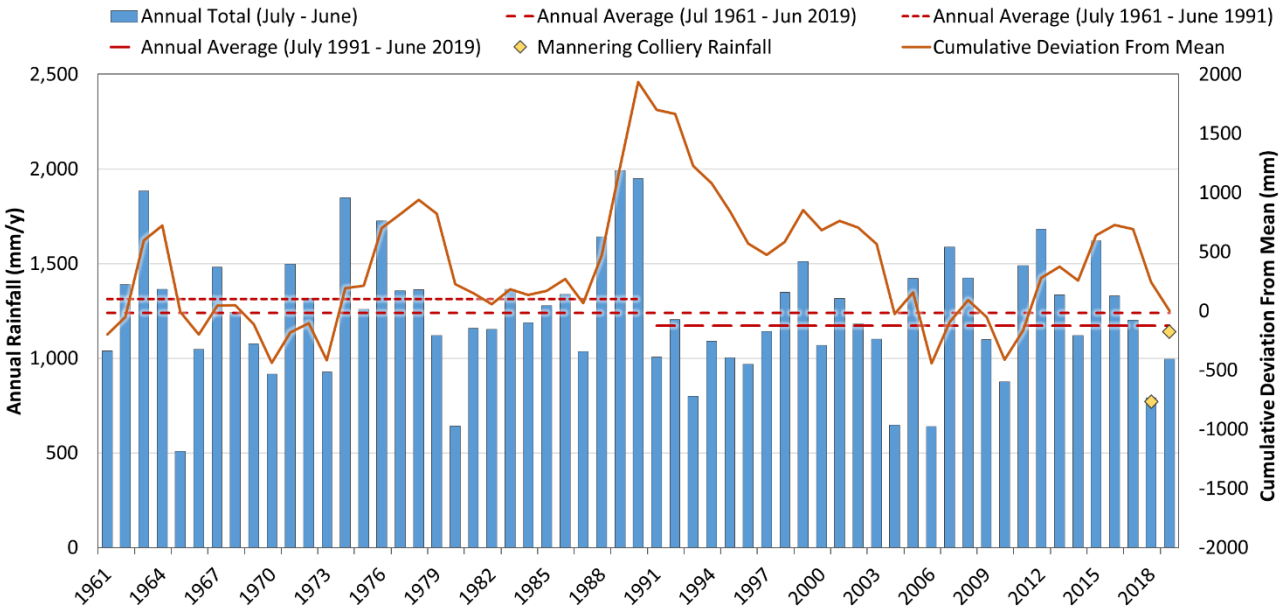


Figure 5: Annual Rainfall Summary for Wyee Farms Road climate station (July 1960 to June 2019)

4.2.3 Mannering Colliery Meteorological Station

The MC's meteorological station provides DC with continuous, site climate measurements including daily total rainfall recorded at 5-minute incremental intervals. Rainfall data for the station are available from 1 January 2017 to 2019.

A summary of monthly rainfall totals for the MC station compared to the BoM Wyee Farms Rd climate station (detailed above) is for the period January 2017 to September 2019 presented in **Figure 6**. Key annual rainfall statistics (for a July to June water year) are summarised in **Table 4**.

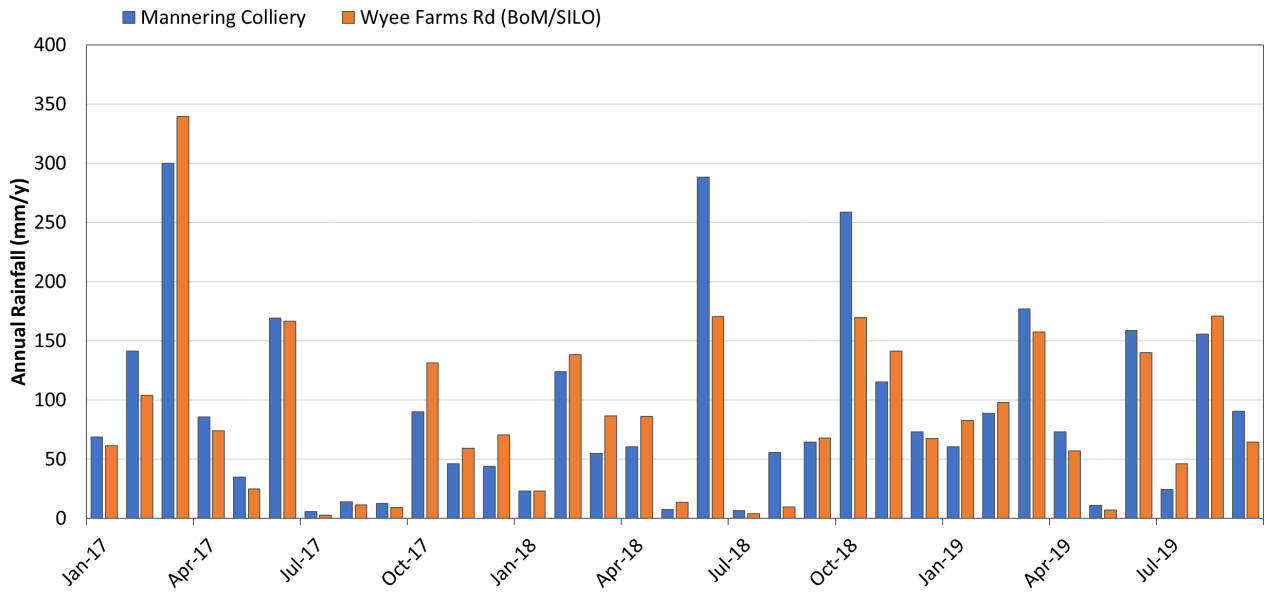


Figure 6: Monthly Rainfall Summary for MC and Wyee Farms Rd climate stations (Jan 2017 to Sep 2019)

Table 4: Rainfall Statistics for Wyee Farms Road climate station (July 1961 to June 2019)

Statistic	2017-18	2018-19
Total Annual Rainfall (mm)	770	1,142
Max Monthly Rainfall (mm)	288.2 (June 2018)	258.4 (Oct 2018)
Max Daily Rainfall (mm)	61.8 (10 June 2018)	77.6 (28 Nov 2018)

It is noted that in 2019-20 a maximum daily rainfall event of 100.4 mm was recorded on 30 August 2019.

4.2.4 Evaporation

Estimates of Class A Pan evaporation rates for the MC site have been extracted from the SILO database (DES, 2019). Monthly statistics for the period July 1960 to June 2019 (based on a July-June rainfall year) are presented in **Table 5**. Monthly average, maximum and minimum Class A Pan evaporation estimates are also presented relative to monthly rainfall statistics in **Figure 4**.

Annual average pan evaporation for the 1961 to 2019 period is estimated to be 1,465 mm, which is approximately 225 mm higher than the estimated annual average rainfall for the period (1,240 mm). However, as shown in **Figure 4**, the relative difference between monthly evaporation rates and total rainfall are much lower for the period February to August which is likely to be reflected in higher surface water runoff responses for this period of the year.

The 2013 water balance assessment adopted an evaporation series with an annual average evaporation rate of 1,205 mm, based on data from the Peats Ridge site located approximately 31.4 km to the south-west of MC.

This can be assumed to be consistent with the Class A Pan estimates presented in **Table 5** assuming a pan factor of approximately 0.8 to convert pan evaporation to open water and/or potential evapotranspiration estimates for modelling.

Table 5: Monthly Rainfall Statistics for Wyee Farms Road Climate Station (July 1961 to June 2019)

Statistic	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
Median	65	90	116	144	160	186	177	143	126	94	67	55	1,440
Average	67	92	121	150	163	190	183	146	130	95	70	57	1,465
Maximum	96	130	193	236	218	258	235	193	172	126	99	74	1,767
Minimum	44	59	88	108	127	116	133	106	100	73	52	44	1,143

4.2.5 Underground Water Extraction

Underground mining operations at MC results in the interaction with two coal seams, the Great Northern and Fassifern seams. Input into the underground water system consists of:

- natural recharge of the active underground workings (seepage from surrounding strata that originates from Lake Macquarie and rainfall); and
- potable water used as process water generated from mine operations.

The outputs from the underground water system are:

- pumping of water from the active workings to the surface storage dams; and
- discharge direct to LDP1 through a bypass pipeline.

Water in the underground workings is pumped through underground storages that allow the settling of fines and sediment material prior to this underground water being pumped to the surface.

4.2.6 Potable and Wastewater System

Operational water demands for MC are met by external water supply as the high salinity of the groundwater makes it unsuitable for use in the mine water supply system.

The potable and wastewater system are a component of the surface water system at MC. Inputs into the potable and wastewater system consists of potable water provided to the underground workings, administration and bath house facilities area, dust suppression and wash-down areas.

The outputs from the potable and wastewater system are:

- grey water and sewage from buildings directed to the Mannering Park Wastewater Treatment Works (WWTW) through an on-site pump station and private rising main; and
- residual water from the workshop oil-water separator system is extracted and managed by a licensed waste contractor.

As the MC wastewater is managed off-site, the only site management facilities are for the potable water system. Water is received from the Central Coast Council infrastructure which is stored within potable water tanks. These tanks are maintained and provide a source for all onsite demands.

A volume of 92.8 ML of potable water for operations was supplied in 2018.

4.2.7 Additional Data

The water balance for MC includes the surface facilities area infrastructure and underground mining operations.

Sources of water inflow to MC water management system include:

- process wastewater from underground;
- groundwater inflow; and
- catchment and stormwater runoff (influenced by rainfall and evaporative fluxes).

Additional water balance assessment data and assumptions relating to pond volumes and contributing catchment area, adopted from the 2013 water balance assessment, are shown in **Table 6.**

Table 6: Modelling Parameter Data

Parameter	Capacity at Discharge Invert (ML)	Catchment Area (ha)
Settlement Pond 1	1.12 ML	5.16 ha (100% estimate to be impervious)
Settlement Pond 2	1.11 ML	0.80 ha (100% estimate to be impervious)
Settlement Pond 3	0.52 ML	0.3 ha (20% estimated to be impervious)
Pond B	1.63 ML	No natural catchment

An evaporation pan factor, to convert Class A pan evaporation estimates to open water evaporation, of 0.8 was applied to all water storages.

4.3 Water Balance Results

4.3.1 Water Balance Summary

A summary of the MC site water balance for the years 2016, 2017 and 2018 is presented in **Table 7**. The estimated site water balance includes measured water flows from respective Annual Reviews (Lake Coal, 2017, 2018, 2019), assumed water use and flows taken from the 2013 Water Balance Assessment (GHD, 2013b) and includes key calculated water balance flows relating to groundwater inflow contributions and surface runoff contributions to the site water balance.

Groundwater inflow volumes are calculated from the total volume of water pumped from underground less volume of process water sent underground (i.e. total potable supply less discharge to sewer and other operational water use).

Table 7: Water Balance Summary (2016 to 2019)

Water Balance	Item	2016	2017	2018	Notes
Inflow	Potable water supply (ML)	39.0	70.0	92.8	From annual reviews
	Groundwater extraction (ML) [1]	276.8	276.8	311.0	From annual reviews
Outflow	LDP1 discharge (ML)	310.4	355.8	330.6	From annual reviews
	Dust suppression & washdown (ML)	1.9	1.9	1.9	From 2013 water balance
	To sewer (ML)	3.1	3.1	3.1	From 2013 water balance
Balance calculations	Total discharge off site (ML) [2]	313.5	358.9	333.7	Calculated – Total flows out of the site (LDP1 and To Sewer)
	Groundwater contribution (ML) [3]	242.8	211.8	223.2	Calculated - groundwater extraction contribution to LDP1 discharge
	Surface runoff & other contribution (ML) [4]	36.7	82.1	22.7	Calculated – estimate of non-groundwater extraction contribution to LDP1 discharge

[1] in accordance with 20BL172016 (2016 & 2017), WAL40461/Ref 20AL217059 (2018)
[2] LDP1 Discharge (ML) + To Sewer (ML)
[3] Groundwater Extraction (ML) - [Potable Water Supply (ML) - Dust Suppression & Washdown (ML) - To Sewer (ML)]
[4] Total Discharge Off Site (ML) - Groundwater Extraction (ML)

4.3.2 Discharge from Mannering Colliery

A limit on the LDP1 discharge rate, as defined by EPL 191, is set at 4.0 ML/day. A summary of the estimated average annual, weekly and daily discharge rates at LDP1 from the 2013 Water Balance Assessment (GHD, 2013b) is provided in **Table 8**.

Table 8: Modelled Estimates of LDP1 Average Discharge

Discharge Location	Average Annual Discharge (ML/yr)	Average Weekly Discharge (ML/week)	Average Daily Discharge* (ML/d)
LDP1	375.3 ML/yr	7.2 ML/week	1.03 ML/day – (365 days) 1.44 ML/day – (261 days*)

*261 days is on average the number of weekdays in one year, hence demonstrating an average of workdays only.

A summary of measured LDP1 discharge rates are presented in **Table 9** below. The measured maximum daily discharge volume of 4.2 ML in 2016 (6 January 2016) exceeded the licenced daily limit for LDP1 of 4.0 ML. However, the discharge event occurred as a result of significant rainfall event (212.8 mm) over the period 3rd to 6th January 2016.

As stipulated in Condition L3.2 of EPL 191, exceedances of the volume limit for LDP1 are permitted only if discharge occurs solely as a result of rainfall at the premises exceeding 10 mm during the 24 hours immediately prior to the commencement of discharge. Therefore, no action was taken in response to the discharge event.

Table 9: Summary of Measured LDP1 Discharge

Year	Average Annual Discharge (ML/yr)	Average Daily Discharge (ML/d)	Maximum Daily Discharge (ML/d)
2016	310.4	0.85	4.2
2017	355.8	0.99	2.6
2018	330.6	0.91	2.5

Measured annual and daily averaged discharge from LDP1 for the three years presented in **Table 9** are lower than the discharge estimates calculated from the water balance modelling assessment (GHD, 2013b).

This may be a function of a variety of factors influencing the site water balance including:

- changes in mine operation and/or coal production and processing rates;
- lower rainfall over the 2016, 2017 and 2018 years compared to historic averages (see **Figure 5**);
- lower actual groundwater contributions compared to assumed modelling assessment rates; and
- lower rainfall-runoff rates from catchment areas compared to modelled estimates.

5 Erosion and Sediment Control Plan / Ground Disturbance

5.1 Background

Erosion and sediment control is predominately managed through the implementation of the primary controls described above within the surface water management systems (**Section 3**) and as shown in **Figure 2,** which include integrated settlement ponds, sumps/silt traps and gross pollutant traps (GPT's).

In addition to these controls, temporary erosion and sediment controls (ESC's) are implemented for any construction disturbance that is not contained with the surface water management system. The primary objective is to ensure that appropriate procedures and programs of work are in place to meet the requirements of Managing Urban Stormwater: Soils and Construction (the Blue Book), Volume 1 and Volume 2E – Mines and Quarries (Landcom, 2004 and Department of Environment and Climate Change (DECC), 2008).

5.2 Potential Impacts

Erosion impacts are generally expected to be minimal given that the disturbance to ground surfaces would be restricted to limited construction activities associated with the mines pit top. Construction activities would typically be in areas of relatively flat land at the pit top area with mitigation measures to be put in place to control mobilisation of disturbed soils at the time of the construction activity.

The potential for soil exposure and movement would occur during any construction activities. Exposed soil may be mobilised, leading to erosion, fugitive dust emissions and potential sedimentation of Lake Macquarie. The following sections provide control measures to prevent adverse impacts on surrounding catchment areas and receiving waters.

5.3 Standard Erosion and Sediment Controls

Erosion and sediment controls are to be implemented across the MC for all phases of the operation including construction, operational and maintenance activities to mitigate the impacts of the operations on watercourses and the surrounding environment. Where activities are contained with the pit top surface water management system, erosion and sediment control will be achieved through the controls described as part of the surface water management systems.

Where soil disturbance activities are outside of these controls, standard erosion and sediment control techniques and management principles are used in accordance with the requirements of Managing Urban Stormwater: Soils and Construction Vol. 1 and Vol. 2E - Mines and Quarries (Landcom, 2004 and DECC, 2008).

For activities at MC, a Permit to Clear or Disturb Land form should be completed prior to disturbance. This includes requirements to have water management and erosion controls in place prior to disturbance.

5.4 Construction Erosion Management Plan

Where soil disturbance activities are outside of the surface water management system, erosion and sedimentation shall be effectively controlled through the development of a Construction Erosion Management Plan (CEMP) prior to undertaking large scale disturbances (i.e. greater than 2500 m^2). The CEMP shall be consistent with the Blue Book and would include the following key principles:

- conducting best practice land clearing procedures for all proposed disturbance areas including:
  - coordinating construction activities to minimise exposure of disturbed soils to the elements; and
  - topsoil stripping procedures to reduce deterioration in topsoil quality and dust generation.
- appropriate storage of topsoil stockpiles in areas away from roadways and other drainage lines;
- appropriate design of access tracks;
- use of diversion structures to separate 'clean' water runoff from disturbed areas runoff, to minimise volumes of sediment-laden and mine water for management;

- ensuring sediment-laden runoff is treated via designated sediment control devices;
- revegetation, reshaping and topsoiling of disturbed areas as soon as possible following the completion of construction activities;
- temporary erosion and sediment controls to be in place prior to any construction activity outside of an existing dirty water management system; and
- implementing an effective maintenance program for the site.

The above principles are addressed in further detail in **Appendix 4**.

5.5 Oil and Water Separators

Areas of the pit top such as the workshop and wash-down area have their runoff directed to one of a number of oil and water separators. The oil and water separators are either plate or cyclic devices which use a method of gravity separation to separate water from oil particles. Oil and water separators are identified on **Figure 2**.

The treated water from the oil and water separators is directed to the settlement ponds where it passes through the pond system prior to being discharged through to LDP1. Waste oil is collected by a licensed waste contractor.

6 Monitoring

To ensure the continued functionality of the surface water management system and to assist MC in identifying any potential issues, an on-going water monitoring program is implemented for the mine.

6.1 Impact Assessment Criteria and Trigger Levels

6.1.1 Surface Waters

Water quality is monitored at LDP1 in compliance with EPL 191. Water quality monitoring is undertaken by an independent contractor and are sampled in accordance with Australian Standards AS5667.1 "Guidance on the Design of Sample Programs, Sampling Techniques and the Preservation and Handling of Samples" and AS5667.6 "Water Quality Sampling—Guidance on sampling of rivers and streams". Field measurements are undertaken using water quality monitoring equipment, calibrated daily, and field observations are made at the time of sampling and recorded on the field monitoring sheet. All laboratory analysis is conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Quality monitoring for pH, conductivity and total suspended solids (TSS) and oil and grease, is undertaken on a weekly basis with maximum concentration limits for pH, TSS and oil and grease presented in **Table 10**. The full water quality monitoring requirements as per Condition M2.3 of EPL 191 are presented in **Appendix 3** and water quality exceedances in Monthly and Annual Review reports published on the Delta Coal website (www.deltacoal.com.au). Surface water quality monitoring summary plots for LDP1 for the period from January 2015 are also presented in **Appendix 3**.

Table 10: Concentration Limits for LDP1 (EPL 191)

Pollutant	Unit of Measure	100th percentile Concentration Limit	Sampling Method
pH	pH	6.5 (lower) - 8.5 (upper)	Grab sample
Total Suspended Solids	milligrams per litre (mg/L)	50	Grab sample
Oil and Grease	milligrams per litre (mg/L)	10	Grab sample

The volume of underground water discharge from underground workings is measured by an inline flow meter at the Pump Shed. The volume discharged through LDP1 is measured by an in-line flow meter on the discharge point. The data is recorded which enables determination of compliance with the volumetric limit condition within EPL 191 as defined in **Table 11**. Surface water discharge through LDP1 from January 2014 to December 2021 is presented in **Appendix 3**.

Table 11: Volume and Mass Limit LDP1 (Point 1) (EPL 191)

Point	Unit of Measure	Volume/Mass Limit
1 (LDP1)	Kilolitres per day	4,000

6.1.2 Groundwater

Australasian Groundwater and Environmental Consultants Pty Ltd (AGE Consultants 2006) concluded within the groundwater assessment that there is little risk that the alluvial aquifers and shallow regolith/bedrock aquifers will be adversely impacted by the Project. These shallow aquifers are the prime aquifers used in the area for stock and domestic supplies, (although there are relatively few users), and on which aquatic ecosystems may be dependent.

The deep coal seam aquifers have been extensively impacted by the current and past mining operations in the area resulting in a large cone of depression in the piezometric surface around the mines. The Project may result in further depressurization of the Fassifern Seam to the north-west however this is assessed to be a relatively small cumulative impact on that which has already occurred.

The coal seam aquifers contain poor quality water which it is assessed as no environmental value.

This assessment, is based on:

- the description of the hydrogeological regime of the MC mine and surrounding areas;
- the depth of the proposed area of mining in the Fassifern Seam;
- the bord and pillar method of mining; and
- the extensive impact on the groundwater regime that has occurred from existing and past mining operations at MC and from surrounding collieries.

Groundwater inflow volumes are calculated from the total volume of water pumped from underground less volume of process water sent underground resulting in an estimation in groundwater make to the mine. Ongoing monitoring of the underground discharge volumes will give an immediate indication of any change in groundwater make.

Volumetric monitoring of mine dewatering is undertaken by an inline flow meter at the pump shed. The flow meter is connected to the site SCADA system which records the data. The SCADA system summarises the data as a daily total. On average the daily rate of mine dewatering was predicted to be approximately 0.9 ML/day, as identified in the 2013 Water Balance Assessment, with the FY2020-2021 monitoring period recording an average of approximately 0.67 ML/day, slightly below the modelled prediction.

6.2 Surface Water Monitoring and Frequency

MC undertakes surface water monitoring as required by EPL 191 and outlined in **Section 6.1** and shown in detail in **Table 12**. To enable the ongoing assessment of water quality from MC, the existing monitoring requirements will be maintained for the life of the mine and will also include monitoring at a downstream point. Changes to the monitoring regime may however occur to align with any future changes in EPL 191.

The monitoring frequency program is outlined in **Table 12** and surface water monitoring locations (LDP1 and Downstream) are shown in **Figure 7**. Water quality monitoring results for pH, total suspended solids (TSS) and oil and grease along with associated limits at LDP1 and downstream monitoring point are shown in **Appendix 3**.

Table 12: Surface Water Quality Monitoring Program

Location	Frequency	Monitored Parameters
LDP1	Weekly	pH, TSS, oil and grease, conductivity
	Monthly	Aluminium (dissolved), Aluminium (total), Antimony, Arsenic (dissolved), Arsenic (total), Barium, Beryllium, (dissolved), Beryllium (total), Boron, Cadmium (dissolved), Cadmium (total), Calcium, Chromium (dissolved), Chromium (total), Cobalt (dissolved), Cobalt (total), Conductivity, Copper (dissolved), Copper (total), Iron, Lead (dissolved), Lead (total), Lithium, Magnesium, Manganese (dissolved), Manganese (total), Mercury (dissolved), Mercury (total), Molybdenum (dissolved), Molybdenum (total), Nickel (dissolved), Nickel (total), Nitrogen (ammonia), Oil and Grease, pH, Phosphorus, Potassium, Selenium (dissolved), Selenium (total), Silica, Silver (dissolved), Silver (total), Sulfur, Tin, Titanium, Total suspended solids, Vanadium (dissolved), Vanadium (total), Zinc (dissolved), Zinc (total)
Downstream	Monthly	Aluminium (dissolved), Aluminium (total), Antimony, Arsenic (dissolved), Arsenic (total), Barium, Beryllium, (dissolved), Beryllium (total), Boron, Cadmium (dissolved), Cadmium (total), Calcium, Chromium (dissolved), Chromium (total), Cobalt (dissolved), Cobalt (total), Conductivity, Copper (dissolved), Copper (total), Iron, Lead (dissolved), Lead (total), Lithium, Magnesium, Manganese (dissolved), Manganese (total), Mercury (dissolved), Mercury (total), Molybdenum (dissolved), Molybdenum (total), Nickel (dissolved), Nickel (total), Nitrogen (ammonia), Oil and Grease, pH, Phosphorus, Potassium, Selenium (dissolved), Selenium (total), Silica, Silver (dissolved), Silver (total), Sulfur, Tin, Titanium, Total suspended solids, Vanadium (dissolved), Vanadium (total), Zinc (dissolved), Zinc (total)

All monitoring of waters will be undertaken in accordance with Approved Methods for Sampling and Analysis of Water Pollutants in NSW (EPA, March 2004). Pollutant concentration measurements shall be determined in the units specified by EPL 191.

Figure 7: Surface Water Monitoring Locations

6.3 Groundwater Monitoring and Frequency

Delta Coal will implement a groundwater monitoring program commensurate with the level of predicted impact on groundwater quality and yield, groundwater quality impact assessment trigger levels will be defined following 2 years of baseline data being obtained.

The groundwater monitoring program will involve the monitoring as identified in **Table 13**.

Table 13: Groundwater Monitoring Program

Location	Frequency	Monitored Parameters
Seam to Surface flow meter	Daily	Volumetric flow (daily total water extracted from underground workings)
Outlet of groundwater pipeline	Quarterly	Aluminium (dissolved), Aluminium (total), Antimony, Arsenic (dissolved), Arsenic (total), Barium, Beryllium, (dissolved), Beryllium (total), Boron, Cadmium (dissolved), Cadmium (total), Calcium, Chromium (dissolved), Chromium (total), Cobalt (dissolved), Cobalt (total), Conductivity, Copper (dissolved), Copper (total), Iron, Lead (dissolved), Lead (total), Lithium, Magnesium, Manganese (dissolved), Manganese (total), Mercury (dissolved), Mercury (total), Molybdenum (dissolved), Molybdenum (total), Nickel (dissolved), Nickel (total), Nitrogen (ammonia), Oil and Grease, pH, Phosphorus, Potassium, Selenium (dissolved), Selenium (total), Silica, Silver (dissolved), Silver (total), Sulfur, Tin, Titanium, Total suspended solids, Vanadium (dissolved), Vanadium (total), Zinc (dissolved), Zinc (total)

In addition to the above, the main underground dam water levels will be monitored by a deputy on a weekly basis during operation to identify changes in the level of water underground and to verify that the rate of extraction is sufficient.

The groundwater volume/yield trigger levels are defined in **Table 14**, the trigger values have been derived based on the groundwater modelling predictions within the Environmental Assessment.

Table 14: Groundwater Trigger Levels and Actions

Monitoring/Review Event	Trigger	Action
Review daily groundwater extraction rates on a monthly basis	Daily groundwater extraction exceeds 2.0 ML/day	Complete an internal investigation to determine the reason(s) for increased daily groundwater extraction.
Review monthly groundwater extraction rate average	Monthly average exceeds 1.8 ML/day	Complete an internal investigation to determine the reason(s) for increased daily groundwater extraction. Review prior 12 months groundwater extraction data to determine trend in groundwater extraction.
Review annual average groundwater extraction (annually as part of each Annual Review)	Annual average exceeds 1.7 ML/day but remains less than 1.8 ML/day	Review and update site water balance.
	Annual average exceeds 1.8 ML/day	Complete an internal investigation to determine the reason(s) for increased groundwater extraction (above EA predictions). Complete incident report process, and determine required actions

Results of the groundwater monitoring program and whether any groundwater trigger levels have been reached will be reported in the Annual Review.

6.3.1 Groundwater Monitoring Summary

Measured groundwater extractions, as reported in the Annual Reviews for 2017, 2018, 2019, 2020 and 2021 are presented in **Table 15**, including a summary of the percentage of annual licenced limit of 450 ML (in accordance with WAL40461/Ref 20AL217059).

Table 15: Summary of Measured Groundwater Discharge

Year	Total Annual Groundwater Extraction (ML)	Average Daily Extraction (ML/d)	% of Licenced Limit (450 ML)
2017	276.81	0.758	61.5%
2018	311.0	0.852	69.1%
2019	272.86	0.748	60.64%
2020	271.15	0.743	60.26%
2021	246.27	0.722	54.73%

6.4 Additional Operational Monitoring

In addition to the other monitoring described above, MC is also committed to monitoring water usage onsite. Water usage is currently monitored through the following:

- metering on the potable supply to site;
- metering of potable water supply going underground;
- monitoring of the volume of water pumped from the Fassifern Seam to the surface; and
- monitoring of the effluent volumes transferred offsite to the Council Wastewater Treatment Plant.

6.5 Inspections and Maintenance

All water management structures will be inspected regularly. **Table 16** contains the inspection schedule used to ensure the water management structures are functioning effectively throughout MC. The inspections will also determine the scheduling of maintenance required for the structures.

Table 16: ESC Inspection Schedule

Item	Frequency
All on-site water management structures (Monthly Environmental Inspection Form)	Monthly
Works In Progress (including temporary ESC structures)	Weekly
Visual inspection for stability of the unnamed creek (Creek Stability Inspection Form)	3 Monthly

In addition to these inspections, regular water quality monitoring is undertaken as described in previous sections. The results of this monitoring with regards to total suspended solids (TSS) will assist in assessing the effectiveness of the water management system, along with highlighting any possible areas that need to have additional controls added or improve the function of existing controls.

All water management structures are maintained in a functioning condition. Where controls are observed to be not functioning correctly, the controls are restored to meet the required standard. The maintenance and monitoring of specific features of the site are described in the sections below.

6.5.1 Settlement Ponds

The network of connecting pipes and manual valves previously noted, along with a mobile diesel pump, allows for each of the settlement ponds to be dewatered manually following rainfall and be maintained at low water levels to ensure maximum storage volumes are available when rainfall events occur.

Visual inspections of the settlement ponds are undertaken to determine the clarity of the water and if any maintenance is required. The inspections also enable correct scheduling of de-silting works and prompt repairs and/or replacement of damaged works, along with identifying if water levels can be lowered. When required, the silt from dams is removed and stored so that it is not able to be washed back into the dam. Documented inspections of the above are part of the Monthly Environmental Inspection which is scheduled via a work order (part of the MC maintenance management system).

All water management structures will be maintained in a functioning condition. Where controls are observed to be not functioning correctly, the controls will be restored to meet the required standard. De-silting of dams is scheduled to occur annually. However, the schedule may be amended based on the above inspections and identified requirements.

Documented monthly inspections of the above are recorded as part of the environmental inspection which is scheduled via a work order as part of the sites maintenance management system. De-silting works will be scheduled based on the above inspections and identified requirements.

6.5.2 Flocculent System

In addition to the above, a flocculent system is also used at MC, which consists of solid flocculent blocks, situated at four locations leading into, or within, the sediment pond system. The flocculent blocks are situated at the following four locations:

- pipeline entry of hardstand area catchment into Pond 1;
- concrete drainage channel from the coal stockpile catchment into Pond 2;
- outlet of the subsurface drainage system leading into Pond 1; and
- at the outlet of the concrete pipe transferring water into the final dam (Pond B).

The intent of the flocculent system is to enable sediment laden water flows during rainfall events to dose the surface water running into the sediment ponds by dispersing small amounts of flocculent as the runoff flow passes across the solid (hydrophilic) flocculent blocks into the sediment dams immediately downstream.

The system therefore only operates when sufficient rainfall has fallen to generate surface runoff, and continues to function while ever surface runoff into the sediment dam system continues. As a result, the system is largely automated. When it rains it works, and simply requires the inspection and replacement of flocculent blocks as they are consumed. A diluted chemical flocculent and water mix can also be broadcast over the dams when full to reduce the total suspended solids in the dirty water system. The underground mine water, due to its salt levels, acts as a flocculent and also aids in the reduction of total suspended solids within the surface water dams.

6.5.3 Drainage Channels

For clean water diversions, any signs of erosion along the length of the drains should be noted and remedial works undertaken as required. Where significant erosion is observed, additional erosion controls are constructed e.g. establishment of vegetation cover, use of temporary sediment devices until the vegetation is established, scour protection (rock-armouring or erosion blanket) of the channel surface.

Where dirty water drainage channels contain in-line sumps, these will be cleaned on a regular basis depending on the accumulation of material within the sumps.

6.5.4 Temporary ESC Structures

Regular visual checks will be made of any temporary sediment controls such as sediment filter fences; sandbag weirs etc. to ensure that they are functioning adequately and repaired where required.

6.5.5 Roads and Car Park Areas

As most of the roads and car park areas at MC are sealed, there is very little maintenance required for these surfaces. If required, a water cart will be used to ensure dust is kept to a minimum. A street sweeper is used on a monthly basis to sweep the sealed entry roads and carpark.

6.5.6 Oil Water Separators

The separators have specific work orders that form part of MC maintenance system to ensure the system is serviced and maintained. All accumulated waste oils and solid material shall be disposed of periodically or as required by a licensed operator.

6.5.7 Drive-in Sumps

Drive-in sumps are present around the pit top with many surrounding the coal stockpile area and crushing plant (refer to **Figure 2**). The drive-in sumps are designed to capture coarse sediment particles and a limited percentage of smaller sediment particles in the event of site runoff. The drive-in sumps either overflow or are manually pumped out to one of the nearest settlement pond.

Drive-in sumps are maintained on a quarterly (or as required) basis using pumps to dewater the sumps and frontend loaders or excavators to remove captured and accumulated material. Material is stockpiled and appropriately managed on site.

6.5.8 Underground Flow Monitoring Devices

Water flow monitoring appliances have been installed in the mine to measure pumped water volumes to and from the mine workings. These appliances shall be maintained in good working order.

6.5.9 Creek Stability Inspection

The inspection schedule includes monitoring of the channel stability and potential erosion and scour impact to the unnamed creek downstream of LDP1. The monitoring inspections will involve undertaking a visual assessment and photographs of the creek on a 6-monthly basis by a suitably qualified person to identify any potential instabilities that may form as a result of operations. The results of the visual inspection of watercourse stability are recorded on a pro-forma field inspection sheet.

The TARP provided in **Table 17**, should be referenced to determine the appropriate actions in response to any instabilities identified as a part of the monitoring program.

Table 17: Creek Stability Monitoring Trigger Action Response Plan (TARP)

Trigger Level	Trigger Conditions	Action Required	Notifications & Reporting	Notes
Normal Conditions	Watercourse monitoring indicates no areas of instabilities from visual inspections.	Continue site inspections in accordance with the program in Section 7.	Results to be reporting in Annual Reviews.	
Stage 1 Trigger	Watercourse monitoring indicates one or more areas of instabilities in watercourses.	Seek to stabilise the localised instabilities, which may include geomorphology specialist advice/guidance. Investigate cause for instabilities, and whether site water management has contributed to the creek instability.	Notification to Delta Coal Environmental Compliance and Approvals Coordinator. Results to be reporting in Annual Reviews.	For consecutive Stage 1 triggers, escalate to Stage 2.
Stage 2 Trigger	Watercourse monitoring indicates one or more areas of instabilities in watercourses. Causing sediment material and loads to migrate and or impact downstream environments.	Seek to stabilise the local (or extensive) area of instability, which may include geomorphology specialist advice/guidance. Investigate cause for instabilities, and whether site water management has	Notification to Delta Coal Environmental Compliance and Approvals Coordinator. Results to be reporting in Annual Reviews.	

		contributed to the creek instability.		

7 Reporting

7.1 Regular Reporting

Recording of monitoring data will be undertaken in accordance with the requirements outlined within EPL 191. MC will collate and maintain an up-to-date record of surface water quality monitoring data for all sampling at the mine in either a hard copy or electronic format, or a combination of both. Monitoring results will be interpreted as they are received in order to ensure appropriate operational guidance on maintaining water quality within the desired parameters.

A summary of results, including daily volumetric discharge and water quality results, will be prepared monthly and made publicly available on the DC website in accordance with the requirements of *Protection of the Environment Operations Act 1997*.

The results will also be compared to relevant site operations and meteorological conditions to further interpret the results. This comparison between samples, between sampling periods and against other factors will assist in identifying whether the activities on the site are in fact affecting the water quality of the local catchment.

The results will also be made communicated to the Community Consultative Committee members on a regular basis as part of the Environmental Monitoring and Reporting process, as well as to the local Councils and other relevant authorities.

7.2 Annual Review

The results will be presented in the Annual Review and include a summary of monitoring and inspection results during the past year; a comparison against the impact assessment criteria; a summary of previous years' monitoring results; a comparison of the impacts with those predicted in the Environmental Impact Statement and present an analysis of the potential cause(s) of any significant discrepancies.

The Annual Review will also identify any trends in water quality impacts and identify any non-compliance over the year as well as describing any actions currently implemented or planned to ensure compliance with the impact assessment criteria.

The Annual Review will be forwarded to the relevant authorities including the DPIE, the EPA, members of the Community Consultative Committee and local Councils (Wyong and Lake Macquarie) and will also be placed on the DC website along with a summary of environmental monitoring results.

The EPA will also be provided with an annual return including monitoring details as required by EPL 191.

7.3 Incident or Non-Compliance Reporting

If monitoring reveals as a direct result of MC operation, levels have exceeded the relevant criteria**,** DC will conduct an investigation into the source of the non-compliance. As detailed in Condition 6, Schedule 5 of the PA, relevant agencies will be notified by phone or email at the earliest opportunity of an incident that causes or threatens to cause material harm to the environment. For all other incidents, relevant agencies will be notified by phone or email as soon as practicable.

The investigation into the incident will consider any activities, plant operations or other factors that may have caused or contributed substantially to the non-compliance. The written report will be provided to any affected landowner and/or existing tenants, including tenants of mine owned properties, to the DPIE, EPA and any other relevant stakeholders within 7 days of the date of the incident or being made aware of the incident (such as receiving monitoring data).

The report will:

- describe the date, time and nature of the observation;
- identify the cause (or likely cause) of the damage;
- describe what action has been taken to date; and
- describe the proposed measures to address the impacts and prevent further such occurrences.

DC will implement the recommendations of the investigation in order to address any potential future incidents. Additional details of the incident reporting process are provided in the Environmental Management Strategy (EMS).

Any incidents or complaints will be recorded and fully investigated to find root causes and corrective actions implemented where necessary. Additionally, the following measures will be undertaken:

- a review of management practices to systematically identify and implement options to modify site practices so as to ensure effective control of activities and achieve the water quality goals stated in this plan; and
- additional water quality monitoring may be conducted at a complainant's request at an appropriate frequency.

8 Stakeholder Management, Response and Training

8.1 Complaint Protocol

DC has a 24-hour telephone hotline (1800 687 260) through which members of the public can lodge complaints, concerns, or to raise issues associated with the operation. This service aims to promptly and effectively address community concerns and environmental matters. All complaints are recorded and responded to. The information recorded in the complaint register includes:

- date and time the complaint was lodged;
- personal details provided by the complainant;
- method by which the complaint was made;
- nature of the complaint;
- action taken or, if no action was taken, the reason why; and
- follow-up contact with the complainant.

8.2 Independent Review

As detailed in Schedule 4, Condition 1 of the PA, an Independent Review can be requested by a landowner who "considers the project to be exceeding the impact assessment criteria in schedule 3".

If determined to be warranted by the Secretary, an Independent Review will be undertaken in accordance with the process identified in Conditions 2 to 4 of Schedule 4 of the PA. If the landowner is not satisfied with the outcomes of the Independent Review, then the matter can be referred to the Secretary for resolution. Appendix 5 of the PA contains a flowchart of an indicative Independent Dispute Resolution Process that can be followed.

8.3 Dispute Resolution

If the response of DC is not considered to satisfactorily address the concerns, a meeting may be convened with the complainant, Mine Manager together with the Environmental Compliance and Approvals Coordinator to determine any further options to reduce potential impacts. Any actions agreed from the meeting will be implemented by DC. After implementation of the proposed actions the complainant will be contacted and advice sought as to the satisfaction or otherwise with the measures taken.

If no agreed outcome is determined or the complainant is still not satisfied by the action taken, then the matter can be referred to the Secretary for resolution. Appendix 5 of the PA contains a flowchart of an indicative Independent Dispute Resolution Process that can be followed.

8.4 Training, Awareness and Competence

Training is an essential component of the implementation phase of this WMP. The Environmental Compliance and Approvals Coordinator will ensure that training and awareness processes are implemented to manage, identify and minimise potential impacts of MC and to ensure personnel are aware of their roles and responsibilities in terms of water quality management and erosion and sediment control.

Generally training at MC consists of induction training for new starters and contractors along with environmental awareness training at and ongoing "toolbox" training for all permanent employees as required. Site inductions also specifically identify that no unauthorised clearing is to occur.

As the document owner, the Environmental Compliance and Approvals Coordinator is the contact point for any person that does not understand this document or their specific requirements and will provide guidance and training to any person that requires additional training regarding this management plan.

9 Audit and Review

9.1 Review and Improvement

In accordance with Schedule 5, Condition 4 of the PA, this WMP shall be reviewed, and if necessary revised, within 3 months of the following:

- the submission of an Annual Review;
- the submission of an incident report;
- the submission of an independent environmental audit; and
- following any modification to the project approval.

9.2 Audits

Internal and external audits of this document will be carried out as described below. Internal and external audits shall be objective and if possible be conducted by a person or organisation independent of the document being audited.

Audits shall be carried out by personnel who have the necessary qualifications and experience to make an objective assessment of the issues. The extent of the audit, although pre-determined, may be extended if a potentially serious deviation from this document is detected.

Any audit non-conformances and/or improvement opportunities will have corrective and preventative actions implemented to avoid recurrence, these actions will be loaded into the site Incident Database to ensure the actions are assigned to the relevant people and completed.
External audits will be conducted utilising external specialists and will consider this document and related documents. External auditors shall be determined based on skills and experience and upon what is to be accomplished.

An Independent Environmental Audit (IEA) was undertaken in 2022. In accordance with PA (MP06_0311) Schedule 5, Condition 8, IEA's will be scheduled for every three years thereafter (unless the Secretary directs otherwise) by an audit team whose appointment has been endorsed by the Secretary.

10 Records and Document Control

10.1 Records

Generally, the Environmental Compliance and Approvals Coordinator will maintain all Environmental Management System records which are not of a confidential nature. Records that will be maintained include:

- monitoring data and equipment calibration;
- environmental inspections and auditing results;
- environmental incident reports;
- the complaints register; and
- licences and permits.

All records will be stored so that they are legible, readily retrievable and protected against damage, deterioration and loss. Records will be maintained for a minimum of 4 years or as otherwise required under any legislation, licence, lease, permit or approval.

10.2 Document Control

This document and all others associated with the Environmental Management System shall be maintained in a document control system which is in compliance with the site Document Control Standard which is available to all site personnel. Any proposed change to this document will be via the Environmental Compliance and Approvals Coordinator. Details on document revisions are provided in **Table 18**.

Table 18: Document Revision Details

Version	Date	Details of Revision	Company	Reviewed by/ Authorised by
0	26/02/09	Draft WMP	Centennial Coal	P. Williams
1	13/03/09	Final WMP	Centennial Coal	P. Williams
2	09/03/10	Revision 2	Centennial Coal	P. Williams
3	27/06/11	Revision 3	Centennial Coal	M. Gleeson P. Williams
4	06/01/12	Revision 4	Centennial Coal	M. Gleeson P. Williams
5	10/05/16	Updated to LakeCoal format	LakeCoal	C. Ellis W. Covey
6	03/02/2020	Updated to Delta Coal format and reviewed.	Delta Coal	K.Weekes S. Boxhall C. Armit
7	24/11/2022	Revision of WMP following 2022 IEA	Delta Coal	L. McWha

11 Roles and Responsibilities

All employees and contractors at MC are responsible for environmental management. However, various positions in the organisation have roles, responsibilities and authorities for managing environmental aspects, action plans, programs and controls. Roles and responsibilities specific to completing the requirements of this WMP are identified in **Table 19**.

Table 19: Water Management Roles and Responsibilities

Roles	Responsibilities
Manager of Mining Engineering	• Ensure that adequate financial and personnel resources are made available for the implementation of the WMP. • Overall responsibility for environmental compliance with Mining Lease, EPL, Project Approval and other mining approvals as they pertain to water management. • Support the implementation of the WMP through coordination site resources and planning processes.
Environmental Compliance and Approvals Coordinator	• Planning for adequate resources to implement this site WMP. • Approving revised versions of this site WMP; • Co-ordination of external audits, corporate reporting and management; • Co-ordinate environmental monitoring, reporting, inspections, environmental training, authority liaison, maintaining complaints register and community liaison; • Allocation of resources within area of responsibility and budget; • The implementation and adherence to this site WMP; • Providing adequate training to employees and contractors regarding their requirements under this site WMP; • Contractor management; and • Delegating tasks associated with this site WMP when responsible personnel are absent.
Employees and contractors	• Comply with the requirements of this WMP.

12 References

Documents used in the preparation of this management plan are detailed in **Table 20**.

Table 20: References

Reference	Title
Australian Standards	AS/NZS ISO 14001:2004 Environmental management systems – Requirements with guidance for use. AS/NZS ISO 14004:2004 Environmental management systems – General guidelines on principles, systems and support techniques.
Legislation and Regulations	Environment Protection Licence (EPL) 191 *Mining Act 1992* Project Approval (PA) 06_0311 (as modified) *Protection of the Environment Operations Act, 1997* *Water Act 1912* *Water Management Act 2000*
Delta Coal documents	EMS 001 Mannering Colliery - Environmental Management Strategy. LakeCoal, 2017. *Mannering Colliery Annual Review 2016*. Doc No. REP 00025, 28 April 2017. LakeCoal, 2018. *Mannering Colliery Annual Review 2017*. Doc No. REP 00040, 30 March 2018. LakeCoal, 2019. *Mannering Colliery Annual Review 2018*. Doc No. REP 00058, 16 May 2019.
External documents	Australasian Groundwater and Environmental Consultants Pty Ltd, 2006, Mannering Colliery Continuation of Mining Environmental Assessment: Groundwater. Boughton, W.J. 2004. The Australian water balance model, Environmental Modelling & Software, vol. 19, pp. 943-956. DECCW, March 2004. Approved Methods for Sampling and Analysis of Water Pollutants in NSW. DES, 2019. SILO database of Australian climate. Electronic dataset downloaded 3 July 2019, https://www.longpaddock.qld.gov.au/silo/. Queensland Department of Environment and Science (DES). EMM Consulting June 2015, Mannering Colliery Modification 3 Environmental Assessment, prepared for LakeCoal Pty Limited. GHD, 2011. Water Management Assessment prepared for Centennial Mannering Pty Ltd. December 2011. GHD, 2013a, Surface Water Quality Assessment prepared for Centennial Mannering Pty Ltd. June 2013. GHD, 2013b, Water Balance Assessment prepared for Centennial Mannering Pty Ltd. September 2013.

13 Definitions

ANZECC Australia New Zealand Environment Conservation Council

DC Delta Coal

DP&E Department of Planning & Environment (former)

DPIE Department of Planning, Industry and Environment

DPI Water Department of Primary Industries – Water

EA Environmental Assessment

EMS Environmental Management System

EPA NSW Environment Protection Authority

EPL Environmental Protection License

EP&A Act *Environmental Planning and Assessment Act 1979*

LDP Licensed Discharge Point

MC Mannering Colliery

NSW New South Wales

OEH NSW Office of Environment and Heritage

PA Project Approval

POEO Act *Protection of the Environment Operations Act 1997*

ROM Run of mine

Secretary Secretary of the Department, or nominee

TSS Total Suspended Solids

WMP Water Management Plan

Appendix 1: Consultation

From: Chris Armit
Sent: Sunday, 1 December 2019 8:52 PM
To: landuse.enquiries@industry.nsw.gov.au; joanna.pajkowska@nrar.nsw.gov.au; Mitchell Isaacs <mitchell.isaacs@dpi.nsw.gov.au>; EPA RSD Hunter Region Mailbox <hunter.region@epa.nsw.gov.au>; Steve Clair <Steve.Clair@epa.nsw.gov.au>
Cc: Katie Weekes <KWeekes@deltacoal.com.au>; Chris Nicholas <CNicholas@deltacoal.com.au>; Colin Phillips <Colin.Phillips@planning.nsw.gov.au>
Subject: Mannering Colliery Water Management Plan review

Hi All,
Please find attached a review of the Mannering Colliery's Water Management Plan for your comment and review.
Please respond within 14 days, comments/consultation will be reviewed and after that it will be added onto the DPIE's portal.
If there's any questions don't hesitate to call.
Kind regards,
Chris

Delta coal

Chris Armit
Environmental and Community Coordinator
Phone: 02 4358 0800
Mobile: 0409 070 233

Chain Valley Colliery
Off Construction Rd (Off Ruttleys Rd)
Mannering Park NSW 2259

From: cassandra.mcnamara@dpi.nsw.gov.au [mailto:cassandra.mcnamara@dpi.nsw.gov.au] **On Behalf Of** DPI Cabinet
Sent: Friday, 13 December 2019 3:49 PM
To: Chris Armit
Subject: DPI Response - Mannering Colliery Water Management Plan review

Dear Chris

Subject: Mannering Colliery Water Management Plan review

I refer to your email of 1 December 2019 to the Department of Primary Industries (DPI) regarding the above matter.

DPI has reviewed the management plan and has no comments.

Many thanks
Cass

DPI Coordination Team:
Cass McNamara, Manager - 0404 087 481
Sophia Stanley, Policy & Project Officer - 0427 326 931

eCabinet: https://ecab.nsw.gov.au/ecabinet-prod/login?0

NSW Department of Primary Industries
Lvl 49 MLC Centre | 19 Martin Place | Sydney NSW 2000
E: dpi.cabinet@dpi.nsw.gov.au

Department of Planning and Environment

NSW GOVERNMENT

Lachlan McWha
Environmental Compliance Coordinator
Great Southern Energy Pty Ltd t/as Delta Coal
Off Construction Road
Mannering Park, NSW, 2259

13/09/2022

Approval of Suitably Qualified and Experienced Persons

Dear Mr McWha

I refer to your request seeking the Planning Secretary's approval of suitably qualified and experienced persons to revise several management plans and strategies required under the Chain Valley Colliery (CVC) and Mannering Colliery (MC) development consents (SSD 5465 and MP06_0311 respectively), as set out in the following table:

Name	Management Plan	Scope of Review
Rachael Thelwell	Land MP (includes Bushfire MP)	Combining CVC and MC Land MP, and addressing stakeholder comments
Morgan Wilcox	Heritage MP	Combining CVC and MC Heritage MP and addressing stakeholder comments
Lachlan McWha	Environmental Management Strategy, Noise MP, Air Quality and Greenhouse Gas MP, Rehabilitation MP, Water MP, Biodiversity MP, Segrass MP, Benthic Communities MP, Public Safety MP, Built Features MP, Subsidence Monitoring Program MWS5 and NMA Pillar Extraction, Subsidence Monitoring Program NMA First Workings and Lake M Extraction, Water MP	Minor administrative revisions

The Department is satisfied that the nominees are suitably qualified and experienced to undertake the scope of work described abve. Accordingly, I can advise the Planning Secretary approves Rachael Thelwell, Morgan Wilcox and Lachlan McWha to revise the abovementioned plans and strategies.

If you wish to discuss the matter further, please contact Tanvir Islam on (02) 9995 6389 or tanvir.islam@dpie.nsw.gov.au.

Yours sincerely

James McDonough
Team Leader
Resource Assessments

As nominee of the Planning Secretary

Department of Planning and Environment

Our ref: MP06_0311-PA-28

Lachlan McWha
Environmental Compliance Coordinator
Great Southern Energy Pty Ltd (t/a Delta Coal)
Off Ruttleys Roads
Mannering Park, NSW, 2259

10/01/2023

Subject: Mannering Colliery Water Management Plan

Dear Mr McWha

I refer to the Water Management Plan submitted in accordance with condition 8 of Schedule 3 of the consent for the Mannering Colliery (MP06_0311).

The Department has carefully reviewed the document and is satisfied that it meets the requirements of the relevant conditions of consent.

Accordingly, as nominee of the Planning Secretary, I approve the Water Management Plan (Version 7, dated November 2022).

You are reminded that if there are any inconsistencies between the Plan and the conditions of consent, the conditions prevail.

Please ensure you make the document publicly available on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact James McDonough on (02) 9585 6313.

Yours sincerely

JEvans

Jessie Evans
Director, Resource Assessments
Resource Assessments

As nominee of the Planning Secretary

Appendix 2: Project Approval Summary

Mannering Colliery Project Approval 06_0311 Summary

Relevant sections of PA 06_0311 detail the requirements of the WMP and are reproduced in **Table A1** below along with identification of where the requirements are addressed in this document.

Table A1: Requirements from Mannering Colliery Project Approval (06_0311)

Condition No.	Requirements	Relevant section of this document
	Schedule 2 Administrative Conditions	
8	***Updating and Staging Strategies, Plans or Programs*** *The Proponent must regularly review the strategies, plans and programs required under this approval and ensure that these documents are updated to incorporate measures to improve the environmental performance of the development and reflect current best practice in the mining industry. To facilitate these updates, the Proponent may at any time submit revised strategies, plans or programs for the approval of the Secretary. With the agreement of the Secretary, the Proponent may also submit any strategy, plan or program required by this approval on a staged basis.* *With the agreement of the Secretary, the Proponent may prepare a revision or stage of any strategy, plan or program required under this approval without undertaking consultation with all parties nominated under the applicable condition in this approval.* *Notes:* • *While any strategy, plan or program may be submitted on a staged basis, the Proponent must ensure that the existing operations on site are covered by suitable strategies, plans or programs at all times.* *If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage to which the strategy, plan or program applies, the relationship of this stage to any future stages, and the trigger for updating the strategy, plan or program.*	**Section 9**
	Schedule 3 Specific Environmental Conditions	
	Discharge	
6	*The Proponent must only discharge water from the site as expressly provided for by its EPL.*	**Section 2.4**
	Water Management Plan	
8	*The Proponent must prepare a Water Management Plan for the project to the satisfaction of the Secretary. This plan must:*	**This document**
	(a) be prepared in consultation with DPI Water by suitably qualified expert/s whose appointment/s have been approved by the Secretary;	**Section 1.4**
	(b) be submitted to the Secretary by the end of March 2009;	**Section 1.4, relates to original WMP**
	(c) include a: • *Site Water Balance;* • *Erosion and Sediment Control Plan;* • *Surface Water Monitoring Plan; and* • *Groundwater Monitoring Program.*	**Section 4** **Section 5** **Section 6.2** **Section 6.3**

Condition No.	Requirements	Relevant section of this document
	The Proponent must implement the approved management plan as approved from time to time by the Secretary.	**This document**
	Site Water Balance	
9	*The Site Water Balance must:*	
	(a) include details of: • *sources and security of water supply;* • *water use on site;* • *water management on site; and*	**Section 4**
	(b) investigate, assess and report on measures to minimise water use by the project, particularly potable water from the Wyong Shire town water supply.	**Section 3.7**
	Erosion and Sediment Control	
10	*The Erosion and Sediment Control Plan must:*	
	(a) be consistent with the requirements of Managing Urban Stormwater: Soils and Construction (Landcom 2004, or its latest version);	**Section 5.3**
	(b) identify activities that could cause soil erosion and generate sediment;	**Section 5.2**
	(c) describe measures to minimise soil erosion and the potential for transport of sediment from the site;	**Section 5** **Appendix 4**
	(d) describe the location, function, and capacity of erosion and sediment control structures; and	**Section 6.5**
	(e) describe what measures would be implemented to monitor and maintain the structures over time.	**Section 6.5**
	Surface Water Monitoring Program	
11	*The Surface Water Monitoring Plan must include:*	
	(a) detailed baseline data on surface water flows and quality in creeks and other waterbodies that could be affected by the project;	**Section 4**
	(b) surface water impact assessment criteria;	**Section 6.1**
	(c) a program to monitor the impact of the project on surface water flows and quality; and	**Section 6.2**
	(d) procedures for reporting the results of this monitoring.	**Section 7**
	Groundwater Monitoring Program	
12	*The Groundwater Monitoring Program must include:*	
	(a) detailed baseline data to benchmark the natural variation in groundwater levels, yield and quality;	**Section 4**
	(b) groundwater impact assessment criteria;	**Section 6.1**
	(c) a program to monitor the impact of the project on groundwater levels, yield and quality; and	**Section 6.3**
	(d) procedures for reporting the results of this monitoring.	**Section 7**

Condition No.	Requirements	Relevant section of this document
	Schedule 5 Environmental Management, Monitoring, Auditing and Reporting	
2	***Management Plan Requirements*** *The Proponent must ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:* *(a) detailed baseline data;*	**This document**
	(b) a description of: • *the relevant statutory requirements (including any relevant approval, licence or lease conditions);* • *any relevant limits or performance measures/criteria;* • *the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;*	**Section 2, Section 6**
	(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	**Section 3.2**
	(d) a program to monitor and report on the: • *impacts and environmental performance of the project;* • *effectiveness of any management measures (see (c) above);*	**Section 6 Section 7**
	(e) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	**Section 5**
	(f) a protocol for managing and reporting any: • *incidents;* • *complaints;* • *non-compliances with statutory requirements; and* • *exceedances of the impact assessment criteria and/or performance criteria; and*	**Section 7.3 Section 8.1**
	(g) a protocol for periodic review of the plan. *Note: The Secretary may waive some of these requirements if they are unnecessary for particular management plans.*	**Section 9.1**
4	***Revision of Strategies, Plans and Programs*** *Within 3 months of:* *(a) the submission of an annual review under Condition 3 above;* *(b) the submission of an incident report under Condition 6 below;* *(c) the submission of an audit under Condition 8 below; or* *(d) any modification to the conditions of this approval (unless the conditions require otherwise),* *the Proponent must review, and if necessary, revise, the strategies, plans, and programs required under this approval to the satisfaction of the Secretary.* *Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.*	**Section 9.1**

Condition No.	Requirements	Relevant section of this document
	Statement of Commitments – Water Management	
	LakeCoal will undertake a review of the existing site water management system in consultation with the EPA.	**Section 1.4**
	The water level within the sediment pond system will be monitored and kept at a relatively low operating level, such that the ponds can provide a detention function in a significant rainfall event.	**Section 4.3, 6.3**
	A visual assessment of the unnamed creek will be undertaken every 6 months to monitor stability and erosion.	**Section 6.5**
	Where practicable, underground water levels will be recorded to monitor changes in the level of water stored in underground depressions and to verify that the rate of extraction is sufficient.	**Section 6.3**
	The extraction of underground water from the mine workings will be undertaken in accordance with the Bore License (20BL172016) issued under the Water Act 1912.	**Section 2**
	To enable on-going assessment of the quality of water discharged, the existing monitoring program will be maintained for the life of the Project with the following enhancements: • *An assessment of the surrounding catchments summarising land uses and other background information to characterise an appropriate water quality; and* • *Annual monitoring of heavy metals at the monitoring location identified as 'Downstream'.*	**Section 6.2**

MC operates under EPL 191 issued by the NSW EPA under the POEO Act. The EPL has been modified a number of times, most recently on the 1 April 2019. MC has a single Licensed Discharge Point (LDP) under EPL 191 defined in the EPL as Point 1 and referred to herein as Licensed Discharge Point 1 (LDP1).

Relevant sections of EPL 191 detail water related requirements and are reproduced in **Table A2** below along with identification of where the requirements are addressed in this document.

Table A2: Environment Protection Licence 191 Water Quality Requirements

Condition No.	Requirements	Relevant section of this document
P1	**Location of monitoring/discharge points and areas**	
P1.2	The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.	**Noted**
P1.3	The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.	**Section 6.1** **Table 11**

	Water and land **EPA Identification no.** / **Type of Monitoring Point** / **Type of Discharge Point** / **Location Description** 1 / Discharge to waters Discharge quality monitoring / Discharge to waters Discharge quality monitoring / Discharge from Final Treatment Pond (surface and groundwater) identifed as point 1 on plan titled "Mannering Colliery EPL Premises Plan - Figure 2 Surface Extents, Compliance and Monitoring Locations" dated 24 January 2014 DOC15/31114. Held on LIC08/38-03	
3	**Limit Conditions**	
L1	**Pollution of Waters**	
L1.1	Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.	**Section 2**
L2	**Concentration Limits**	
L2.1	For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.	**Section 6**
L2.2	Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.	**Section 6**
L2.3	To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.	**Noted**
L2.4	Water and/or Land Concentration Limits **Point 1** **Pollutant** / **Units of Measure** / **50 percentile concentration limit** / **90 percentile concentration limit** / **3DGM concentration limit** / **100 percentile concentration limit** Oil and Grease / milligrams per litre / / / / 10 pH / pH / / / / 6.5-8.5 Total suspended solids / milligrams per litre / / / / 50	**Section 6.1**
L3	**Volume and mass limits**	
L3.1	For each discharge point or utilisation area specified below (by a point number), the volume/mass of: a) liquids discharged to water; or; b) solids or liquids applied to the area; must not exceed the volume/mass limit specified for that discharge point or area. **Point** / **Unit of Measure** / **Volume/Mass Limit** 1 / kilolitres per day / 4000	**Section 6**
L3.2	Exceedance of the volume limit for Point 1 is permitted only if the discharge from Point 1 occurs solely as a result of rainfall at the premises exceeding 10mm during the 24 hours immediately prior to the commencement of discharge.	**Section 6**
M2	**Requirement to monitor concentration of pollutants discharged**	

M2.3

Water and/ or Land Monitoring Requirements

Point 1

Section 6
Appendix 3

Pollutant	Units of measure	Frequency	Sampling Method
Aluminium (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Aluminium (total)	micrograms per litre	Monthly during discharge	Grab sample
Antimony	micrograms per litre	Monthly during discharge	Grab sample
Arsenic (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Arsenic (total)	micrograms per litre	Monthly during discharge	Grab sample
Barium	micrograms per litre	Monthly during discharge	Grab sample
Beryllium (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Beryllium (total)	micrograms per litre	Monthly during discharge	Grab sample
Boron	micrograms per litre	Monthly during discharge	Grab sample
Cadmium (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Cadmium (total)	micrograms per litre	Monthly during discharge	Grab sample
Calcium	micrograms per litre	Monthly during discharge	Grab sample
Chromium (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Chromium (total)	micrograms per litre	Monthly during discharge	Grab sample
Cobalt (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Cobalt (total)	micrograms per litre	Monthly during discharge	Grab sample
Conductivity	microsiemens per centimetre	Weekly during any discharge	Grab sample
Copper (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Copper (total)	micrograms per litre	Monthly during discharge	Grab sample
Iron	micrograms per litre	Monthly during discharge	Grab sample
Lead (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Lead (total)	micrograms per litre	Monthly during discharge	Grab sample
Lithium	micrograms per litre	Monthly during discharge	Grab sample
Magnesium	micrograms per litre	Monthly during discharge	Grab sample
Manganese (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Mercury (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Mercury (total)	micrograms per litre	Monthly during discharge	Grab sample
Molybdenum (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Molybdenum (total)	micrograms per litre	Monthly during discharge	Grab sample
Nickel (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Nickel (total)	micrograms per litre	Monthly during discharge	Grab sample
Nitrogen (ammonia)	micrograms per litre	Monthly during discharge	Grab sample
Oil and Grease	milligrams per litre	Weekly during any discharge	Grab sample
pH	pH	Weekly during any discharge	Grab sample

Phosphorus	micrograms per litre	Monthly during discharge	Grab sample
Potassium	micrograms per litre	Monthly during discharge	Grab sample
Selenium (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Selenium (total)	micrograms per litre	Monthly during discharge	Grab sample
Silica	micrograms per litre	Monthly during discharge	Grab sample
Silver (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Silver (total)	micrograms per litre	Monthly during discharge	Grab sample
Sulfur	micrograms per litre	Monthly during discharge	Grab sample
Tin	micrograms per litre	Monthly during discharge	Grab sample
Titanium	micrograms per litre	Monthly during discharge	Grab sample
Total suspended solids	milligrams per litre	Weekly during any discharge	Grab sample
Vanadium (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Vanadium (total)	micrograms per litre	Monthly during discharge	Grab sample
Zinc (dissolved)	micrograms per litre	Monthly during discharge	Grab sample
Zinc (total)	micrograms per litre	Monthly during discharge	Grab sample

M3.2	Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.	**Section 6**
M7	**Requirement to monitor volume or mass**	
M7.1	For each discharge point or utilisation area specified below, the licensee must monitor: a) the volume of liquids discharged to water or applied to the area; b) the mass of solids applied to the area; c) the mass of pollutants emitted to the air; at the frequency and using the method and units of measure, specified below. **Point 1**	**Section 6**

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	kilolitres per day	In line instrumentation

G2	**Other general conditions**	
G2.1	Completed programs	**Noted**

Program	Description	Completed Date

PRP 1 - Assessment of Potential Impacts of Metals	The licensee must conduct an assessment of metals detected in wastewater discharges from the mine in accordance with the ANZECC water quality guidelines.. To obtain a greater understanding of the type and concentration of metals discharged in mine water and entering the receiving waters. To limit the concentration of metals discharged in mine water within ANZECC guidelines.(@)	26-June-2013
Coal Mine Particulate Matter Control Best Practice	Requires licensee to conduct a site specific Best Management Practice (BMP) determination to identify wyas to reduce particle emissions.	19-September-2012
Coal Handling and Preparation Plant Commissioning Water Quality Monitoring Study	CHPP commissioning water quality monitoring study	12-October-2016

Appendix 3: EPL 191 Water Quality Monitoring

Monitoring requirements of EPL 191 in relation to water quality monitoring at Mannering Colliery are detailed in Table A3.

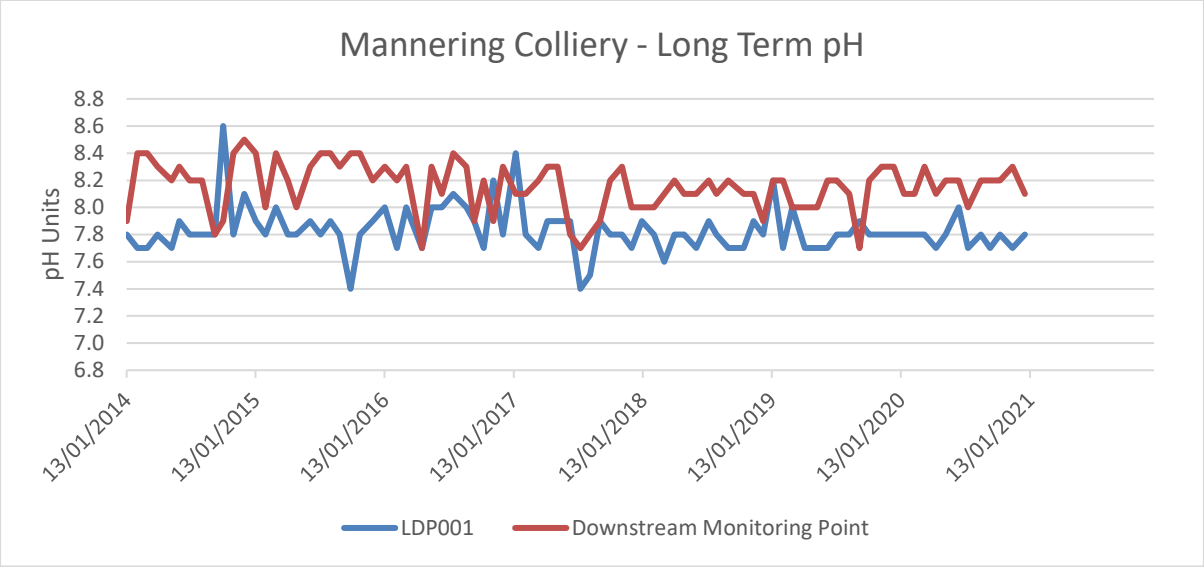
Table A3: Water Monitoring Requirements LDP1 (EPL 191)

Pollutant	Unit of Measure	Frequency	Sampling Method
Aluminium (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Aluminium (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Antimony	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Arsenic (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Arsenic (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Barium	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Beryllium (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Beryllium (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Boron	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Cadmium (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Cadmium (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Calcium	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Chromium (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Chromium (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Cobalt (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Cobalt (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Conductivity	microsiemens per centimetre (µS/cm)	Weekly during discharge	Grab sample
Copper (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Copper (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Iron	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Lead (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Lead (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Lithium	micrograms per litre (µg/L)	Monthly during discharge	Grab sample

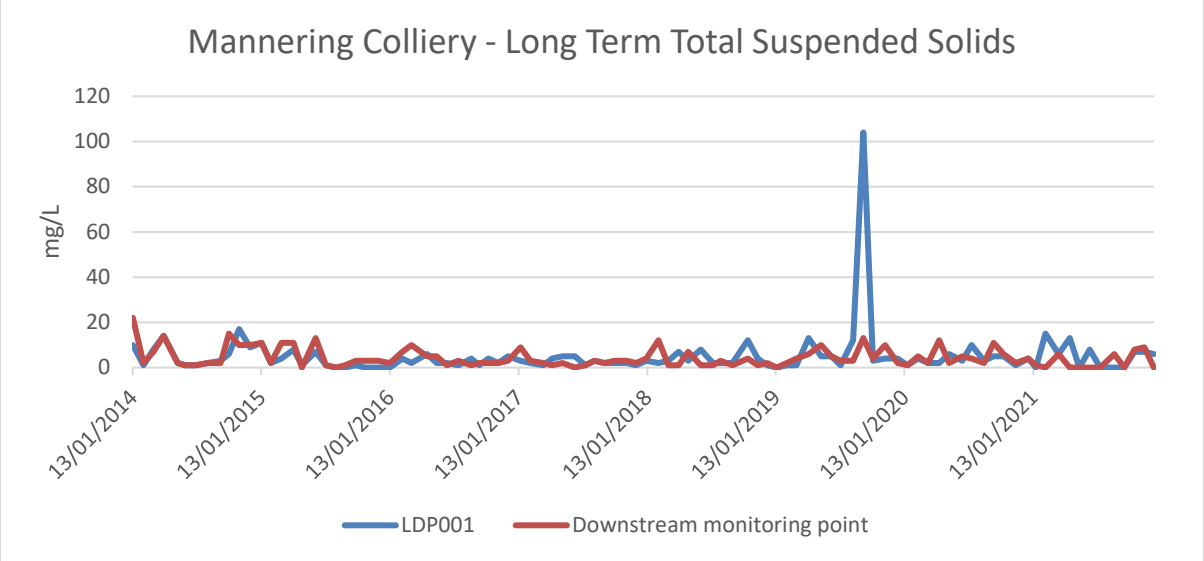
Pollutant	Unit of Measure	Frequency	Sampling Method
Magnesium	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Manganese (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Manganese (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Mercury (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Mercury (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Molybdenum (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Molybdenum (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Nickel (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Nickel (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Nitrogen (ammonia)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Oil and Grease	milligrams per litre (mg/L)	Weekly during discharge	Grab sample
pH	pH	Weekly during discharge	Grab sample
Phosphorus	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Potassium	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Selenium (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Selenium (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Silica	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Silver (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Silver (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Sulfur	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Tin	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Titanium	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Total suspended solids	milligrams per litre (mg/L)	Weekly during discharge	Grab sample
Vanadium (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Vanadium (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample
Zinc (dissolved)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample

Pollutant	Unit of Measure	Frequency	Sampling Method
Zinc (total)	micrograms per litre (µg/L)	Monthly during discharge	Grab sample

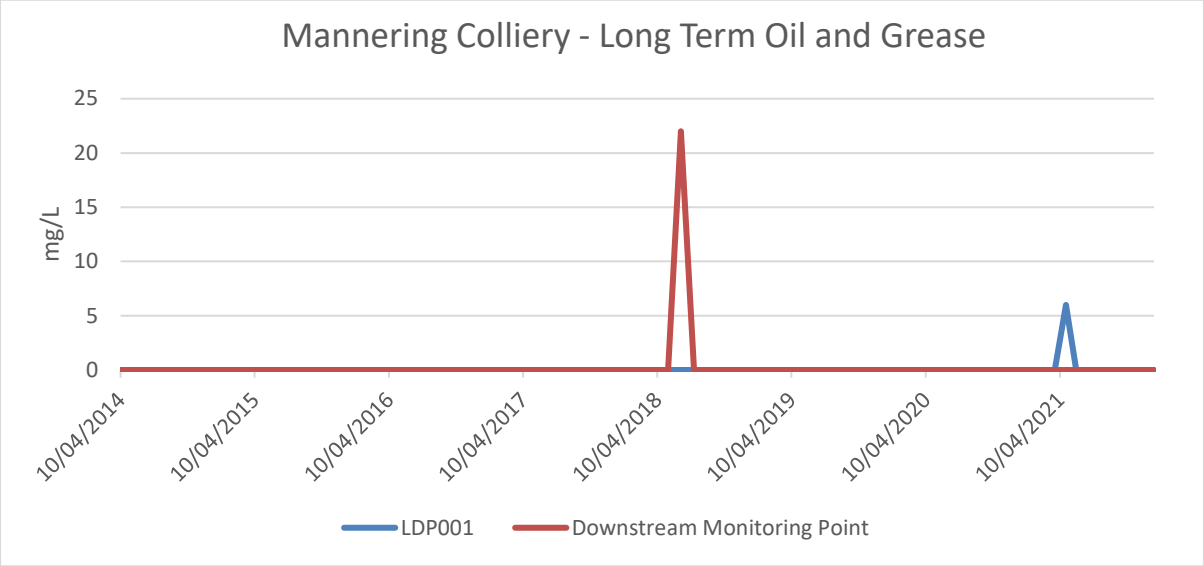
LDP1 – pH monitoring (Jan 2015 to Oct 2019)



LDP1 – Total suspended solids (TSS) monitoring (Jan 2015 to Oct 2019)

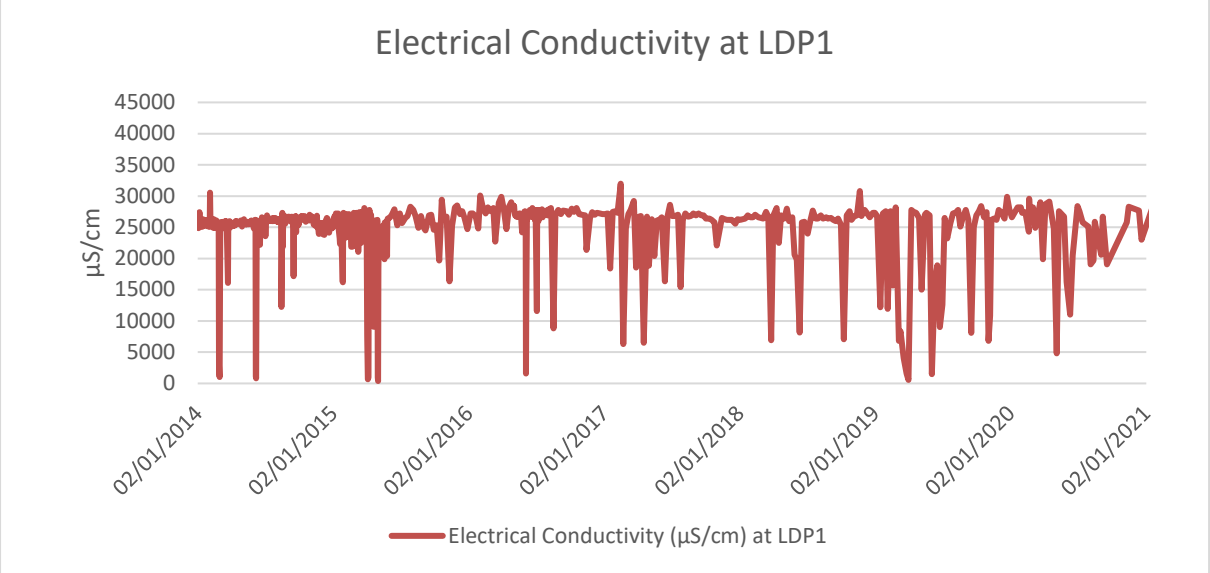


LDP1 – Oil and grease monitoring (Jan 2015 to Oct 2019)

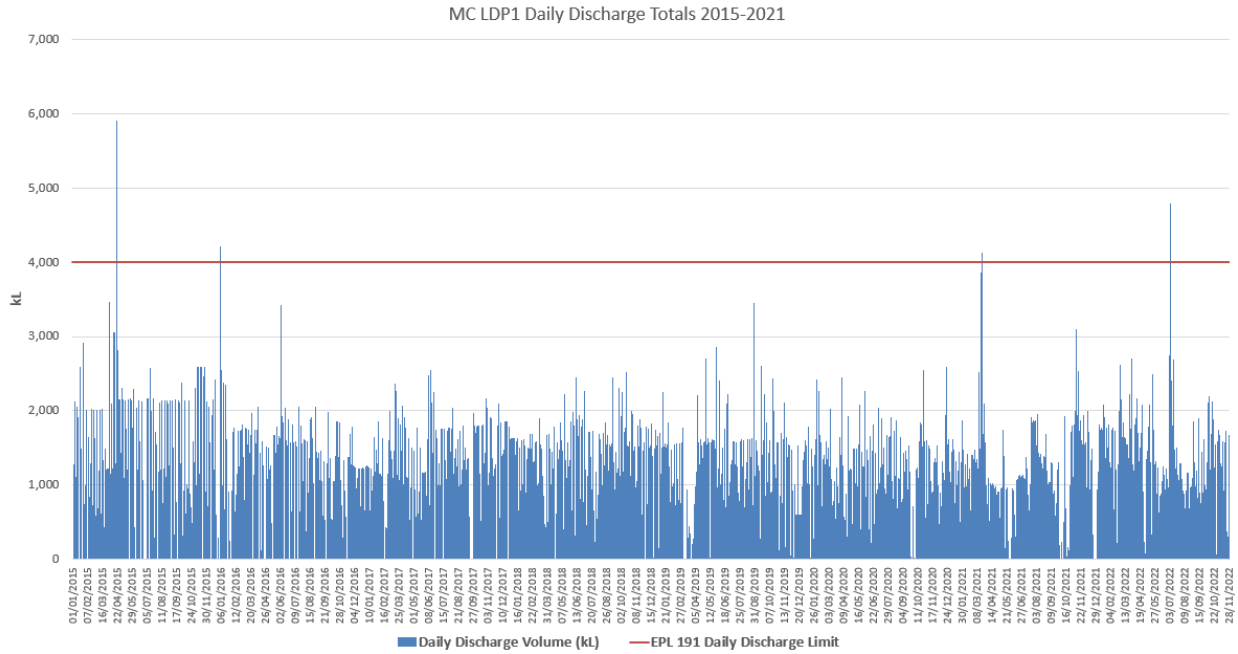


Note that all oil and grease results less than the laboratory reporting limit (<5mg/L) is recorded as a zero

LDP1 – Electrical conductivity monitoring (Jan 2015 to Oct 2019)



LDP1 – Daily discharge monitoring (Jan 2015 to Oct 2019)



Appendix 4: Standard ESC's

Generic Erosion and Sediment Controls

Land Clearing Procedures (Clearing and Topsoil Stripping)

Minimise land disturbance to avoid exposing unnecessary land to the processes related to erosion and sedimentation. This is achieved by:

- All operations are planned to ensure that only the areas which are under active excavation are cleared and that there is no damage to any trees and pasture areas outside the limits to be cleared.
- Limiting the cleared width to that required to accommodate excavation plus areas required for topsoil stockpiling.
- General vegetation clearing will not be undertaken until earthwork operations are ready to commence.
- All proposed erosion and sediment control measures are implemented in advance of, or in conjunction with, vegetation clearing and soil stripping operations.
- Prior to vegetation clearing or soil stripping operations, the stripping panel is delineated on a plan and in the field will be marked by survey pegs placed at intervals on each side of the disturbed area. Topsoil limits and the topsoil stripping depths are shown on the pegs.
- Where possible, topsoil is stripped in moist but not wet condition to reduce deterioration in topsoil quality and dust generation and only be stockpiled when no areas of reshaped overburden are available for direct placement and spreading.

Topsoil Stockpiles

Where suitable areas are unavailable for the immediate respreading, topsoil is stockpiled to a maximum depth of three metres and subsequently applied when the areas become available. The period of the stockpiling is minimised in order to reduce the detrimental effects of the storage of any native seed in the soil and damage to the soil structure.

All stockpiles are shaped, trimmed (max batter slope 3H:1V) then ripped and immediately sown with a sterile cover crop and permanent pasture species to provide stockpile stabilisation. Sediment fence is constructed around the downslope perimeter of the stockpiles where required to provide temporary sediment control until vegetation becomes established. Surface drainage in the vicinity of the stockpiles is configured as to direct any runoff around the area so not to cause any potential erosion of the loose material.

Where topsoil is used as the growing medium, it is re-spread in the reverse sequence to its removal, so that the organic layer, containing any seed or vegetation, is returned to the surface. Re-spreading on the contour aids runoff control and increased moisture retention for subsequent plant growth. Re-spread topsoil should be levelled to achieve an even surface, avoiding a compacted or an over-smooth finish.

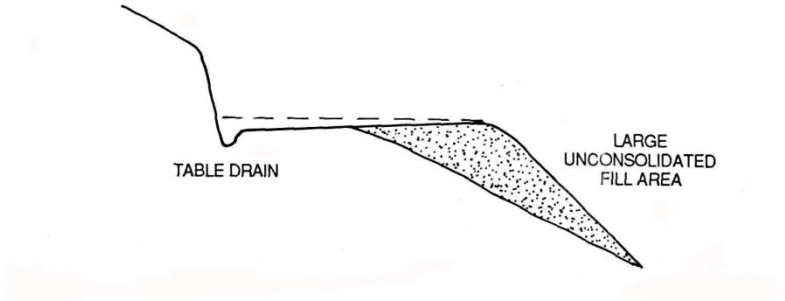
Access Tracks

Access tracks are constructed in accordance with appropriate standards such as those described in *Managing Urban Stormwater: Soils and Construction Vol. C - Unsealed Roads*. Surface drainage is optimised and stabilised, thereby reducing roadside erosion and sedimentation. Appropriate control measures are constructed on all access roads with cross fall drainage at 3% either side of the road crown to be largely responsible for immediate water shed from the road surface. Techniques that could be used to provide crossfall on the track include crowing, infall and outfall.

- Crowning

Crowning allows water to be shed on both sides

- Infall



- Outfall

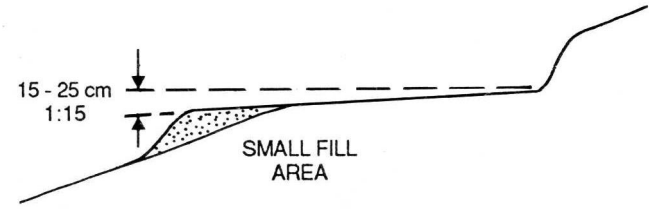


Table Drains, Mitre Drains, Culverts and Cross Drains are used where required to safely convey the water from the track surface so to prevent runoff from eroding them or adjacent land. Mitre Drain spacing should not exceed 50m even on soils with low erodibility. Cross Drains are placed every 20m to 90m depending on the road grade and soil erodibility as required. Refer to Table 5.2 of Vol2C – Unsealed Roads of the 'Blue Book' for more detail.

Cut and fill batters associated with service tracks are formed to a safe slope and stabilised by vegetation. Where cut batters are greater than 1.5m, stabilisation methods are applied to these areas such as laying back, revegetation and drainage. Stabilisation is assisted by spreading topsoil and/or by applying chemical or organic mulch over the exposed batter surface. Where fill batters are greater than 2:1, re-grading may be required.

Planning and construction of new tracks is undertaken in accordance with the guidelines presented Vol. 2C - Unsealed Roads of the 'Blue Book'.

Diversion Structures (Clean Water)

In order to minimise the volume of dirty and mine water to be treated, all clean run-on water is diverted where possible into clean water drainage lines to be directed off-site. This not only reduces the potential for erosion to occur on disturbed areas, but also reduces the pressure on the dirty and mine water management controls which are required to treat sediment-laden runoff to an acceptable standard for discharge. Suitably designed and constructed diversion drains are implemented where practical around the MC in accordance with 'Blue Book' standards relating to channel design. In general, the drains should be trapezoidal in shape with maximum

side slopes of 1V:2H. Where peak design water velocities exceed 1.5m/s, the drains should be protected from scour using either erosion channel liners and/or geofabric with rock rip-rap armouring.

Diversion Structures (Mine and Dirty Water)

Catch drains are utilised throughout the site to minimise erosion and re-direct runoff from the dirty water catchment area into sediment dams. Runoff from disturbed areas, such as stockpile areas, is conveyed to these dams by catch drains and bunds.

Bunds shall be constructed similar to top soil emplacement areas, bunds shall be shaped, trimmed (max batter slope 3H:1V) then ripped and immediately sown with a cover crop and permanent pasture species to provide bund stabilization.

For runoff from rehabilitation areas, the water management structures should be appropriately designed before layout and construction. Typically the water management structures include contour banks, which are constructed at intervals down the slope of rehabilitation areas to control surface flow and minimize erosion. The effect of these is to divide long slopes into a series of short slopes with the catchment area commencing at each bank. This prevents runoff from reaching a depth of flow or velocity which would cause erosion. As the slope angle of the landform increases, the banks are spaced closer together. Bank spacing is determined based on the surrounding catchment layout and the bench spacing guide contained in Table 4.1 of *Vol2E – Mines and Quarries* of the 'Blue Book'. The banks should have a longitudinal grade of 1.2%. Where peak design water velocities exceed 1.5m/s, the drains should be protected from scour using either erosion channel liners and/or geofabric with rock rip-rap armouring.

Control Devices

Sediment dams are used at MC to contain potentially contaminated water. This water has the potential to contain elevated TSS concentrations and/or potential hydrocarbon contamination as a result of runoff from access roads, workshop areas and areas exposed to carbonaceous material. Sediment dams assist in improving water quality throughout the mine site.

The number and capacity of dams will be related to the total area of catchment, the duration of disturbance and the anticipated soil loss. The capacity of each dam is derived from the benchmark design reference for sediment control, *Managing Urban Stormwater: Soils and Construction Vol. 1* and *Vol. 2E Mines and Quarries* (the Blue Book) (Landcom, 2004 and DECC, 2008). The dams are constructed to at least the recommended minimum design criteria as presented in Table 6.1 of Vol 2E Mines and Quarries of the Blue Book. For most areas, this is the 90th percentile, 5 day rainfall event for a Type F/D basin (soils that are fine textured and possibly dispersive).

The following points will be considered when selecting future sites for sediment dams:

- Each dam will be located so that runoff may easily be directed to it, without the need for extensive channel excavation or for excessive channel gradient. Channels will discharge into the dam without risk of erosion. Similarly, spillways will be designed and located so as to safely convey the maximum anticipated discharge.

- The material from which the dam is constructed will be stable and be imported from elsewhere on the mine, if necessary. Highly dispersible clays will require treatment with gypsum and/or bentonite to prevent failure.

Temporary Erosion and Sediment Controls

Prior to any construction activity (including soil stripping, road construction, bulk earthworks), temporary erosion and sediment control measures are installed. The following sub-sections include temporary erosion and sediment control features that may be utilized at the site.

Sediment Filter Fences

There may, on occasion, be a disturbance area which is either not protected by existing structures or requires additional temporary protection against erosion and sedimentation. In these cases it may be suitable to install sediment filter fencing. Sediment filter fences filter run-off leaving the site, trapping sediment and allowing filtered water to pass. Sediment filter fences are constructed around the base of any areas of exposed land that are not subject to concentrated overland flow, that are not adequately protected by existing structures and that are not within the mine water management system. Sediment filter fencing is installed around the extent of the disturbance areas where sediment-laden water could potentially enter clean downstream receiving waters.

Sediment filter fences are normally placed on the contour or slightly convex to the contour. The contour on each end of the fence should be turned to create a stilling dam up slope of the fence. Where possible, a silt fence system should consist of a series of overlapping fences. Each fence should be NO longer than about 40 metres. They should not intercept large concentrated or channelised flows. The fences are constructed in accordance with the Sediment Fence Standard Drawing (SD6-8) of the 'Blue Book'. Silt fences require regular maintenance. Trapped sediments should be removed, pickets straightened, filter cloth re-secured and tightened.

Sandbag Weirs

Sandbag weirs are sometimes installed within existing swale drains or existing drainage channels, which are not able to be regularly graded. The use of these devices is limited to temporary erosion and sediment control in channels during construction or high disturbance phase mining.

The weirs are typically installed at a minimum of 40 metre intervals. As with sediment filter fences, sandbag weirs may be installed prior to any works commencing on the site in existing channels and immediately after the construction of new channels. Inspections of the sandbag weirs after rain should take place with removal of the collected sediment as required. Damaged/shifted bags should be repaired or replaced.

Temporary Drains

Runoff from areas exposed during the works is to be controlled by construction of temporary contour and diversion drains. These drains generally take the form of channels constructed across a slope, with a ridge of the lower side. They should be implemented immediately after a construction site is cleared to intercept and divert runoff from the site to nearby stable areas at non-erosive velocities. The drains should be formed with a gentle grade of approximately 1.2%.

Temporary Silt Traps

Temporary sediment trapping devices may be required during construction to trap and filter sediment-laden runoff from small areas (0.5 ha or less) prior to discharge. They are used to trap small amounts of run-off water and filter sediment from runoff before entering the natural watercourses or to protect adjacent lands. These would typically be used at the discharge point of mitre drains and other similar devices.