ENV-WAT-PLN-001-ATT-001 Site Water Balance Report

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BOGGABRI COAL

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8	Include Modification 8 approval conditions.	T. Tinkler/A. Wyatt	P. Forbes	18 May 2017
9	2020 Annual Review.	M. Best/A. Wyatt	H. Russell	23 Apr 2021
10	Regular plan revision	M. Best/A. Wyatt	H. Russell	30 Aug 2021
11	2021 Annual Review	M. Best/A. Wyatt	H. Russell	3 May 2022
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14	2024 Annual Review	H. Brichacek/J. O'Brien	L. Tolson	13 March 2025
15	Revised to address agency comments following updated EPBC approval conditions.	J. O'Brien	L. Tolson	28 May 2025
16	Revised to address DPHI comments on V15 of SWMP	J. O'Brien	L. Tolson	3 Oct 2025

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1.0 INTRODUCTION

1.1 Project description

Boggabri Coal Mine (BCM or the project) is an open cut coal mine located 15 kilometres (km) north-east of the township of Boggabri in north-western New South Wales (NSW) (refer to Figure 1-1). BCM is managed by Boggabri Coal Operations Pty Ltd (BCOPL), a subsidiary of Idemitsu Australia Resources Pty Limited (Idemitsu).

Mining activities at BCM commenced in 2006. The mine currently operates under State Significant Development (SSD) Project Approval (SSD 09_0182), which allows BCOPL to produce 8.6 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal from BCM until the end of 2036. Approval was granted by the NSW Planning Assessment Commission (PAC) under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 18 July 2011 and has been subject to several modifications.

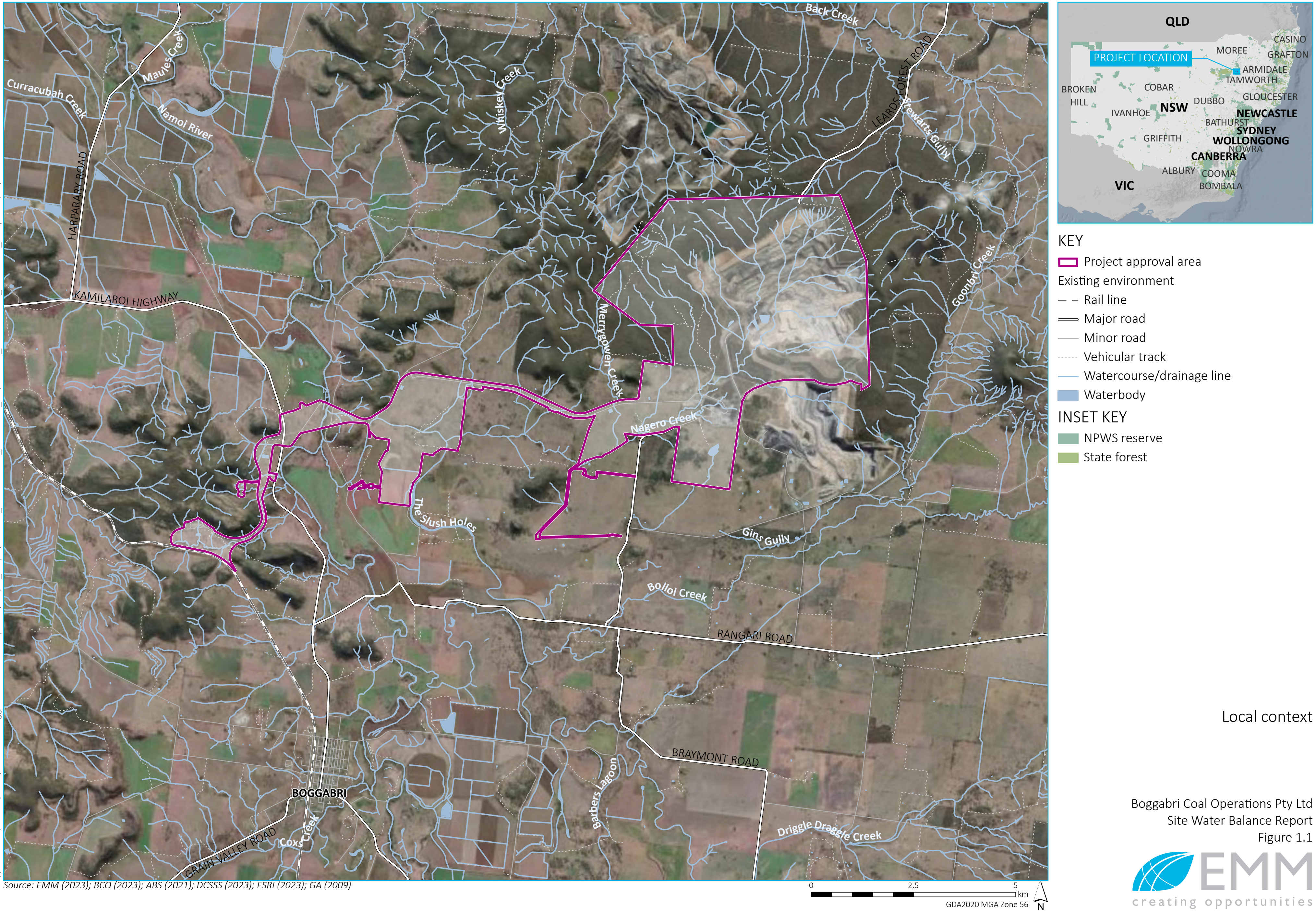
1.2 Purpose

The purpose of this Site Water Balance Report (SWBR) is to define the components of the Site Water Balance (SWB) model at BCM with respect to current Life-of-Mine (LOM) planning and all relevant available information. The SWBR was prepared to directly address SWB related conditions outlined in the Project Approval (SSD 09_0182), the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval and mining lease conditions. The key objectives of this SWBR are to:

- address the relevant approval conditions
- describe any changes to the SWB model since the 2023 SWBR (BCOPL, 2024)
- validate the SWB model using observed climate and operational data recorded since the 2023 SWBR (BCOPL, 2024)
- forecast the future water balance for the water management system (WMS) over the approved LOM
- describe proposed water efficiency initiatives, improvement programs and reporting requirements.

This SWBR was prepared with consideration of the relevant statutory requirements (Commonwealth, State or local), regulations, and environmental planning instruments relevant to mine water management, as summarised in Chapter 2.0.

The WMS that forms the basis of the SWB is documented in the BCM Surface Water Management Plan (SWMP). This SWBR should be read in conjunction with the SWMP.



\\emmsvr1\EMM2\2023\E230625- Boggabri Coal SWMP update\GIS\02_Maps\SWL001_LocalContext_20231211_01\SWL001_LocalContext_20231211_01.aprx 12/12/2023

Source: EMM (2023); BCO (2023); ABS (2021); DCSSS (2023); ESRI (2023); GA (2009)

KEY

Project approval area

Existing environment

Rail line

Major road

Minor road

Vehicular track

Watercourse/drainage line

Waterbody

INSET KEY

NPWS reserve

State forest

Local context

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Figure 1.1

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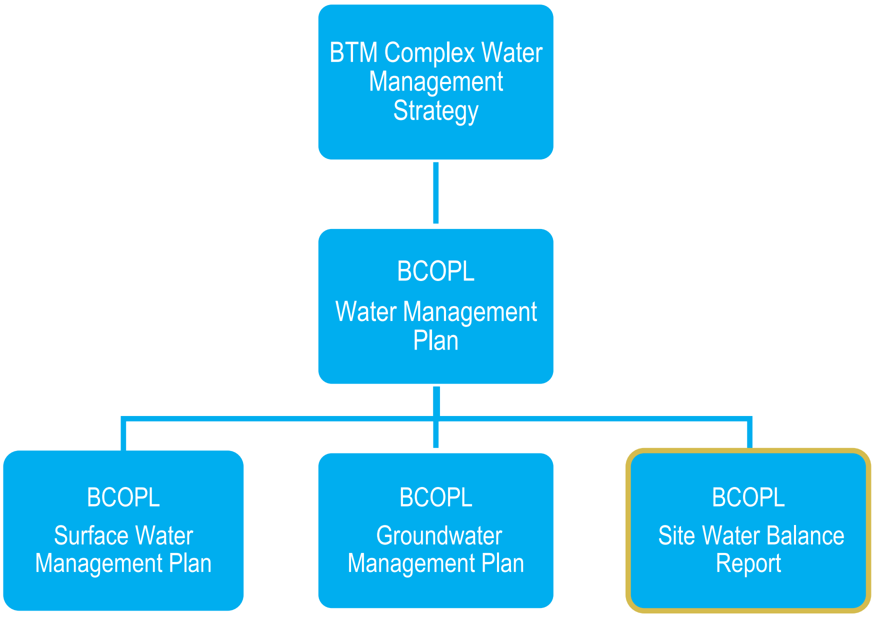
1.3 Related water management documents

This SWBR is a subplan of the overarching BCOPL Water Management Plan (WMP). The water management documents applicable to the BCM are listed in Table 1-1. The WMP document hierarchy is shown in Figure 1-2.

Table 1-1: Related water management documents

Document	Description
Boggabri – Tarrawonga – Maules Creek (BTM) Complex Water Management Strategy	Regional strategy prepared in consultation with Tarrawonga Coal Pty Ltd (TCPL) and Maules Creek Coal Project (MCC).
BCOPL Water Management Plan (WMP)	Overarching document setting out water management framework, statutory requirements, and procedural requirements.
BCOPL Surface Water Management Plan (SWMP)	Surface water baseline data, performance criteria, monitoring program, response plan, water management system description, erosion and sediment controls.
BCOPL Groundwater Management Plan (GWMP)	Groundwater baseline data, performance criteria, monitoring program, response plan, and groundwater model validation program.
BCOPL Site Water Balance Report (SWBR)	Water balance modelling methodology, assumptions and results, and mine water management system operating philosophy.

Figure 1-2: Water management plan document hierarchy



1.4 Agency consultation

As required by consent condition 38 of Schedule 3 of the Project Approval, previous versions of the SWBR and this version of the SWBR were prepared in consultation with several NSW government agencies The most recent set of agency comments is provided in Table 1-2.

Table 1-2: Agency consultation

Agency	Date received	Comment
Department of Climate Change, Energy, the Environment and Water – Water (DECCEW Water)[1]	8 April 2025	Recommendation to ensure BCOPL has sufficient water entitlement prior to the commencement of each water year. Addressed in Section 3.5.4.
Department of Climate Change, Energy, the Environment and Water – Conservation Programs, Heritage and Regulation (DECCEW CPHR)[2]	21 March 2025	No comment
North West Local Land Services (NW LLS)[3]	10 April 2025	No comment
Narrabri Shire Council	8 April 2025	No comment
Community Consultative Committee (CCC)	-	SWBR disseminated to CCC 23 May 2025 but no comments received.
Environment Protection Authority (EPA)	9 May 2025	Comment to keep water management plans consistent with EPL12407 and Protection of Environment Operations Act 1997.

Notes: 1. Formerly Department of Planning and Environment (DPE) – Water (DPE-Water).

2. Formerly DPE – Biodiversity, Conservation and Science (BSC).

3. Formerly Namoi Catchment Management Authority (NCMA).

1.5 Report preparation

This SWBR has been prepared by Water Resource Engineer Hallam Brichacek and Senior Water Resource Engineer Jason O'Brien and reviewed by Associate Water Resource Engineer Sally Callander. Hallam has four years' experience as a water resource engineer preparing surface water assessments, water management plans, water balance modelling and flood modelling and assessment. Jason has eight years' experience as a water resource engineer preparing surface water assessments, water management plans, water balance modelling and flood risk assessments. Sally has 15 years' experience in the water industry specialising in surface water assessments and management plans, water balance assessments, water quality assessments, hydrologic and hydraulic modelling and floodplain impact assessment, and risk management development and policy.

2.0 STATUTORY REQUIREMENTS

2.1 Relevant legislation

Key legislation that is relevant to this SWBR include:

- *Environmental Protection and Biodiversity Conservation Act (1999)* (EPBC Act) – Commonwealth
- *Environmental Planning and Assessment Act 1979* (EP&A Act) – NSW
- *Mining Act 1992* – NSW
- *Protection of the Environment Operations Act 1997* (POEO Act) – NSW
- *Water Management Act 2000* (WM Act) – NSW.

2.2 Project approval conditions

2.2.1 Commonwealth approval conditions

Commonwealth approval for the project was granted 11 February 2013 pursuant to Sections 130 (1) and 133 of the EPBC Act (EPBC Act referral 2009/5256). A variation to the EPBC Act conditions of approval was authorised in February 2020.

Commonwealth approval for Modification 8 (EPBC Act referral 2021/8875) was granted 19 December 2024. However, the approval conditions associated with EPBC Act referral 2021/8875 are not directly relevant to the SWBR and are addressed in the SWMP and GWMP.

The EPBC Act approval conditions relevant to this SWBR are reproduced in Table 2-1.

Table 2-1: Site water balance related EPBC approval conditions

Condition	Description	Where addressed
EPBC Act referral 2009/5256 – Surface Water and Groundwater Management Plans		
No. 18	The person taking the action must within 6 months of this approval, or such other timeframe specified by the Minister, provide to the Minister a report on: a) any updated modelling of surface and groundwater impacts that has been undertaken in preparing the surface and groundwater management plans b) how the surface and groundwater management plans addressed groundwater and surface water impacts on native vegetation.	Updated surface water modelling is provided in Chapter 3.0. Groundwater impacts are addressed in the GWMP. Impacts to riparian health are addressed in the SWMP.

2.2.2 Mining lease conditions

The objectives of the *Mining Act 1992* are to encourage and facilitate discovery and development of mineral resources having regard to the need to encourage ecologically sustainable development. In relation to water, the Act requires that BCOPL ensure effective rehabilitation of disturbed land and water and to ensure mineral resources are identified and developed in ways that minimise impact to the environment. BCOPL hold coal lease CL368 under this Act. Mining lease conditions are not directly relevant to the SWBR and are addressed in the SWMP.

2.2.3 State project consent conditions

State development consent (SSD 09_0182) was granted 18 July 2012 pursuant to Section 75J of the EP&A Act by the Planning and Assessment Commission of NSW as delegate of the Minister for Planning. Development consent for Modification 8 was issued in January 2024. The NSW State development consent conditions relevant to this SWBR are reproduced in Table 2-2.

Table 2-2: Site water balance related consent conditions

Condition	Description	Where addressed
Water Supply		
Sch 3, 33	The Proponent must ensure that is has sufficient water for all stages of the project, and if necessary, adjust the scale of mining operations on site, to match its available water supply to the satisfaction of the Secretary.	Section 3.5.4
Water Management Plan		
Sch 3, 38	The Proponent must prepare and implement a Water Management Plan for the project to the satisfaction of the Secretary. This plan must be prepared in consultation with the EPA, DPE Water, North West LLS and the CCC, by suitably qualified and experienced person/s whose appointment has been approved by the Secretary, and be submitted to the Secretary for approval within 6 months of the date of this approval. In addition to the standard requirements for management plans (see Schedule 5, Condition 3), this plan must include:	Section 1.4 Section 1.5
	(c) a Site Water Balance, that:	
	• includes details of:	
	– sources and security of water supply, including direct and indirect water take, and contingency for future reporting periods	Section 3.5.4 Section 3.5.5
	– prioritisation strategy for water sources	Appendix B.3.6
	– water use onsite	Appendix B.3.7
	– water management on site	Section 3.2
	– any off-site water discharges and management of water during high rainfall years and periods of flooding, including water storage options	Section 3.5.6
	– reporting procedures, including the preparation of a site water balance for each calendar year	Chapter 6.0
	– a program to validate the surface water model, including monitoring discharge volumes from the site and comparison of monitoring results with modelled predictions	Section 5.2

Condition	Description	Where addressed
	– methodologies used in the preparation of thew site water balance, including provision of data sources, measurement type (direct sample/mass balance/engineering calculations/ factors) and formulas used for all inflows, processes and outflows	Appendix B
	• is supported by an annual improvement program to identify and address deficiencies and improvements within monitoring, measurement and calculation methods	Chapter 5.0
	• includes an action plan and schedule to implement annual water efficiency initiatives, and the recommendations in the Advisian peer review report titled “Peer Review of Site Water Use Aspects of Boggabri Coal MOD 5 Project, 22 July 2016”, as set out in Appendix 6A	Chapter 4.0
	• describes the measures that would be implemented to minimise clean water use on site.	Appendix B.3.6

2.3 Permits and licences

2.3.1 Environmental protection licence

Environmental protection licence (EPL) No. 12407 applies to the BCM operations. The EPL outlines surface water quality monitoring requirements and discharge criteria. The EPL also includes a requirement to maintain an air capacity (cumulative freeboard) of 1,000 megalitres (ML) within the BCM mine water inventory. EPL water quality and quantity monitoring requirements are addressed the SWMP.

2.3.2 Water access licences

BCOPL are required to hold water access licences (WAL) for surface water take associated with the BCM. Water licensing requirements, existing WALs and water supply works approvals, and the methodology to account for surface water take at the BCM are described in the SWMP. Water licensing requirements and existing WALs associated with groundwater take are described in the GWMP.

3.0 SITE WATER BALANCE

3.1 Overview

The SWB model is built using GoldSim software and was originally developed as a part of the Continuation of Boggabri Coal Mine Project Surface Water Assessment (WSP, 2010). The SWB model is updated annually to reflect development of the mine and ensure on-site conditions are adequately simulated.

The SWB model is a key strategic planning tool to assess the resilience of the BCM WMS by testing it under a wide range of climate scenarios that may occur over the LOM, each generated by sampling historic rainfall records. By simulating the BCM WMS under these scenarios, the corresponding water inflows, outflows and the likely range of water deficits, surpluses, and discharges from BCM can be quantified.

The SWB model is based on the mine plan layout and WMS documented in *the Continuation of Boggabri Coal Mine Environmental Assessment* (Hansen Bailey, 2010), *Boggabri Coal Forward Program: Sunday 1 January 2023 to Wednesday 31 December 2025*, and *Modification 8 (MOD 8) Amendment Report* (JBA, 2022).

This chapter summarises on site water management and how it relates to the SWB model, describes the SWB model updates that have been made since the 2023 SWBR (BCOPL, 2024), presents the outcomes of the model validation process, and provides forecast model results for the WMS over the approved LOM. The WBM methodology including key inputs and assumptions is described in Appendix B.

3.2 Water management

The BCM WMS is designed to control and manage water across the site, and includes diversion drains, sediment control measures, water management dams, water storages, pumps and pipelines. These components work together to support operational needs, minimise water use and offsite discharges, and meet regulatory requirements.

The WMS is closely aligned with the SWB model. The SWB model is structured to reflect the physical layout and components of the WMS to provide an accurate representation of site conditions. In turn, the SWB model informs WMS operations by tracking inputs, outputs, and storage volumes, supporting decisions around water use, discharge, and infrastructure capacity.

Appendix B outlines how the WMS has been incorporated into the SWB model, while a detailed description of the WMS is provided in the Site Water Management Plan SWMP.

3.3 Model updates

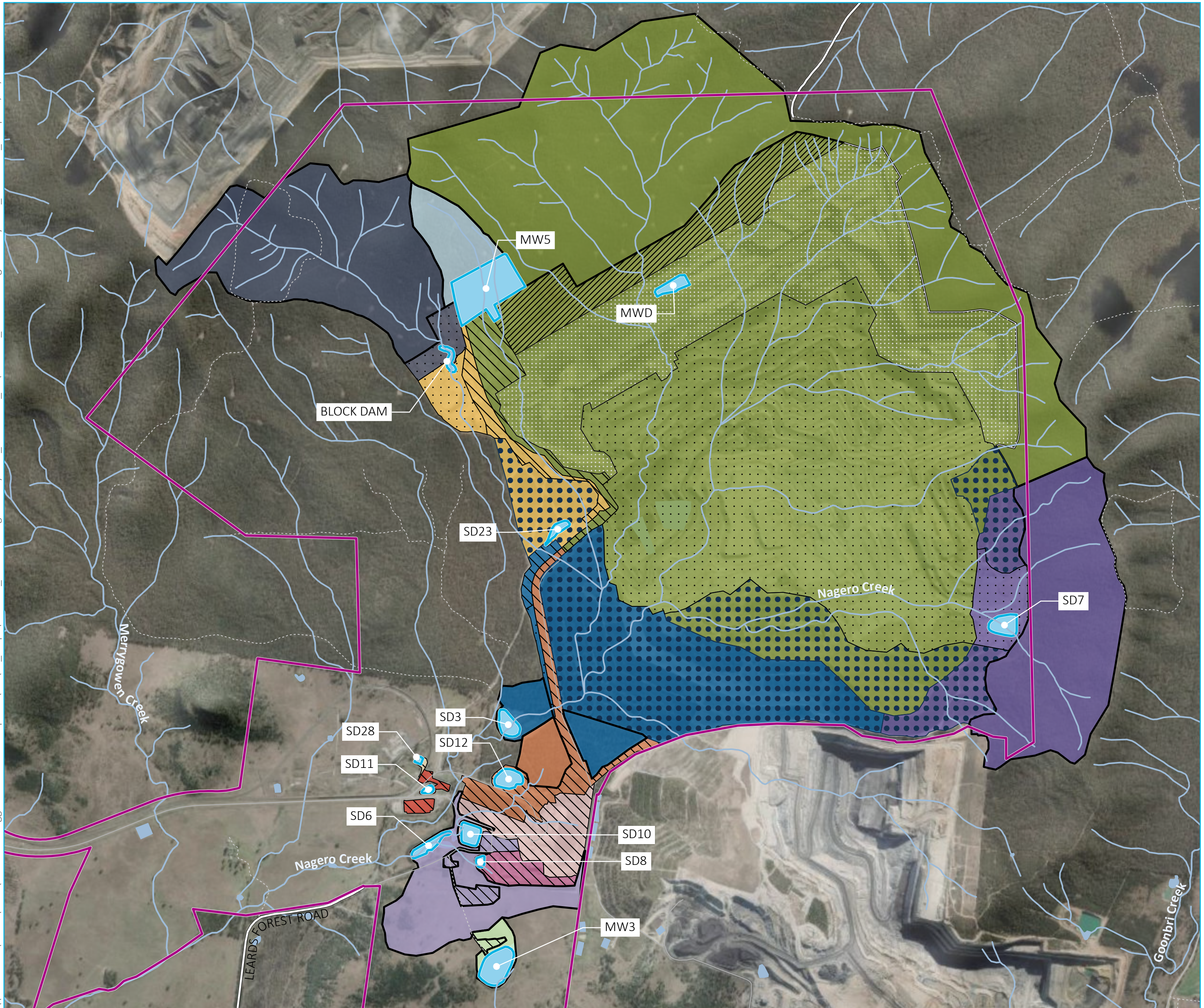
The following key components of the WMS were reviewed as part of the 2024 SWB model update:

- catchment areas and land use
- pump rates and transfers
- storage data (including number of storages, capacity and operating levels)
- Australian Water Balance Model (AWBM) runoff parameters.

The following key updates were made to the model:

- Haul road lengths for 2024 were adjusted to 17 km to remain consistent with observed conditions onsite.
- Decommissioning of MW5 was delayed from the start of 2025 to the start of 2026.

In general, the 2024 SWB remains consistent with the 2023 SWB (BCOPL, 2024).



Source: EMM (2023); BCO (2023); DCSSS (2023); ESRI (2023)

0 0.5 1 km
GDA2020 MGA Zone 56
N

KEY

- Project approval area
- Water storage

Storage catchment

- MW3
- MW5
- Pit
- Block Dam
- SD3
- SD4
- SD6
- SD7
- SD8
- SD10
- SD11
- SD12
- SD23
- SD28

Land use type

- Industrial
- Mine void
- Pre strip
- Rehabilitation
- Undisturbed
- Unshaped spoil dump

Existing environment

- Major road
- Minor road
- Vehicular track
- Regulation hydroline
- Waterbody

Existing water management system- 2024

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Figure 3.1

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3.4 Model validation

This section presents of the outcomes of the model validation for the 2024 calendar year. Model validation was completed by comparing modelled results to observed results for the following key model elements:

- total site water storage volume
- stored water volume at key storages (MW5 and SD10)
- external water import
- dust suppression water use.

3.4.1 Water inventory

BCOPL routinely records storage levels in accordance with the monitoring program described in the SWMP. Recorded storage levels were used to validate storage volumes for the total site, MW5, and SD10.

3.4.1.1 Total site storage

The observed and modelled total site stored volume from January 2020 to January 2025 are compared in Figure 3-2.

Figure 3-2: Observed vs modelled total site storage volume

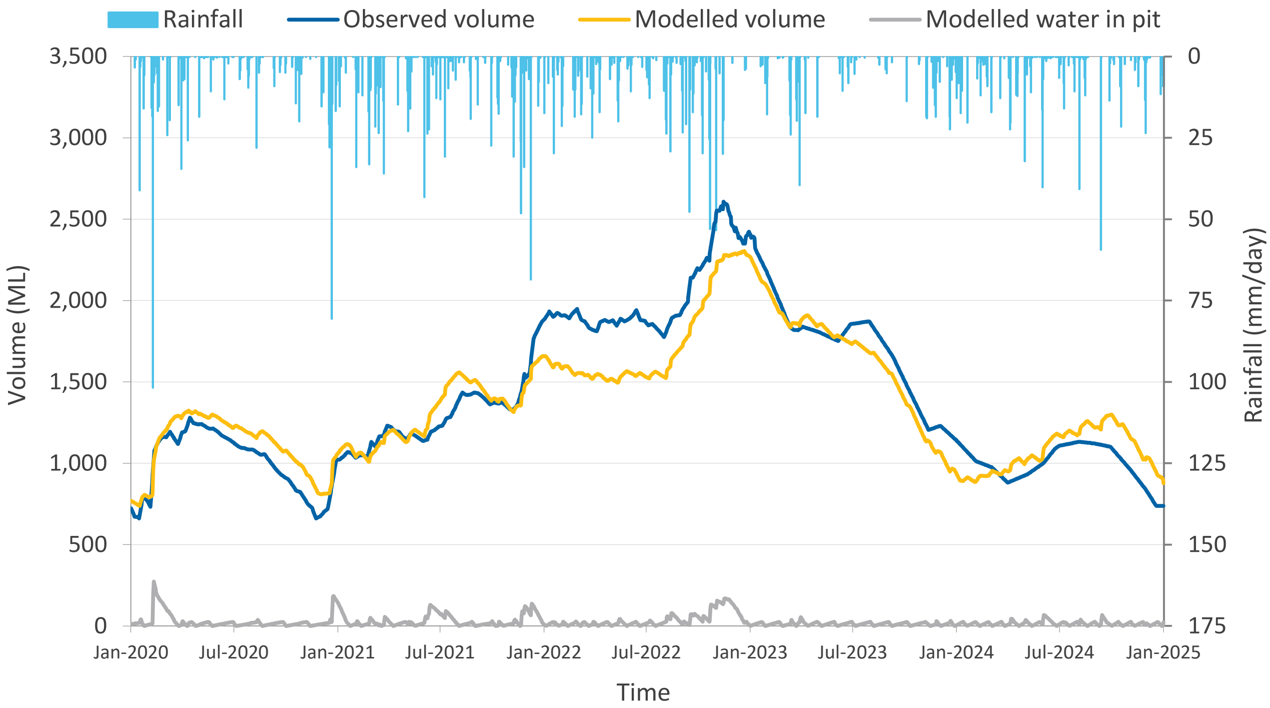


Figure 3-2 shows the modelled storage volume (yellow line) provides a good representation of the observed storage volume (blue line) with similar responses to rainfall occurring for both results. The modelled and observed storage volume are a good match from January 2020 to November 2021. The modelled results show a subdued response to the wet weather period in November and December 2021. After which, the modelled results are shown to follow a similar rise and fall in response to rainfall and storage outflows to the end of 2024.

The total modelled storage volume from January 2022 to January 2023 is generally lower than the observed storage volume due to the underestimation of the 2021 rainfall event.

Overall, the model shows an acceptable fit for total inventory, with the modelled rate of drawdown after rainfall events correlating well with the observed data. Except for the November and December 2021 rainfall event, the magnitude of inflows from rainfall events is also captured by the runoff model.

3.4.1.2 MW5 storage

The observed and modelled storage volume in MW5 from January 2021 to January 2025 are compared in Figure 3-3.

Figure 3-3: Observed vs modelled MW5 storage volume

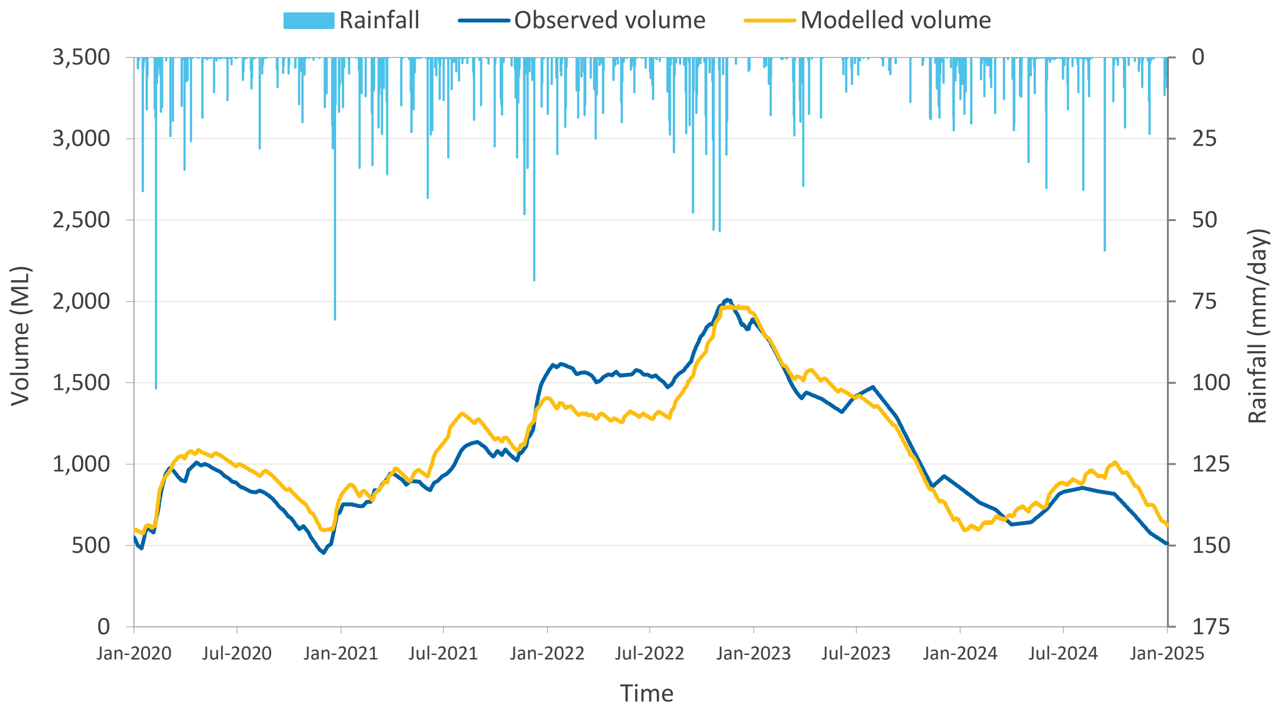
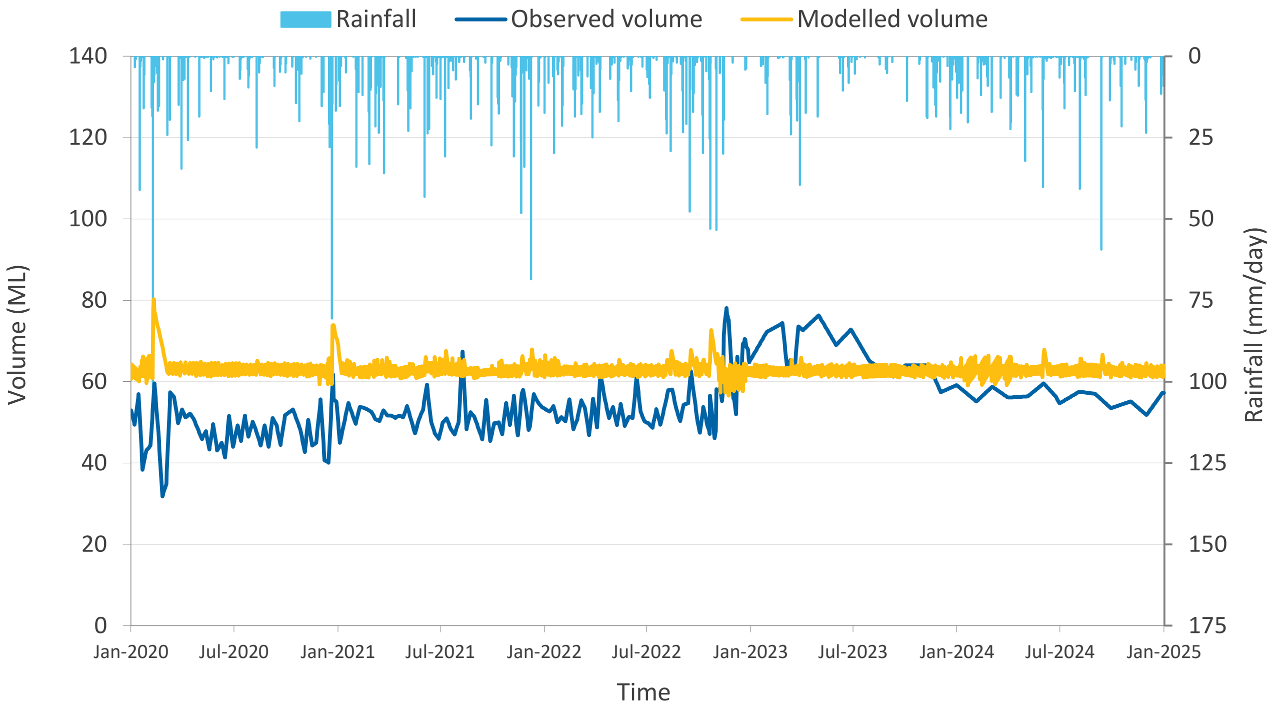


Figure 3-3 shows the modelled storage volume in MW5 is a good match to the observed storage volume with similar responses to rainfall occurring for both results. The modelled volume is underestimated following the November and December 2021 rainfall event as per the total site stored water. The modelled MW5 volume matches the observed peak that occurred During the November 2022 rainfall event as the pumping and transfer rules described in Appendix B preferentially send water to MW5 from the rest of the WMS whenever an excess is observed up until MW5 reaches its HOV.

3.4.1.3 SD10 storage

The observed and modelled storage volume in SD10 from January 2020 to January 2025 are compared in Figure 3-4.

Figure 3-4: Observed vs modelled SD10 storage volume



SD10 operates as a transfer point for water to and from MW5 as well as supplying water to the CHPP and MIA. Modelled storage volumes are elevated compared to observed values prior to January 2023. The modelled storage volumes are similar to observed values from January 2023 onwards. Modelled storage volumes are shown to follow a relatively stable trend as per the observed values. This is expected as SD10 has a relatively small contributing catchment area and is therefore strongly influenced by pumped transfers to and from other aspects of the WMS. The observed storage volume fluctuates more than the modelled volume due to day-to-day operational decisions which may vary from the strict rules implemented within the WBM. The modelled operating logic is considered to be capturing the operation of SD10 adequately.

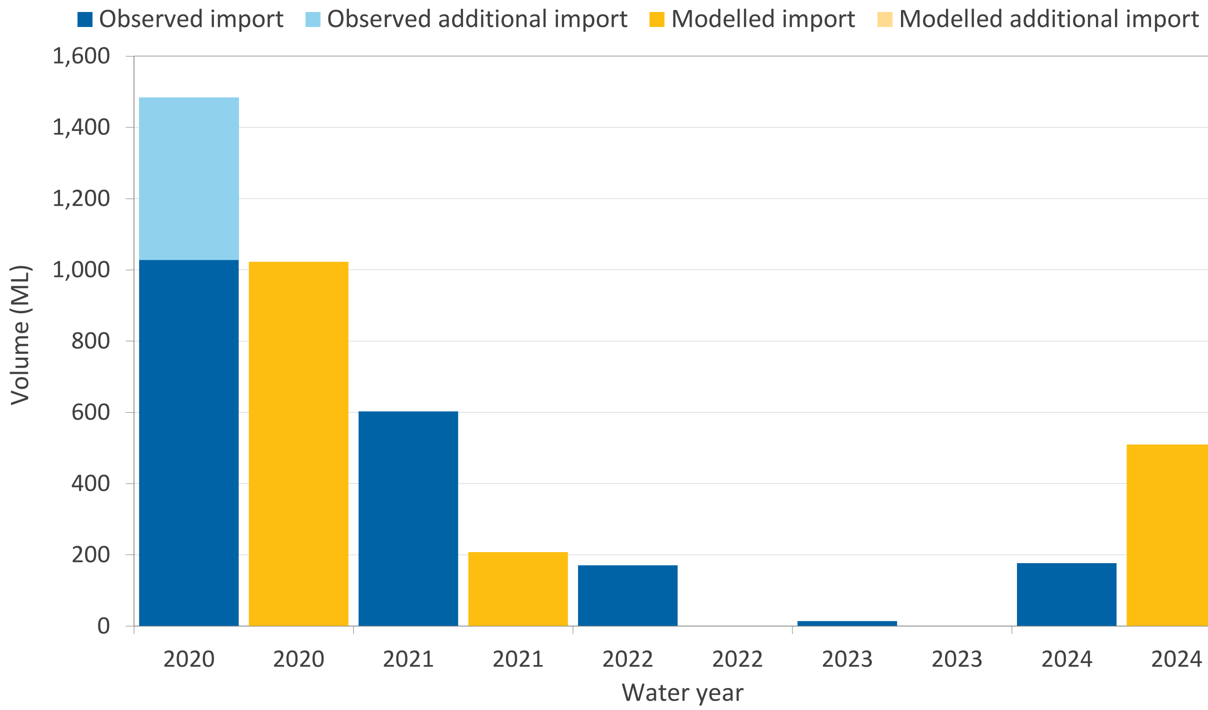
3.4.1.4 Summary

Modelled storage volumes generally match observed storage volumes with the key trends in rainfall and runoff adequately represented. Typically, modelled results differ from observed results due to the model operating rules described in Appendix B. In reality, water may be preferentially held in one storage or another on a case-by-case basis which is difficult to replicate in a model based on rules and assumptions.

3.4.2 Water import

Consistent with the water source prioritisation strategy described in the SWMP and summarised in Appendix B.3.6, the SWB model preferentially sources import water from groundwater sources as water from the Namoi River is often unreliable during dry periods. As a result, modelled water import has been classified as either groundwater import or additional import, where the additional import is assumed to be sourced from the purchase of additional temporary groundwater entitlements (but other options such as river water may be explored). Modelled water imports are compared to observed water imports on a water year (July to June) basis in Figure 3-5.

Figure 3-5: Observed vs modelled water import: water year (July to June)



The SWB model is shown to generally underestimate the volume of water imported from the borefield or additional sources. The underestimation of imported water from 2020 to 2022 is primarily associated with the updated SWB model logic which preferentially sources CHPP and MIA water demand (several hundred megalitres a year) from SD10 via a filtration system (implemented in the 2022 calendar year) rather than directly from the borefield.

Due to the substantial volume of water stored onsite (refer to Figure 3-7) through 2022 and 2023, only 13.6 ML was imported from the borefield during the 2022/2023 water year. The SWB model predicted zero water imports during 2022 and 2023 which is consistent with the observed values.

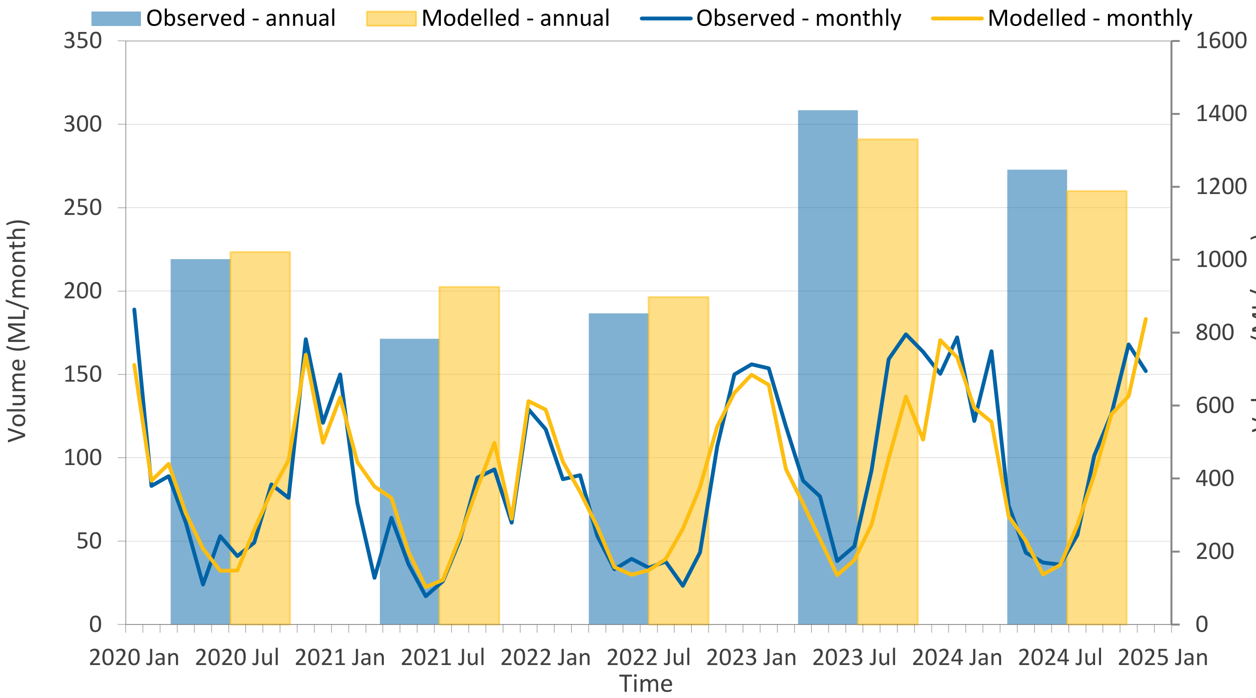
The water balance model predicted that all water take in 2024 would occur in the first half of the year (i.e. during the 2023/2024 water year). BCM recorded a water take volume of 177 ML (refer to Figure 3-7) in the first half of 2024, however 353 ML was extracted over the full year. The model predicted a water take volume of 510 ML for 2024 which is 31% greater than the actual take for 2024. The difference in water take timing and volume can be attributed to differences between the model logic and operational decisions.

3.4.3 Dust suppression

Monthly and annual modelled dust suppression use is compared to observed values in Figure 3-6. Modelled dust suppression usage generally shows a good match to observed values. Annual modelled dust suppression values range from 18% higher than observed values in 2021 to 6% less than observed values in 2023. Monthly modelled dust suppression is shown to follow similar trends to observed values (i.e. higher in summer and lower in winter).

Total haul road area and the applied evaporation rate both have a degree of uncertainty around them when estimating dust suppression, as such the small variance from observed usage is acceptable for the SWB model. The methodology for modelling dust suppressions is outlined in Appendix B.3.7.

Figure 3-6: Observed vs modelled dust suppression



3.4.4 Validation outcome

The validation of the SWB model against total and key storage volumes, water import, and dust suppression was found to provide a suitable estimation of observed values. As a result, the SWB model is considered adequate and suitable to forecast conditions for the LOM. Recommendations to improve validation outcomes and the veracity of the model in future model updates are made in Section 5.1.

3.5 Forecast model results

The SWB model was used to forecast the performance of the BCM WMS over the LOM to assess the risk of water shortfall or water excess and to allow for mine planning to be undertaken to mitigate potential risks.

The SWB model was run for a total of 130 times using simulated rainfall and evaporation conditions sampled from the historical climate record (refer to Appendix A). The results of the simulation are presented in the following sections.

3.5.1 Model results summary

The median annual site water balance for the 2025, 2026, 2028, 2033 and 2036 mine years is provided in Table 3-1. It should be noted the median values of the different inflows and outflows do not coincide and result in an increase or decrease in site water storage volumes. Unlike mean values, the median of the total inflows and total outflows do not balance exactly. Nonetheless, median values have been shown as they are a more representative measure of central tendency for processes with skewed distribution such as rainfall/runoff.

Table 3-1: Median site water balance for select mine years

Water management system component	2025	2026	2028	2033	2036
Inflows (ML)					
Runoff and direct rainfall:					
• Dirty water storages	119	118	381	444	439
• Contaminated water storages and pit	655	634	437	426	416
Groundwater interception	424	582	238	230	127
Imported water from borefield	747	573	819	647	752
Import water from additional sources	0	0	0	0	0
Total inflows (ML)	1,945	1,906	1,876	1,747	1,734
Outflows (ML)					
Demands:					
• Dust suppression – haul roads	1,246	1,444	1,432	1,154	1,159
• CHPP/MIA	310	310	311	310	311
Evaporation:					
• Dirty water sediment dams	37	40	137	221	233
• Contaminated water dams, MWDs and pit	222	198	198	198	199
Discharges:					
• Dirty water sediment dams	0	0	0	0	0
• Mine water dams and pit	0	0	0	0	0
Total outflows (ML)	1,816	1,992	2,079	1,883	1,902
Change in storage (ML)	87	-15	40	12	15

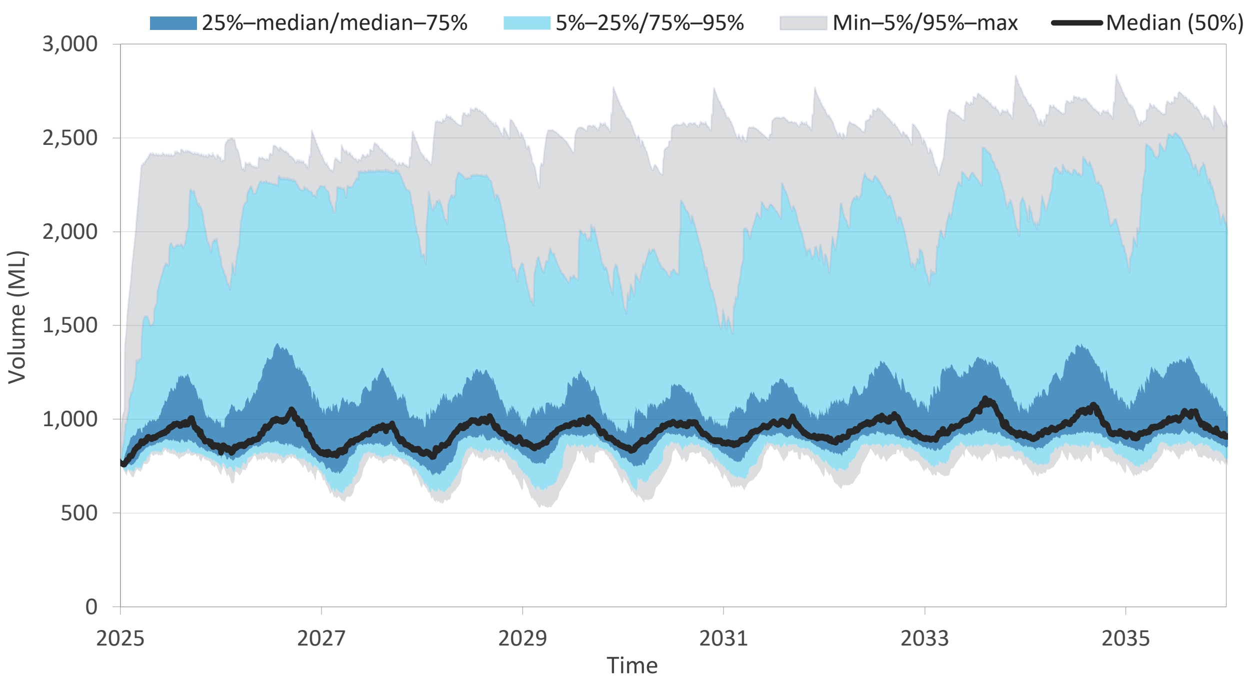
The SWB model results presented in Table 3-1 indicate water imported from the borefield represents between 30% and 44% of total median inflows. Rainfall and runoff make up between 39% and 50% of total median inflows while groundwater interception represents between 7% and 31% of total median inflows. Import from additional water sources is not predicted to be required under median conditions.

Water used for dust suppression is the largest outflow from the system, representing between 61% and 72% of total median outflows. CHPP and MIA water demand represent between 15% and 17% of total median outflows while evaporation losses range from 12% to 23% of total median outflows. No discharges are expected under median conditions.

3.5.2 Total site storage

Forecasted estimates for total site storage volume (less the volume stored in the pit) are shown in Figure 3-7. The results are presented as the range between the minimum and 5th percentile, 5th percentile and 25th percentile, 25th percentile and median, median and 75th percentile, 75th percentile and 95th percentile, and 95th percentile and maximum values. Note the percentile values for stored volumes represent the daily results, whereas the values shown in Table 3-1 represent annual results.

Figure 3-7: Modelled daily timeseries for total site volume

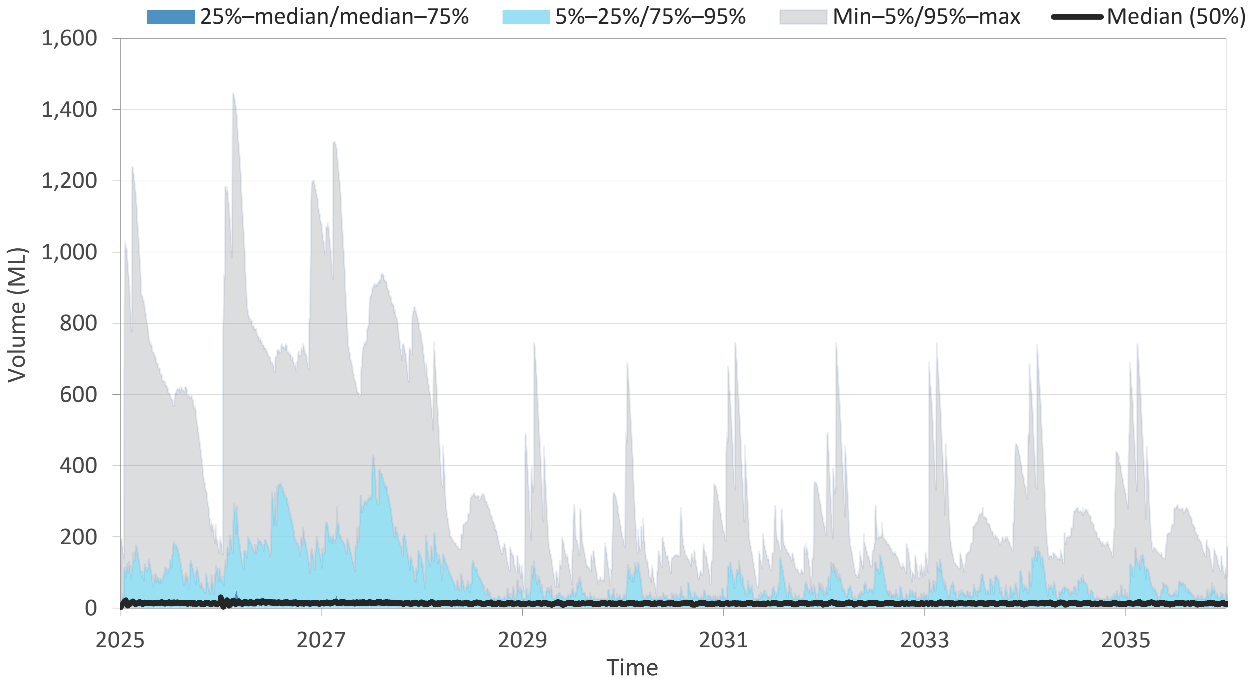


Total site storage is shown to remain relatively stable as the mine progresses with minimum to 75th percentile value range tightly grouped to the median result (shown as the black line). This is expected as the mine is generally in water deficit on an annual basis as rainfall and runoff volumes are typical less than water demands. Hence, the volume of stored water in the system is maintained at a constant level due to imports from the borefield. The 75th percentile to maximum result represents the WMS response to significant wet weather periods that could occur in the future (based on historical rainfall events).

3.5.3 Water stored in the pit

Forecasted model results of water stored in the pit over the LOM are provided in Figure 3-8. The pit void is predicted to be empty most of the time with the maximum predicted volume stored in the pit estimated at 1,400 ML. The volume of water that is expected to be stored in the pit decreases over time as the contributing catchment area to the pit decreases as rehabilitation progresses.

Figure 3-8: Modelled daily timeseries of water stored in-pit



3.5.4 Water supply reliability

Annual predicted water imports (based on the water year) over the LOM are shown in Figure 3-9. The volume of imported water is compared to BCOPL's existing groundwater entitlements (1,028 unit shares) to extract from the borefield and surface water entitlements (322 unit shares) to extract from the Namoi River. BCOPL preferentially sources import water from groundwater sources and typically utilises account carryover as set out under the rules of the water sharing plan or the temporary trade of entitlement to meet onsite water demands. However, the use of river water is still an option and has therefore been included for consideration in this section.

Figure 3-9: Annual modelled water imports

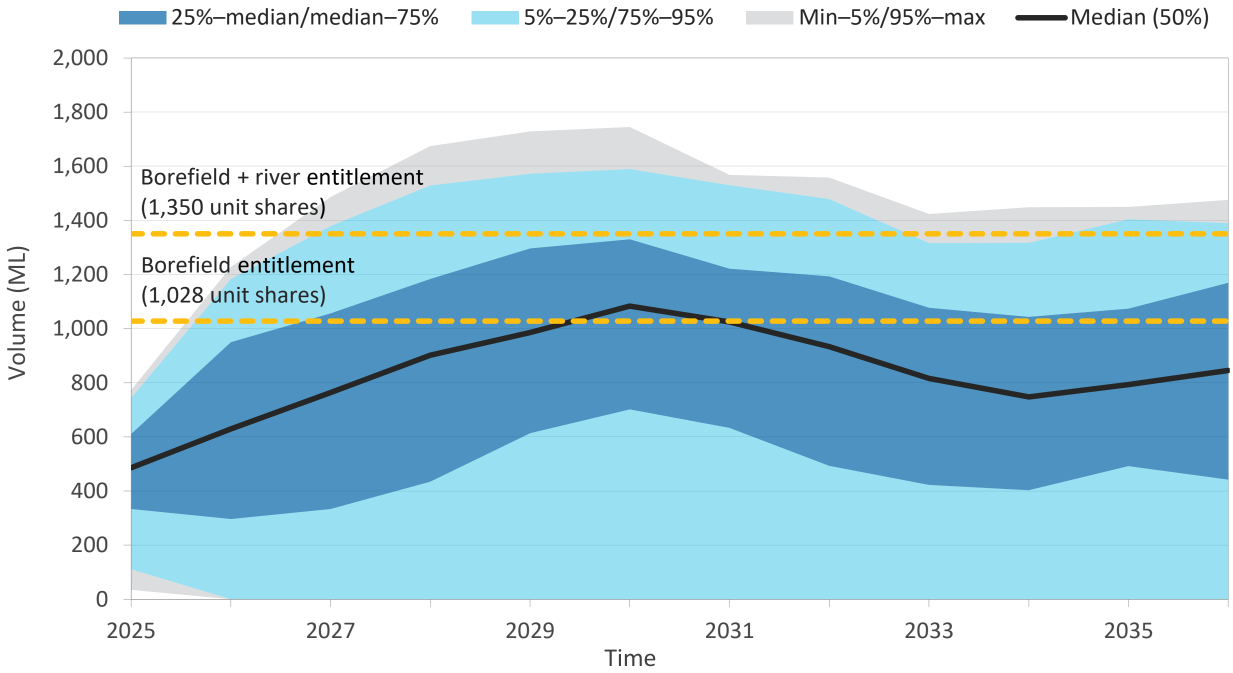


Figure 3-9 shows imported water is expected to peak at the end of 2030 due to increased dust suppression requirements associated with longer proposed haul roads and decreased runoff potential as larger areas of the existing mine void become rehabilitated. The maximum predicted volume of 1,745 ML/year exceeds BCOPL's existing groundwater and surface water entitlements by 395 ML. The probability of requiring additional water entitlements in excess of BCOPL's existing entitlements ranges from 5–25% per year over the LOM.

Condition 33 of the Project Approval requires BCOPL to have sufficient water for all stages of the Project, and if necessary, adjust the scale of mining operations on site, to match its available water supply. Water requirements in excess of BCOPL's entitlements have historically been met via account carryover rules that are applicable to groundwater sources within the Water Sharing Plan for the Namoi Alluvial Groundwater Sources 2020 (the Namoi Alluvial WSP) or via temporary trade within the Upper Namoi Zone 4, Namoi Valley Groundwater Source.

The water allocation account management rules in the Namoi Alluvial WSP permit the carryover of 2 ML per unit share of entitlement from one water year to the next, allowing BCOPL to carry over up to 2,056 ML for use in the following water year. Under typical climate conditions, account carry over is expected to provide sufficient available water to meet demands. Account carryover becomes less effective following several consecutive dry years as the available carryover volume decreases each year (i.e. due to use). Temporary trade of groundwater entitlements is undertaken to meet water demands when account carry over is depleted.

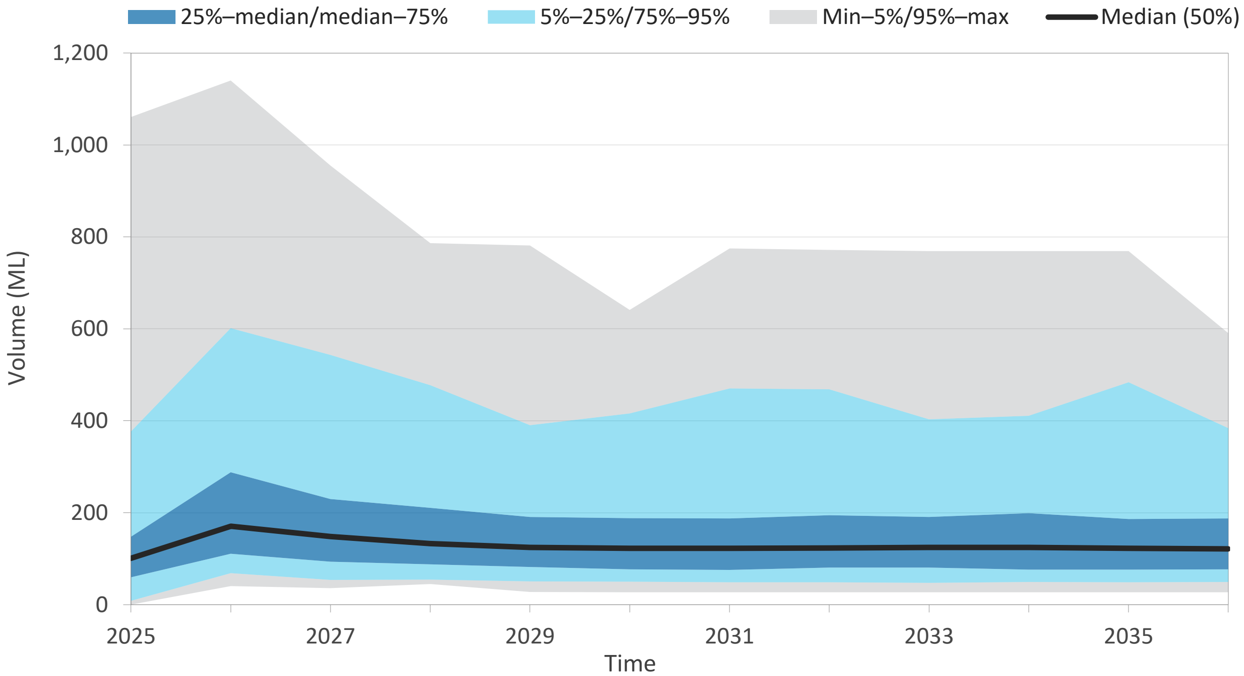
The Upper Namoi Zone 4, Namoi Valley Groundwater Source has a total of 21,000 unit-shares of aquifer access licences and an active trading market. BCOPL has historically been successful in temporary trading water entitlements to meet operational water demands during drier periods including during the 2018 to 2019 drought. The significant number of entitlements available and active water market provides confidence that BCOPL will be able to continue using temporary trade as a viable option to secure any additional water entitlements that may be needed during drier periods.

However, there remains a residual risk that mining operations may be impacted if BCOPL are unable to successfully temporary trade additional water entitlements to meet potential water demands in the future.

3.5.5 Intercepted catchment runoff

Annual runoff from undisturbed catchment area that is predicted to be intercepted over the LOM is shown in Figure 3-10. It should be noted the volumes shown in Figure 3-10 represent all intercepted runoff from undisturbed catchment areas including runoff that is licensable and runoff that does not require licensing due to exemptions.

Figure 3-10: Annual modelled intercepted undisturbed catchment runoff



The predicted volume of intercepted runoff generally decreases over time as mining progresses to the north, reducing the overall contributing catchment area. The median runoff volume over the LOM is 124 ML/year while the 75th percentile is 191 ML/year. BCOPL hold 93-unit shares in the Bluevale Water Source to account for the licensable portion of intercepted catchment runoff. Water accounting is completed quarterly using recorded data and the SWB model. This allows for the actual volume of water take to be accounted for in the year that the take occurs and for the total catchment area that requires licensing to be modified as mining progresses. Additional entitlements are purchased via temporary trade should the SWB model indicate BCOPL may exceed their entitlement.

3.5.6 Offsite discharges

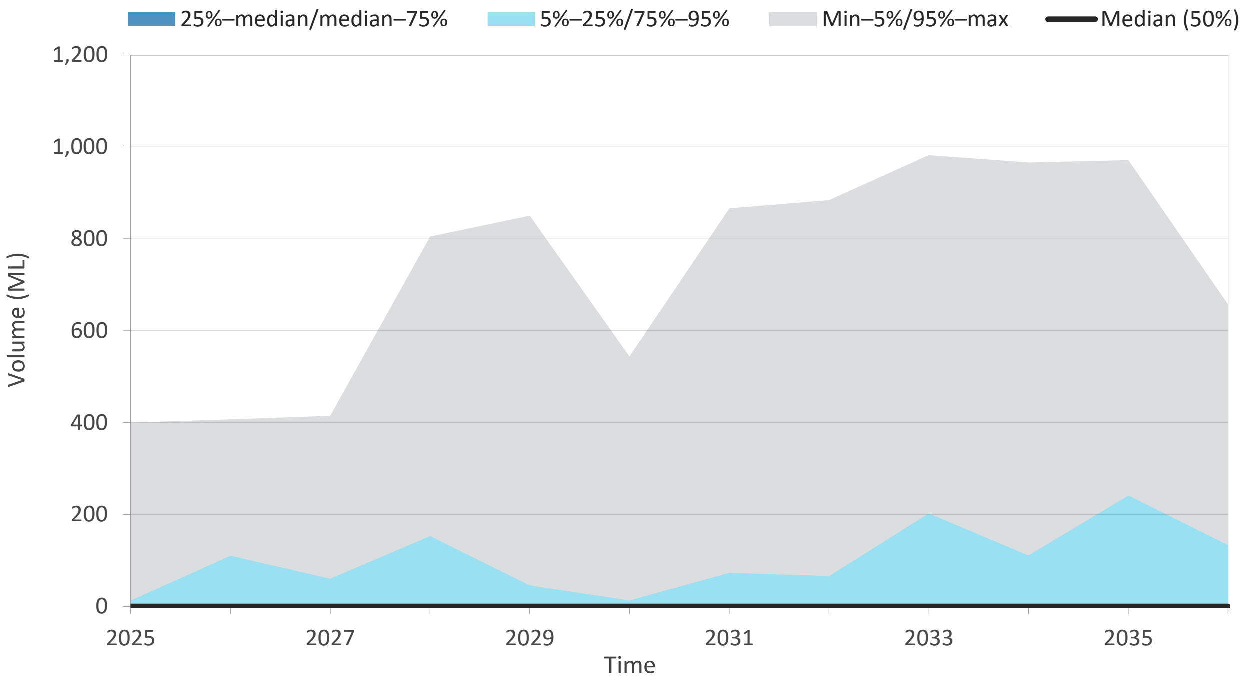
The modelled offsite discharges from dirty water storages are shown in Figure 3-11. No discharges are predicted under median conditions due to the design capacity of MW5/MW11 providing storage space for dirty water runoff in small to moderate rainfall events.

The occurrence of dirty water discharges generally increases over the LOM as rehabilitation progresses and a larger portion of the disturbance area drains to dirty water dams rather than the mine void. A maximum dirty water overflow of up to 982 ML/year is predicted to occur in 2033 when a substantial portion of the disturbed area will drain to sediment dams which are not currently proposed to be harvested from for reuse onsite.

All offsite discharges will be managed in accordance with the conditions of EPL 12407 as described in the SWMP.

No offsite discharges from contaminated water dams are predicted for the LOM. Any excess contaminated water will be stored in the pit to prevent overflows.

Figure 3-11: Annual modelled offsite discharges from dirty water storages



4.0 WATER EFFICIENCY INITIATIVES

The action plan to implement water efficiency initiatives and the recommendations (Advisian, 2016) referenced in Appendix 6A of the Project Approval are provided in Table 4-1.

Table 4-1: Water balance initiatives action plan

Action plan	Schedule
BCOPL water efficiency initiatives	
Propose water efficiency initiatives.	Annually during the SWB review process
Report on the effectiveness of water efficiency initiatives.	Annually in the Annual Review
Water efficiency initiatives (Project Approval Appendix 6A)	
Install meters for all major water flows including:[1]	
Water transfers from sediment dams and mine pits into mine water storages.	Installed, monitoring ongoing and used to inform Annual SWBR
All water-cart fill points.	Installed, monitoring ongoing and reported in Annual SWBR (Section 3.4.3)
All elements of the anticipated water demand for various purposes associated with CHPP (as identified in Table 4 of the letters dated 8 July).	Installed, monitoring ongoing and reported in Annual SWBR (Appendix B.3.7)
All water imports including any bore water obtained onsite.	Installed, monitoring ongoing and reported in Annual SWBR (Section 3.4.2)
Install water level meters on all significant water storages as a check on inflows and outflows and a means of assessing evaporation and seepage losses. This data will also provide a basis for improving estimates of runoff from different surface types (hardstand, mine pit, "raw' overburden, etc.).	Installed, monitoring ongoing and reported in Annual SWBR as part of model validation (Section 3.4.1)
Collect moisture content data for all coal flows associated with the CHPP to permit full water balance accounting.	In progress
Record all flow meters and water levels at least weekly (preferable by means for continuous recording) and analyse the data on a monthly basis to develop a full accounting of all water sources and losses.	Installed, monitoring ongoing and reported in Annual SWBR (Section 3.4)
Compare monitored gains from rainfall and losses by evaporation from water storages to the rainfall and evaporation data from the weather station.	Modelled storage volumes are compared to observed storage volumes in Section 3.5.
Update the site water balance annually based on monitored data and provide details in the Annual Report to the Department.	Commitment to update annual SWB provided in Section 5.2.

Notes: 1. All storages and transfers with level loggers and flow meters are identified in the SWMP.

5.0 ANNUAL IMPROVEMENT PROGRAM

5.1 Recommended improvements

BCOPL undertake annual reviews to identify and address deficiencies and make improvements to the monitoring, measurement, and calculation methods presented in the SWB. The results of the improvement program will be incorporated into the annual revision of the SWB.

It is recommended the following elements of the water balance are reviewed as part of the 2025 SWBR:

- Model calibration – verification of water import volumes following the implementation of water efficiency initiatives at SD6 and SD10 was limited in 2022 and 2023 due to extended wet weather removing the need to import water (refer to Section 3.4.2). Water import volumes were similar between modelled and observed values over the 2024 calendar year. The performance of modelled water imports should be reviewed again in 2025 and if necessary, calibration should be reviewed accordingly.
- Review of AWBM parameters – data from the expanded BCM surface water monitoring program should be utilised to improve calibration of the AWBM runoff parameters including for undisturbed catchment areas.
- Water storage staging – the staging of any new storages or storage upgrades should be reviewed to make sure they are current for the 2025 calendar year and forecasted mine plan.

5.2 Validation program

BCOPL is committed to performing a validation of the SWB model annually. In this validation procedure, the existing model is used to simulate the WMS for the previous year using observed climate data as an input. The modelled results such as water imports, dust suppression water use, and storage volumes (total, MW5, and SD10) are then compared to observed values.

If the SWB model is not representative of the WMS, an investigation into any discrepancies will be conducted with the aim of calibrating the model correctly. The updated model will be used to update the predictions described in Section 3.5.

A summary of the annual validation program outcomes will be included in the Annual Review report.

6.0 REPORTING AND REVIEW

Regular reporting on environmental performance and requirements relevant to the SWBR will be conducted in accordance with Schedule 5, Condition 9 of Development Consent SSD09_0182. Annual reporting and reviews relevant to the SWBR are described in the sections below.

6.1 Reporting

General and specific reporting requirements relevant to this SWBR are described in Table 6-1.

Table 6-1: Reporting requirements

Reporting aspect	Reporting procedure
Annual Return	EPL 12407 contains conditions that require BCOPL supply the EPA with an Annual Return. Details of the Annual Return reporting requirements and procedures are documented in Section 5.1.1 of the WMP.
Incidents and non-compliance	In accordance with Schedule 5, Conditions 4 of Development Consent SSD 09_0182, BCOPL will notify the Secretary and any other relevant agencies of any incident that has caused, or threatens to cause, material harm to the environment at the earliest convenience. Any other incident associated with BCM will be reported as soon as practicable. A report will be provided the relevant stakeholders within 7 days of the date of the incident. BCOPL will manage and report environment incidents, complaints, non-conformances with relevant statutory requirements and exceedances of performance criteria as outlined in the BCOPL Incident Management Standard and described in Chapter 7.0.
Annual SWBR	BCOPL will prepare an annual SWBR in accordance with Schedule 3, Condition 38 of the Development Consent SSD 09_0182. A summary of the annual SWBR will be included in the Annual Review report for each calendar year.

6.2 Review

General and specific review requirements relevant to this SWBR are described in Table 6-2.

Table 6-2: Review requirements

Review aspect	Review procedure
Annual Review	BCOPL prepares and submits an Annual Review with respect to the environmental performance of the development to relevant agencies. Details of the Annual Review requirements are documented in Section 5.1.2 of the WMP.
SWB review	BCOPL will review the SWB in accordance with Schedule 5, Condition 4 of Development Consent SSD 09_0182. Details of the review process are documented in the WMP.

7.0 INCIDENT, NON-COMPLIANCE AND COMPLAINT MANAGEMENT

7.1 Incident identification and notification

In accordance with Schedule 5, Condition 14 of Development Consent SSD 09_0182, BCOPL will immediately notify the Department and any other relevant agencies after it becomes aware of an incident that was a result of the BCM. The notification must:

- Be in writing via the Department's Major Projects Website.
- Identify the development (including the application number and name).
- Set out the location and nature of the incident.

In accordance with Condition 34 and 35 of EPBC 2021/8875, BCOPL will notify DCCEEW within two business days of becoming aware of an incident. Within 12 business days of becoming aware of the incident, BCOPL will notify DCCEEW of the potential impacts, corrective actions taken and their timing, and any required changes to EPBC 2021/8875 conditions or management plans.

Further details on the incident identification, notification and reporting process are provided in Section 6.1 of the WMP.

7.2 Non-compliance notification

In accordance with Schedule 5, Condition 15 of Development Consent SSD 09_0182, within seven days of becoming aware of a non-compliance, BCOPL will notify the Department of the non-compliance. The notification will be in writing via the Department's Major Projects Website and will:

- Identify the development (including the application number and name).
- Set out the condition of the development consent that the development is non-compliant with.
- State why it does not comply and give the reasons for the non-compliance (if known).
- Detail what actions have been, or will be, undertaken to address the non-compliance.

A non-compliance which has been notified as an incident will not also be notified as a non-compliance.

Further details on the non-compliance notification process are provided in Section 6.2 of the WMP.

7.3 Complaints

In accordance with Schedule 5, Condition 12 of Development Consent SSD 09_0182, BCOPL will maintain a complaints register, which will be updated monthly, to receive, respond to and record community complaints.

A summary of complaints for each operational year is available on the Idemitsu website, detailing the date and nature of each complaint, along with the actions taken by BCOPL to investigate the matter.

Further details on the complaints management process are provided in Section 6.3 of the WMP.

8.0 REFERENCES

- Advisian (2016). *Peer Review of Site Water Use Aspects of Boggabri Coal MOD5 Project*.
- AGE (2020). *Boggabri, Tarrawonga, Maules Creek Complex Groundwater Model Update*.
- AGE (2022). *Groundwater Impact Assessment Boggabri Coal Mine MOD 8 Amendment to SSD 09_0182*.
- ANZECC (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.
- ANZG (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.
- BCOPL (2024). *Boggabri Coal Mine - 2023 Site Water Balance Report*.
- Boughton 2004. *Australian water balance model. Environmental Modelling & Software 946-956.*
- DECC (2008). *Managing Urban Stormwater: Soils and Construction, Volume 2E – Mines and quarrie*s.
- DECCW (2006). *NSW Water Quality and River Flow Objectives*.
- Engeny (2022). *Boggabri Coal Mine Modification 8 Amendment: Updated Surface Water Assessment*.
- Hansen Bailey (2010). *Continuation of Boggabri Coal Mine Environmental Assessment*.
- JBA (2022). *Boggabri Coal Mine Modification 8: Amendment Report*.
- Landcom (2004). *Managing Urban Stormwater - Soils and Construction. 4th edition*.
- WSP (2010). *Boggabri Coal Mine Project Surface Water Assessment*.

9.0 ABBREVIATIONS

Abbreviation	Definition
ARI	Average Recurrence Interval
ASCF	Aboriginal Stakeholder Consultation Forum
BCM	Boggabri Coal Mine
BCOP	Boggabri Coal Operations Pty Ltd
BCSD	Department of Planning and Environment – Biodiversity Conservation and Science Division
BCT	Boggabri Coal Terminal
BMP	Biodiversity Management Plan
BOA	Biodiversity Offset Areas
BTM	Boggabri, Tarrawonga, Maules Creek
CBIMP	Common Boundary Integration Management Plan
CCC	Community Consultative Committee
CEC	Cation Exchange Capacity
CFMP	Clearing and Fauna Management Protocol
CHMP	Cultural Heritage Management Plan
CHPP	Coal Handling and Preparation Plant, including By-pass crusher
CL	Coal Lease
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Development Application
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DECC	Former Department of Environment and Climate Change
DECCW	Former Department of Environment, Climate Change and Water
DPI	NSW Department of Primary Industries
DPE	Former Department of Planning and Environment (now Department of Planning Housing and Infrastructure (DPHI))
DPHI	Department of Planning Housing and Infrastructure
DRE	Former NSW Department of Trade and Investment - Division of Resources and Energy

Abbreviation	Definition
DRG	Former Department of Planning and Environment – Division of Resources and Geoscience
DTIRIS	Former NSW Department of Trade and Investments, Regional Infrastructure and Services
EA	Environmental Assessment
EC	Electrical Conductivity
EMPs	Environment Management Plans
EP&A Act	Environmental Planning and Assessment Act, 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act, 1999
EPL	Environment Protection Licence
GMP	Groundwater Management Plan
GSC	Gunnedah Shire Council
IA	Idemitsu Australia Pty Ltd
Km	Kilometre
MCA	Minerals Council of Australia
MEG	Department of Regional NSW – Mining, Exploration and Geoscience
MIA	Mine Infrastructure Area
ML	Mining Lease
Mt	Million Tonnes
Mtpa	Million Tonnes Per Annum
NOW	Former NSW Office of Water
NSC	Narrabri Shire Council
NSW	New South Wales
OEH	Former NSW Office of Environment and Heritage
PAC	Former NSW Planning and Assessment Commission
PAF	Potentially Acid Forming
POEO Act	Protection of the Environment (Operations) Act, 1997
Resources Regulator	Department of Regional NSW – Resources Regulator
RMP	Rehabilitation Management Plan

Abbreviation	Definition
RL	Relative Level
RMS	NSW Roads and Maritime Services
ROM	Run of Mine
SCMP	Spontaneous Combustion Management Plan
SD	Sediment Dam
SWB	Site Water Balance
SMP	Soil Management Protocol
SWC	State Water Corporation
SWMP	Surface Water Management Plan
t	Tonne
TARP	Trigger Action Response Plan
TCPL	Tarrawonga Coal Pty Limited
TSS	Total Suspended Solids
WMP	Water Management Plan
WMS	Water Management Strategy

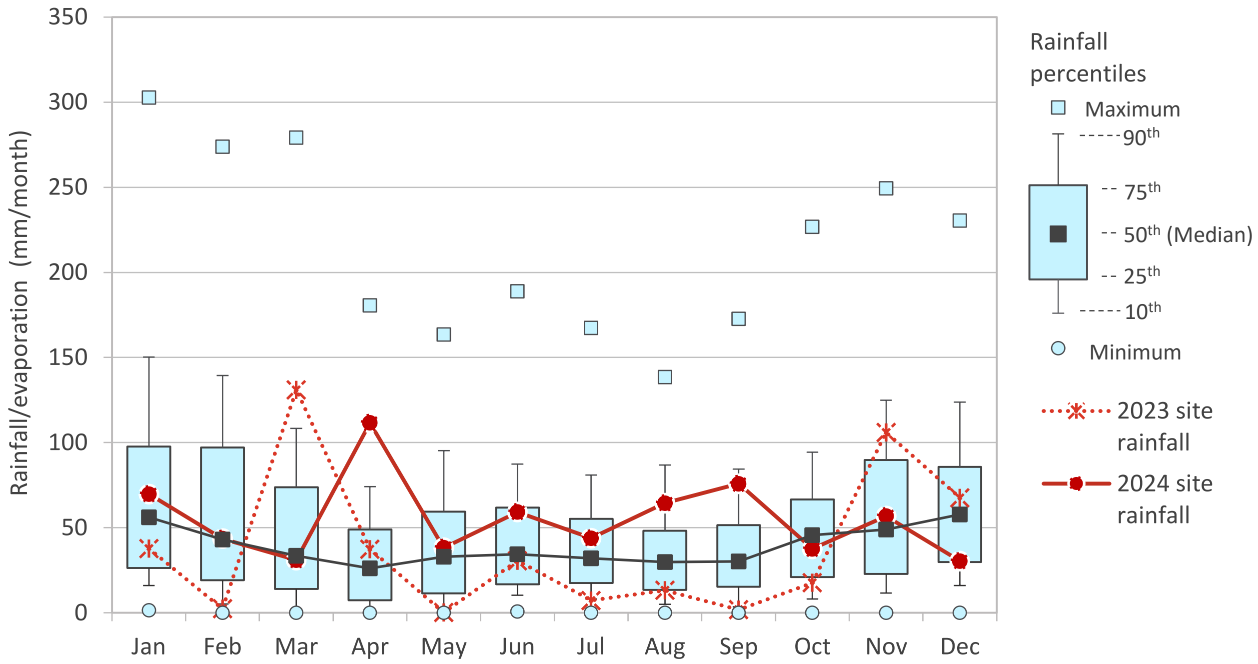
Appendix A
Climate data

A.1 Rainfall data

Daily rainfall data at the Boggabri Post Office gauge was obtained as SILO (Scientific Information for Land Owners) patched point data from the Queensland Climate Change Centre of Excellence. SILO patched point data is based on historical data from the BoM rainfall stations, with missing data 'patched' in by interpolating data from nearby operating stations. SILO data was obtained for Boggabri Post Office gauge from January 1889 to December 2024.

Monthly rainfall statistics for the Boggabri Post Office gauge are shown in Figure A-1. Monthly rainfall totals for the 2023 and 2024 calendar year recorded at the site rainfall gauge are also shown for comparative purposes.

Figure A-1: Monthly rainfall statistics – Boggabri Post Office and site rainfall gauge



Rainfall during the 2023 calendar year was generally drier than typical conditions with most months having rainfall totals less than the historical median value at Boggabri Post Office gauge. Rainfall during the 2024 calendar year was generally wetter than the historical median at Boggabri Post Office gauge. Monthly rainfall totals in 2023 in March, April, November and December had above average rainfall totals with March exceeding the 90th percentile rainfall totals (i.e. rainfall conditions that are only exceeded in 10% of years). All other months had below average rainfall totals with February, May, July and September totals below the 10th percentile indicating an extremely variable rainfall year. Conversely, 2024 rainfall only exceeded the 90th percentile rainfall total in April. All other months had above average rainfall totals excluding March, October and December. The 2023 annual rainfall total at the site gauge of 453 mm is approximately equivalent to a 20th percentile rainfall year based on the 135 years of rainfall data at the Boggabri Post Office gauge, whilst the 2024 annual rainfall of 662 mm equates to roughly a 60th percentile rainfall year.

A.2 Evaporation data

Daily evaporation rates were obtained as SILO patched point data at the Boggabri Post Office gauge over the January 1889 to December 2024 period. Evaporation data was sourced as Class A pan evaporation, Morton's potential evapotranspiration, and Morton's shallow lake evaporation.

The BoM records daily evaporation data at the Gunnedah Resource Centre (GRC) (055024) weather station which is approximately 46 km south-east of the site. The GRC weather station has recorded evaporation data since 1948. The Gunnedah Resource Centre evaporation data is compared to the SILO patched point data for Boggabri Post Office in Figure A-2. The comparison is intended to provide confidence the SILO data reflects actual recorded evaporation values. Average monthly rainfall totals are also presented in Figure A-2 for context.

Figure A-2: Monthly pan evaporation rates – Boggabri Post Office

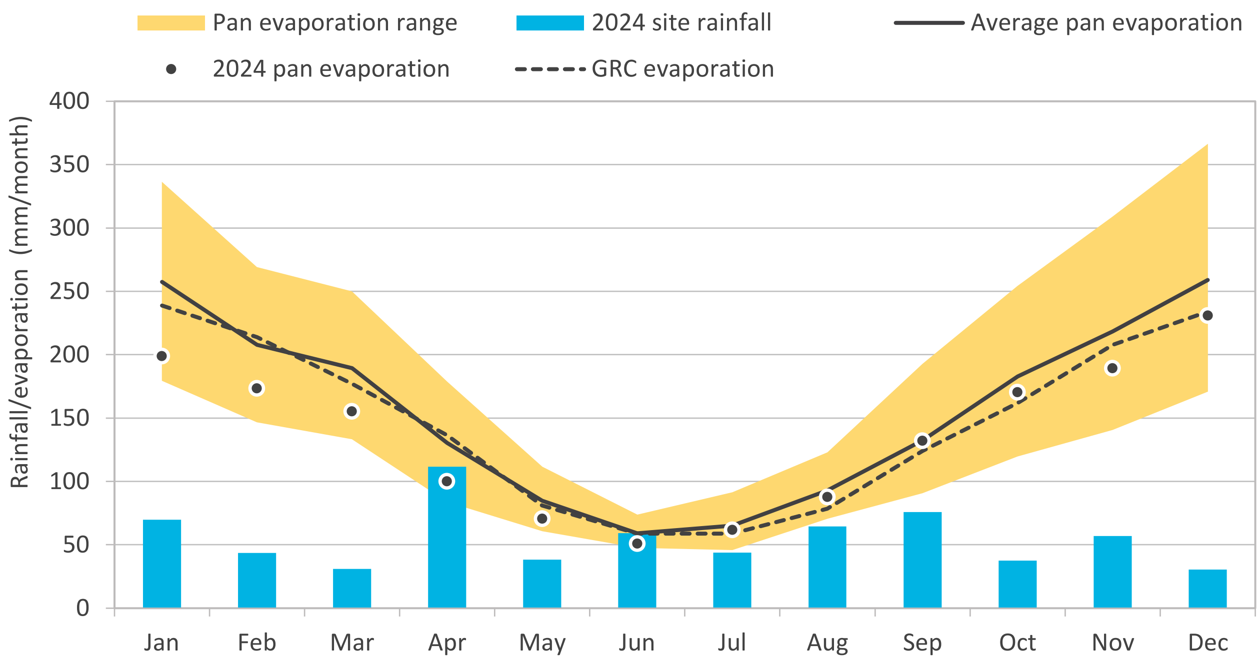


Figure A-2 shows the long-term average data from the SILO patched point data at Boggabri Post Office matches well with the data recorded at the GRC. Monthly evaporation totals are up to four times larger in summer compared to winter. Monthly evaporation totals are shown to have substantially exceeded monthly rainfall totals in most months over the 2024 calendar year.

Appendix B
Water balance methodology

B.1 Overview

The Site Water Balance (SWB) model was developed in GoldSim (version 14). The model applies a continuous simulation methodology that assesses the performance of the Boggabri Coal Mine (BCM) water management system (WMS) under a range of climate conditions. The model was created by representing the WMS as a series of elements, each containing pre-set rules and data, that were linked together to simulate the interaction of these elements.

The water balance model simulated the volume of water stored within the BCM WMS based on the following equation:

Change in volume over time = inflows – outflows

Where:

- Modelled inflows consisted of direct rainfall onto the water surface area of each storage, catchment runoff, groundwater inflows, and make up water imported from the BCM borefield and the Namoi River.
- Modelled outflows consisted of evaporation from the water surface area of each storage, dust suppression water use, Coal Handling and Preparation Plant (CHPP) and Mine Infrastructure Area (MIA) water use, and via discharge from storage outlets due to overflows.

The modelled WMS including how each component is linked is shown schematically in Appendix C.

B.2 Modelling approach

B.2.1 Simulation period

The SWB model simulates the historical WMS performance (back to approximately 2019) for verification purposes as well as the next 11 years (between 2025 and 2036) of the Life-of-Mine (LOM) for forecasting purposes. The simulation period can be updated as needed to investigate a shorter or longer LOM or future operational scenarios.

The SWB model includes 135 years of historical rainfall and evaporation data allowing the LOM to be simulated using a range of climate conditions (refer to Appendix C).

B.2.2 Timestep

Water is pumped across the BCM WMS based on pre-determined rules and pump rates (refer to Table B-4). Daily pump rates for some transfers, such as those between MW5 and SD23 to meet dust suppression demands, may exceed the actual volume of water that requires pumping in each day resulting in more water being transferred than what would occur under actual operations.

A sub-daily timestep is required to allow less than the maximum daily pump rate to be transferred per day. The SWB model applies a 6-hour timestep to adequately simulate the ability to operate pumps at sub-daily intervals.

B.3 Model assumptions

B.3.1 Climate

Rainfall

Historical daily rainfall data from 1889 to 2023 (135 years) obtained as patched point data from the SILO database, as discussed in Appendix A was applied the SWB model. Daily rainfall was applied to calculate direct rainfall onto the simulated water surface of each modelled storage whereby the volume of direct rainfall was calculated as the product of the simulated rainfall depth and the water surface area of the storage, calculated from surveyed stage-storage-area relationships.

Daily rainfall was also applied to the rainfall runoff model described in Appendix B.3.2 to estimate runoff from the WMS contributing catchment.

Evaporation

Daily evaporation rates at the Boggabri Post Office gauge were obtained as SILO patched point data from 1889 to 2023 (135 years). Evaporation data was sourced as Morton's potential evapotranspiration and Morton's shallow lake evaporation and applied to the SWB model as follows:

- Morton's potential evapotranspiration – applied to the rainfall runoff model and to calculate dust suppression demand.
- Morton's shallow lake evaporation – applied to calculate evaporation from pond water surface areas.

B.3.2 Runoff model

Australian Water Balance Model (AWBM) overview

The volume of surface water runoff from the mine site catchment has been estimated using the Australian Water Balance Model (AWBM). The AWBM was developed by Boughton (2004) and is widely used across Australia to estimate stream flow and runoff. The AWBM has been incorporated into the SWB model.

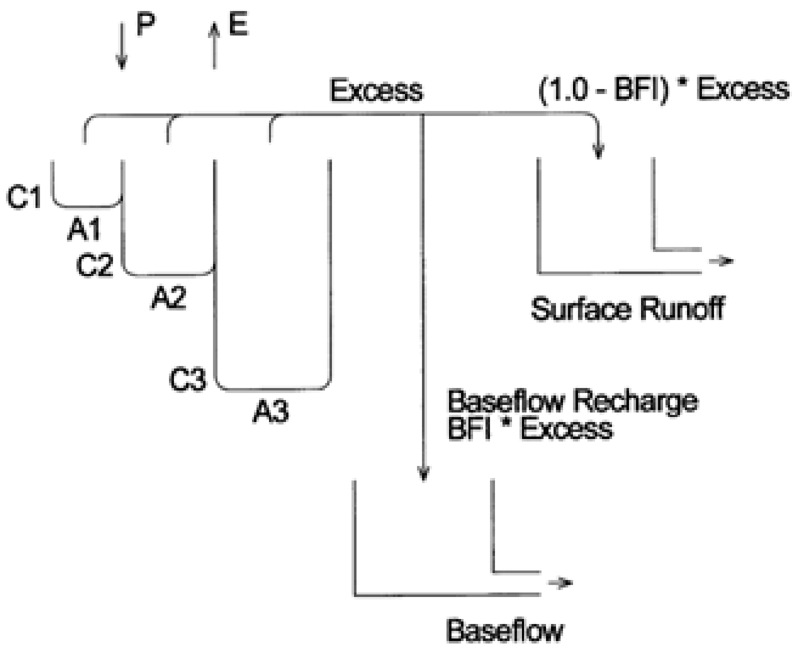
The AWBM is a 'bucket model'. It describes catchment runoff processes using the concept of surface stores (buckets), which trap rainfall and must fill before runoff can occur. Spatial variability is incorporated by using three stores, each with a different capacity (C1, C2 and C3) and partial areas (A1, A2 and A3, where A1+A2+A3=1). Hence, parts of the catchment generate runoff after only a small depth of rain has fallen, while other parts of the catchment only generate runoff after significant ponds have formed and overflowed.

Since the AWBM is a continuous simulation model, antecedent moisture conditions within the catchment are tracked over time within the stores such that catchment wetness from preceding rainfall affects runoff generated by subsequent rainfall. For example, the first day of rain after a dry summer may generate a lower percentage of runoff than subsequent days of rainfall.

The AWBM was used to estimate catchment runoff from the various land use categories across BCM. The land use categories considered were undisturbed, rehabilitated spoil, industrial (hardstand and infrastructure areas), mining void (pit), active spoil and pre-strip.

A schematic of how the AWBM represents rainfall runoff is shown in Figure B-1.

Figure B-1: Schematic layout of the AWBM rainfall-runoff model (Boughton, 2004)



AWBM model parameters

The AWBM is defined by nine parameters: three soil storage capacities, three partial areas, and three recession parameters. The AWBM parameters were selected to reflect the different hydrological responses of each of the six catchment land use types included in the SWB model. The AWBM parameters applied to the SWB model are presented in Table B-1. The model validation results presented in Section 3.4 indicate the adopted AWBM parameters are representing the WMS processes adequately.

Table B-1: Adopted AWBM parameter values

Land use	BFI	K_{base}	K_{surf}	A1	A2	A3	C1	C2	C3
Industrial	0.0	0.0	0.0	0.134	0.433	0.433	10	35	85
Open cut	0.0	0.0	0.0	0.2	0.2	0.6	15	50	150
Pre-strip	0.2	0.98	0.0	0.134	0.433	0.433	15	60	150
Rehabilitation	0.6	0.99	0.0	0.2	0.2	0.6	20	120	200
Spoil	0.9	0.99	0.0	0.2	0.2	0.6	20	130	220
Undisturbed	0.05	0.98	0.0	0.134	0.433	0.433	13	120	200

B.3.3 Water storages

All water management dams to be included in the water balance model, and their key operating volumes, are summarised in Table B-2. BCOPL maintain an in-pit mine water dam (MWD) during operations. The in-pit MWD is typically relocated and renamed frequently as the mine progresses. However, the functionality of the storage to transfer water from the pit to MW5/MW11 and to provide a dust suppression fill point for the pit area remain similar over time.

Table B-2: Water storage assumptions

Storage	Type	Online	Dead storage (ML)	LOV (ML)	HOV (ML)	Capacity (ML)	Overflows to
Existing storages							
MW3	Contaminated water dam	-	1.0	5.0	131.0	153.5	Bollol Creek
MW5	Mine water dam	-	1.0	600	1,961	2,200	Pit
MWD	Contaminated water dam	-	1.0	1.0	33.8	92.8	Pit
Pit	Mining void	-	1.0	25.0	200.0	-	-
SD3	Sediment dam	-	16.7	33.3	34.3	102.3	Nagero Creek
SD6	Sediment dam	-	8.7	17.4	18.4	55.9	Nagero Creek
SD7	Sediment dam	-	11.7	23.3	24.3	95.1	Pit
SD8	Sediment dam	-	1.6	3.3	4.3	13.4	SD6
SD10	Mine water dam	-	9.7	19.4	61.7	116.4	SD6
SD11	Contaminated water dam	-	1.4	2.7	3.7	16.4	Nagero Creek
SD12	Contaminated water dam	-	17.2	34.4	35.4	206.6	Nagero Creek
SD23	Contaminated water dam	-	1.6	3.2	4.2	17.0	Pit
SD28	Sediment dam	-	1.0	0.6	1.6	3.5	Nagero Creek
Proposed storages							
SD19	Sediment dam	2028	30.0	60.0	61.0	179.9	SD3

Storage	Type	Online	Dead storage (ML)	LOV (ML)	HOV (ML)	Capacity (ML)	Overflows to
Existing storages							
SD20	Sediment dam	2033	7.0	13.9	14.9	41.8	SD19
SD21	Sediment dam	2033	9.3	18.5	19.5	55.6	Nagero Creek
SD22	Sediment dam	2033	1.0	0.8	1.8	2.4	Nagero Creek
SD24	Sediment dam	2033	1.2	2.4	3.4	7.3	Nagero Creek
MW11	Mine water dam	2025	1.0	600	2,000	2,200	Pit

B.3.4 Catchment areas

The contributing catchment area to each water management dam at several stages in the LOM are provided in Table B-3. The contributing catchment area to each storage is linearly interpolated between these years for the purposes of the water balance model.

It is assumed the Tarrawonga Coal Mine (TCM) catchment area to Nagero Creek discharging across the western boundary of mining lease 1579 discharges directly to Nagero Creek. However, it is understood that these discharges are captured within SD6. The volumes discharged from TCM are not expected to result in any material impact to the SWB model due to the relatively large volume of water storage available at BCM and have therefore been excluded from the SWB model.

Table B-3: Catchment areas over life of mine

Catchment	Catchment area (ha)				
	2024	2025	2026	2028	2033
Existing					
MW3	10.7	10.7	10.7	10.7	10.7
MW5	208	208	-	-	-
MWD	1.7	1.7	1.7	1.7	1.7
Pit	1,405	1,405	1,493	741	741
SD3	194	194	314	314	314
SD6	64	64	64	64	64
SD7	208	208	208	208	208

Catchment	Catchment area (ha)				
	2024	2025	2026	2028	2033
Existing					
SD8	10.9	10.9	10.9	10.9	10.9
SD10	32	32	32	32	32
SD11	3.9	3.9	3.9	3.9	3.9
SD12	46	46	46	46	46
SD23	57	57	-	-	-
SD28	0.6	0.6	0.6	0.6	0.6
Proposed					
SD19	-	-	-	657	657
SD20	-	-	-	95	95
SD21	-	-	-	-	116
SD22	-	-	-	-	7
SD24	-	-	-	-	17
MW11	-	-	57	57	57
Total	2,242	2,242	2,242	2,242	2,382

B.3.5 Pump transfers

The operating rules applied to pump transfers in the water balance model are summarised in Table B-4. All pumping operations and rules are based on the existing and proposed infrastructure. The pumps are modelled to switch on when the on trigger occurs and the specific conditions are true. The pump remains on until the off trigger occurs, or the conditions become false. The pump triggers and conditions are based on the low operating volume (LOV) and high operating volume (HOV) for each storage. It was assumed that pumping occurs at an average pump rate and no allowance has been made for changes to flowrate with changes in head.

Table B-4: Pump operating rules

Pump from	Pump to	Pump rate (ML/day)	On trigger	Off trigger	Conditions
Existing					
Pit	MW8	5.0 (10.0 if pit volume exceeds 200 ML)	Pit > LOV	Pit < LOV	MW8 < HOV
Pit	MW5	5.0 (10.0 if pit volume exceeds 200 ML)	Pit > LOV	Pit < LOV	MW5 < HOV
Pit	SD23	5.0 (10.0 if pit volume exceeds 200 ML)	Pit > LOV	Pit < LOV	SD23 < HOV
MW3	SD10	3.5	MW3 > HOV	MW3 < LOV	SD10 < HOV
MW5	MWD	5.0	MW5 > dead storage volume	MW5 < dead storage volume	MWD< HOV
MW5	SD23	5.0	MW5 > dead storage volume	MW5 < dead storage volume	SD23 < HOV
MW5	SD10	5.0	MW5 > dead storage volume	MW5 < dead storage volume	SD10 <HOV
SD3	SD12	5.0	SD3 > HOV	SD3 < LOV	SD12 < HOV Pit < HOV
SD6	SD10	2.0	SD6 > HOV	SD6 < LOV	SD10 < HOV Pit < HOV
SD7	SD12	10.0	SD7 > HOV	SD7 < LOV	SD12 < HOV
SD8	SD10	1.9	SD8 > HOV	SD8 < LOV	SD10 < HOV
SD10	MW5	10.0	SD10 > HOV	SD10 < HOV	MW5 < HOV
SD10	MW3	10.0	SD10 > HOV	SD10 < HOV	MW3 < HOV MW5 > HOV
SD10	Pit	10.0	SD10 > HOV MW3 > HOV MW5 > HOV	SD10 < HOV MW3 < HOV MW5 < HOV	-

Pump from	Pump to	Pump rate (ML/day)	On trigger	Off trigger	Conditions
SD11	SD10	2.0	SD11 > HOV	SD11 < LOV	SD10 < HOV
SD12	MW5	20.0	SD12 > HOV	SD12 < LOV	MW5 < HOV
SD23	MW5	3.0	SD23 > HOV	SD23 < HOV	MW5 < HOV
Proposed					
Pit	MW11	5.0 (10.0 if pit volume exceeds 200 ML)	Pit > LOV	Pit < LOV	MW11 < HOV
MW11	MWD	5.0	MW11 > dead storage volume	MW11 < dead storage volume	MWD < HOV
MW11	SD10	5.0	MW11 > dead storage volume	MW11 < dead storage volume	SD10 <HOV
SD10	MW11	10.0	SD10 > HOV	SD10 < HOV	MW11 < HOV
SD12	MW11	20.0	SD12 > HOV	SD12 < LOV	MW11 < HOV
SD19	MW11	3.0	SD23 > HOV	SD23 < HOV	MW11 < HOV

B.3.6 Water sources

Water prioritisation strategy

Water is required for several activities on site including dust suppression, use in the CHPP and as washdown water in the MIA. To minimise clean water use on site, water requirements are sourced from water storages and supplemented with imported water in the following priority:

1. surface water captured on site in contaminated water dams and sediment dams and stored in mine water dams
2. imported groundwater from the Upper Namoi Zone 4 Groundwater Source via the borefield
3. imported surface water from the Lower Namoi Regulated River Water Source via the pump station on the Namoi River.

The water balance model sources water in accordance with the above priorities. Further details on clean water management and water source prioritisation are provided in the SWMP.

Rainfall and runoff

Surface water runoff that drains into the water management dams is stored for use onsite. The volume of inflows to each storage is calculated as the sum of direct rainfall onto the storage water surface and the runoff generated from the contributing catchment.

The volume of direct rainfall is calculated as the product of the rainfall depth and the storage water surface area. Each storage includes a stage storage relationship whereby the assumed exposed surface area of stored water varies with the volume of water stored each day.

The volume of catchment runoff is calculated as the product of catchment area (refer to Table B-3) and the runoff depth calculated by the AWBM described in Appendix B.3.2.

Water Imports

External water supply can be sourced from the BCM borefield or the Namoi River via pump and pipeline. Water imports are triggered in the model when the volume of water stored in MW5/M11 recedes below the LOV of 600 ML. Water imports enter the WMS via SD10 prior to being pumped to the CHPP and MIA to meet water demands or MW5/M11 to meet dust suppression demands via the fill points in SD23 and the MWD. Water imports are assumed to occur at a rate of 5.6 ML/day.

Allowing MW5/M11 to drawdown to the LOV before importing water is intended to maximise the reuse of dirty and contaminated water stored on site before sourcing water from external sources.

Groundwater

Groundwater inflows to the mining void were adopted from *Groundwater Impact Assessment Boggabri Coal Mine MOD 8 Amendment to SSD 09_0182* (AGE, 2022), which represents the most current groundwater modelling results for the Boggabri, Tarrawonga, Maules Creek (BTM) Complex. The predicted annual groundwater inflow volumes for BCM were applied to the water balance model and are presented in Figure B-2.

Figure B-2: Estimated groundwater inflows to mining void (AGE, 2022)

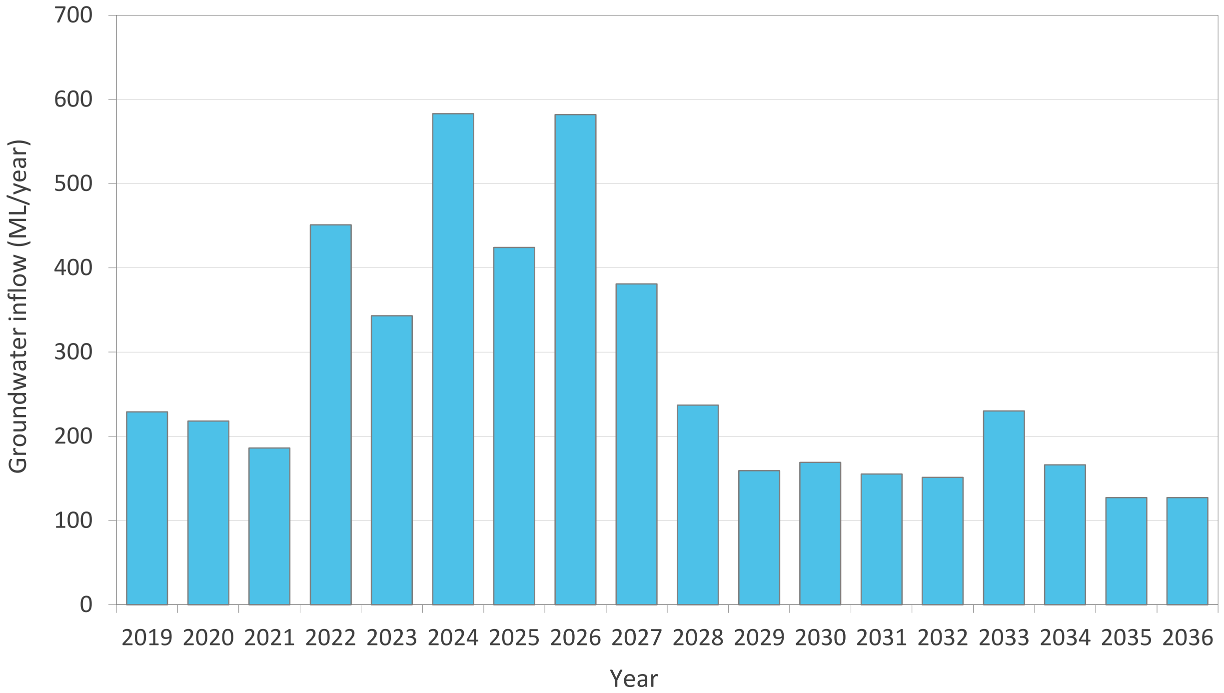


Figure B-2 shows groundwater inflows to the mining void are predicted to peak in 2024 and 2026. After which, groundwater inflows are predicted to gradually decline over the LOM so that inflows are approximately 150 ML/year from 2029 onwards. Some of the predicted groundwater inflows will be lost through evaporation. Any excess groundwater that is collected in the mine void is pumped to the water storages in accordance with the pump operational rules described in Table B-4.

B.3.7 Water demands

Evaporation

Evaporation loss from each storage water surface was calculated as the product of the daily Morton’s shallow lake evaporation depth and the water surface area of the storage. Morton’s potential evapotranspiration data was used in the AWBM runoff calculations to estimate soil moisture losses.

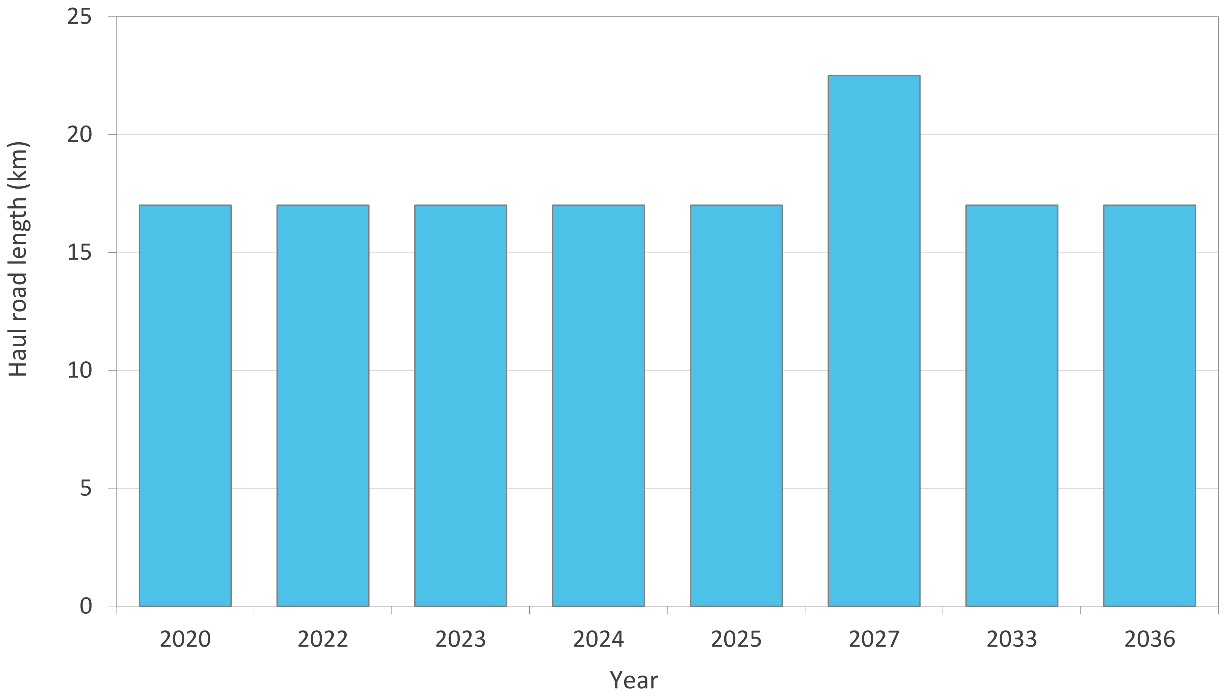
Dust Suppression

Water is required for dust suppression on haul roads and other disturbed areas. Dust suppression for the CHPP coal stockpiles, coal crushing areas, and coal loading areas and MIA are accounted for in the CHPP demands (refer to Appendix B.3.7).

Modelled dust suppression demand is calculated as a factor of haul road surface area multiplied by the daily evaporation rate less rainfall so that no dust suppression occurs on days where the rainfall rate exceeds the evaporation rate. An effective width of 50 m was assumed for all haul roads as calibrated in previous versions of the SWB model. Future hall length roads were adopted from the Modification 8 surface water impact assessment (Engeny, 2022) whereby values were interpolated between years. The haul road lengths applied to the SWB model are shown in Figure B-3.

Water used for dust suppression is preferentially sourced from recycled contaminated water from various storages depending on the mine progression. Currently, there are fill points at the MWD and SD23. There is also a fill point located at SD7 which is not currently being utilised.

Figure B-3: Haul road lengths applied to the SWB model



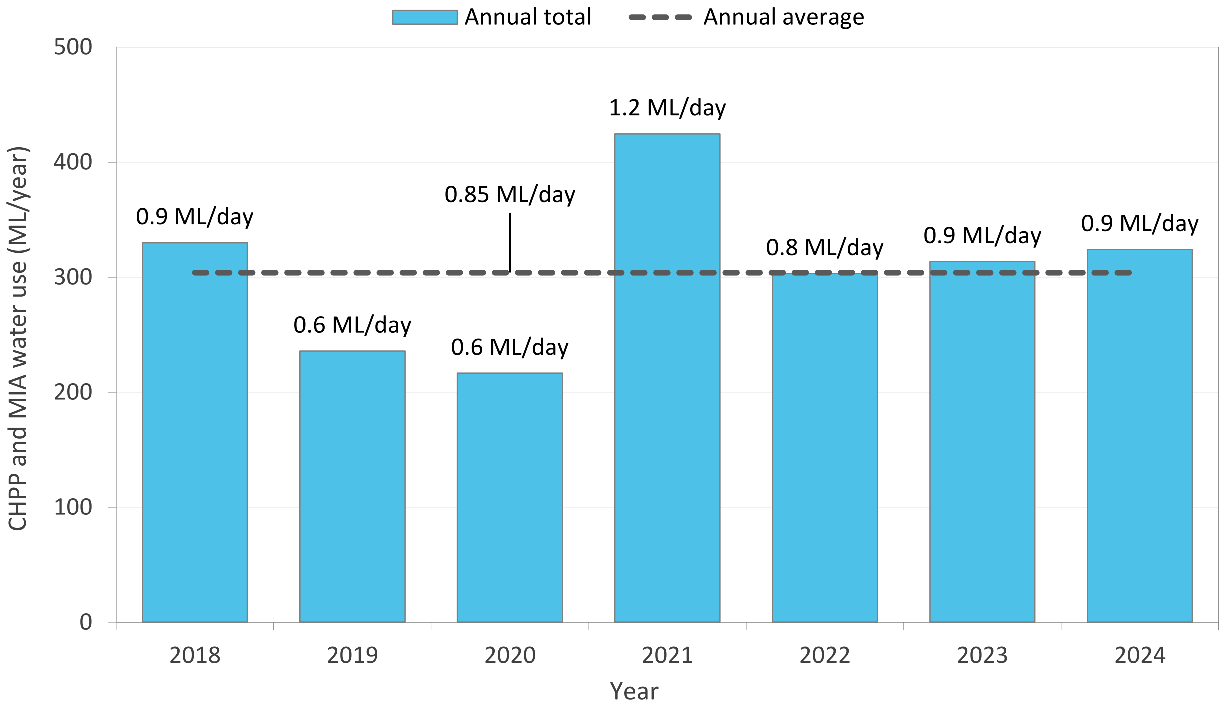
CHPP and MIA water demand

The CHPP requires water for coal washing, dust suppression, and as fire suppression. Water is required for vehicle washdown in the MIA. Washdown water is recycled, however, water is required to make-up evaporative losses. Make-up water for the CHPP and MIA is currently sourced from SD6 and SD10 via a filtration system.

Potable water is used in the administration building and amenities during operations. Potable water is currently sourced from groundwater entitlements (WAL 29473) assigned to the Lovton Bore. Wastewater from the administration building and amenities will be treated in an onsite treatment plant. Potable water demand and wastewater generated by the onsite treatment plant were not considered in the water balance analysis due to the relatively minor volumes involved.

A combined CHPP and MIA water demand of 0.85 ML/day was applied the water balance model based on recent historical recorded values which are shown in Figure B-4. The demand is simulated in the model as a constant flow rate that is extracted from SD10. The assumption of a constant flow rate is appropriate for the purpose of the SWB model as actual day to day variations in operations will be attenuated by the water storage on site.

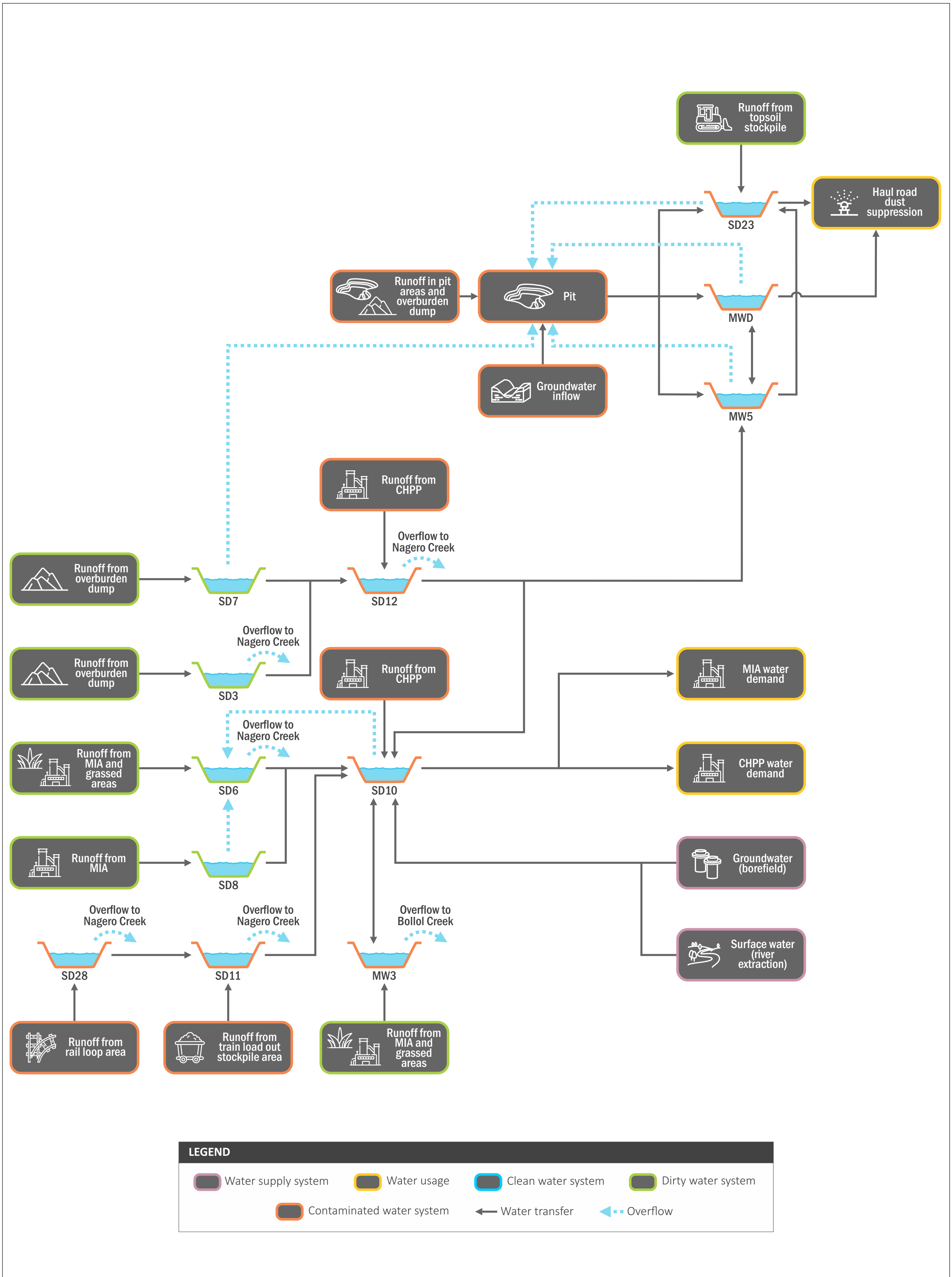
Figure B-4: Recorded CHPP and MIA water use



<u>Seepage</u>

Typically, losses associated with seepage from water storages are minor compared to evaporation and pumped outflows. Hence, seepage losses are assumed to be negligible for modelling purposes and are therefore set to zero in the WBM.

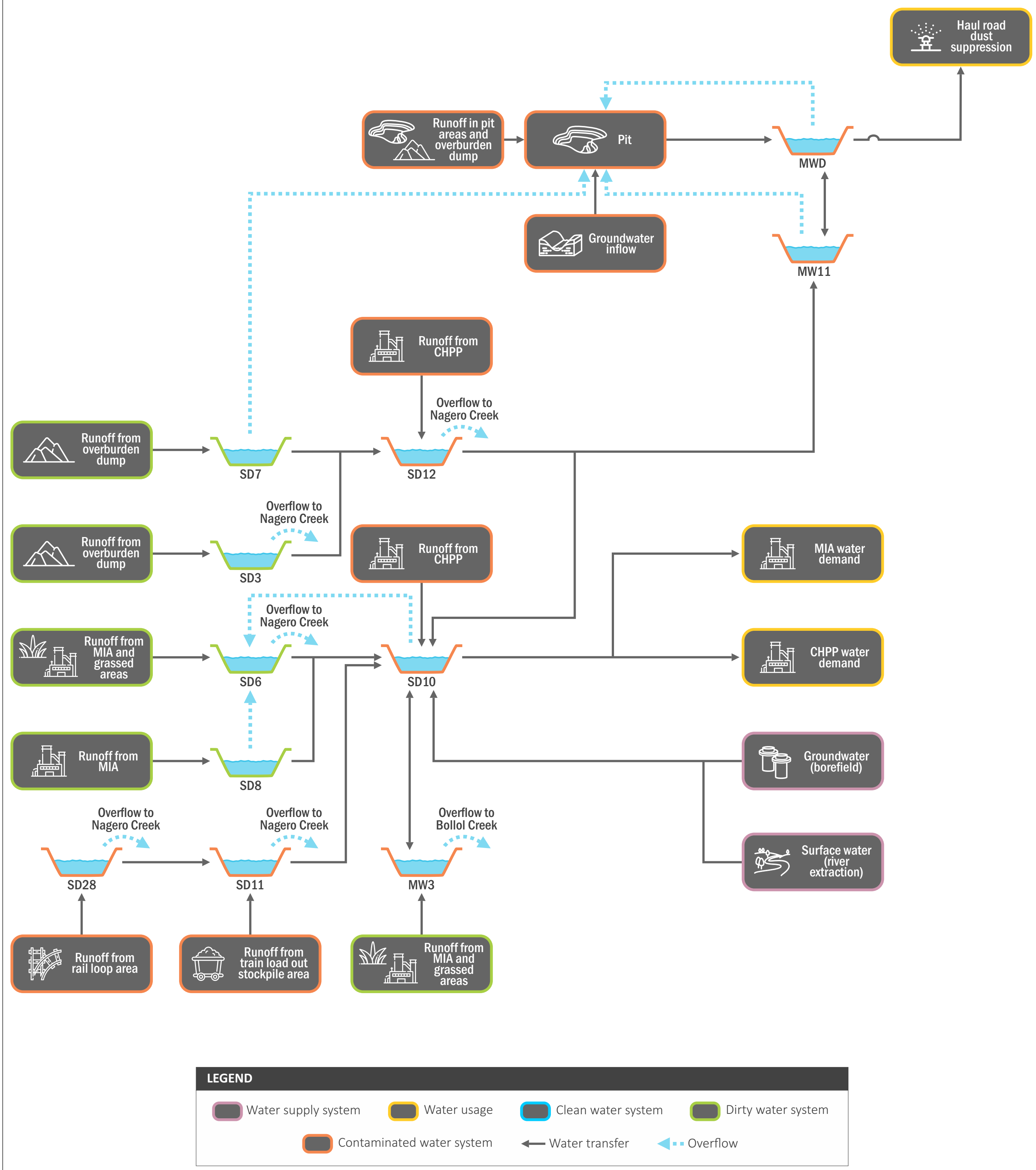
Appendix C
Water management system schematics



EMM creating opportunities

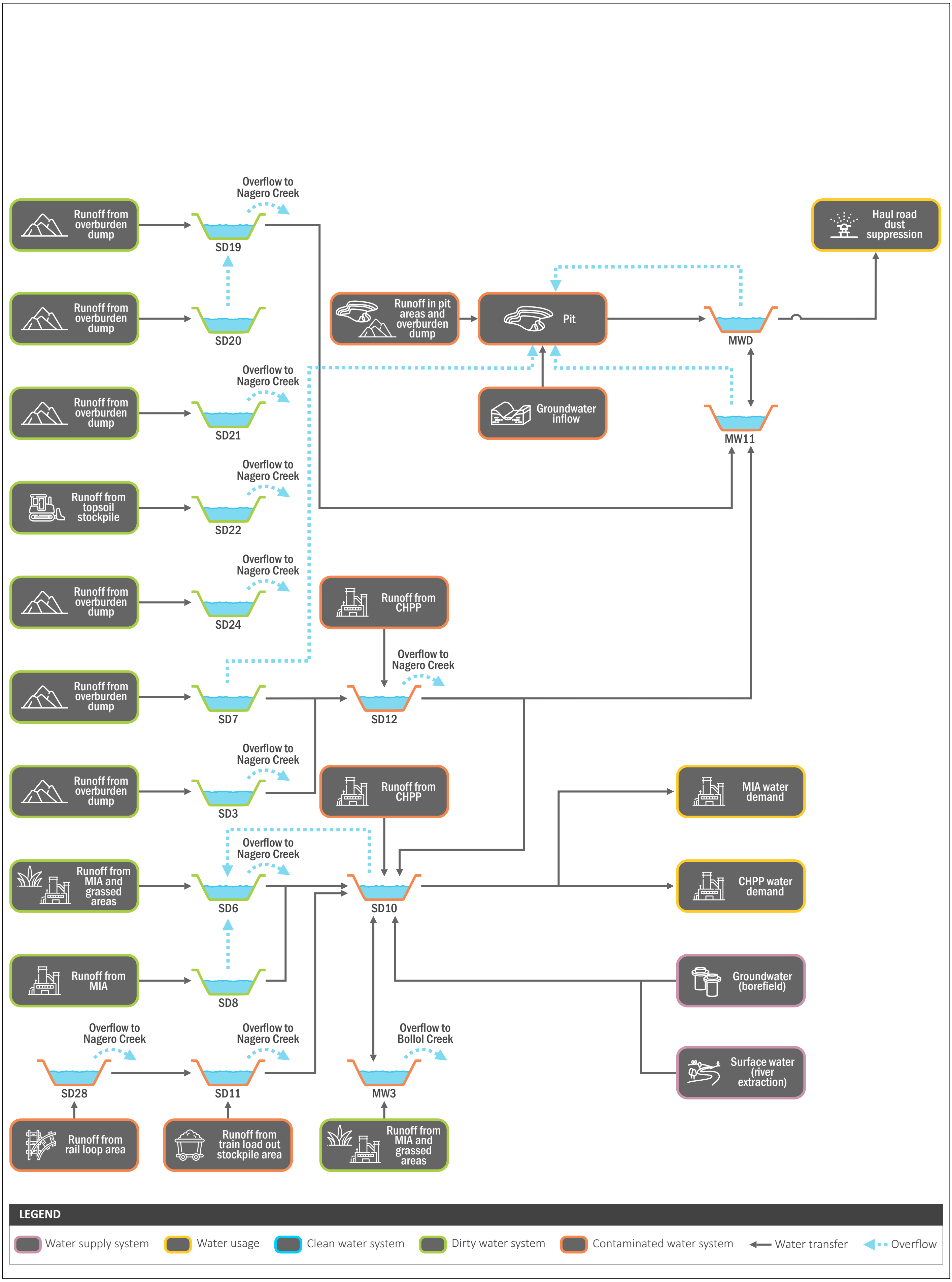
Water balance model schematic (2024)

Boggabri Coal Operations Pty Ltd
Site Water Balance
Figure C.1



Water balance model schematic – indicative conditions (2026)

Boggabri Coal Operations Pty Ltd
Site Water Balance
Figure C.2



Water balance model schematic – indicative conditions (2033)

Boggabri Coal Operations Pty Ltd
Site Water Balance
Figure C.3

EMM creating opportunities