Peabody

# UNITED WAMBO OPEN CUT AND WAMBO UNDERGROUND SITE WATER BALANCE

Document No. WA-ENV-MNP-509.5
August 2020

## Document Control

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| **Document No.** | WA-ENV-MNP-509.5 |
| **Title** | Site Water Balance |
| **General Description** | Site Water Balance for United Wambo Open Cut Mine and Wambo Coal Mine |
| **Document Owner** | WCPL Environment & Community Manager |

## Revisions

| Rev No | Date | Description | By | Checked |
|---|---|---|---|---|
| 0 | October 2015 | Development of WCPL document consistent with other Water Management Plans | WCPL | SP |
| 1 | November 2015 | Incorporate comments from DP&E review | WCPL | SP |
| 2 | August 2020 | New model and updated mine plan data for Wambo and United Wambo Open Cut | WCPL | KH |

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## Important information about this Site Water Balance

This Site Water Balance (SWB) applies to **Phase 2** mining operations at the Wambo Coal Mine (Wambo), as defined in the Notification of Modification for Development Approval (DA) 305-7-2003, dated 29 August 2019, i.e.

> *The phase of the development that comprises underground mining operations at Wambo underground mine, the operation of Wambo mine infrastructure within the green operational area identified in Figure 2 of Appendix 2 (of DA305-7-2003) and associated surface development.*

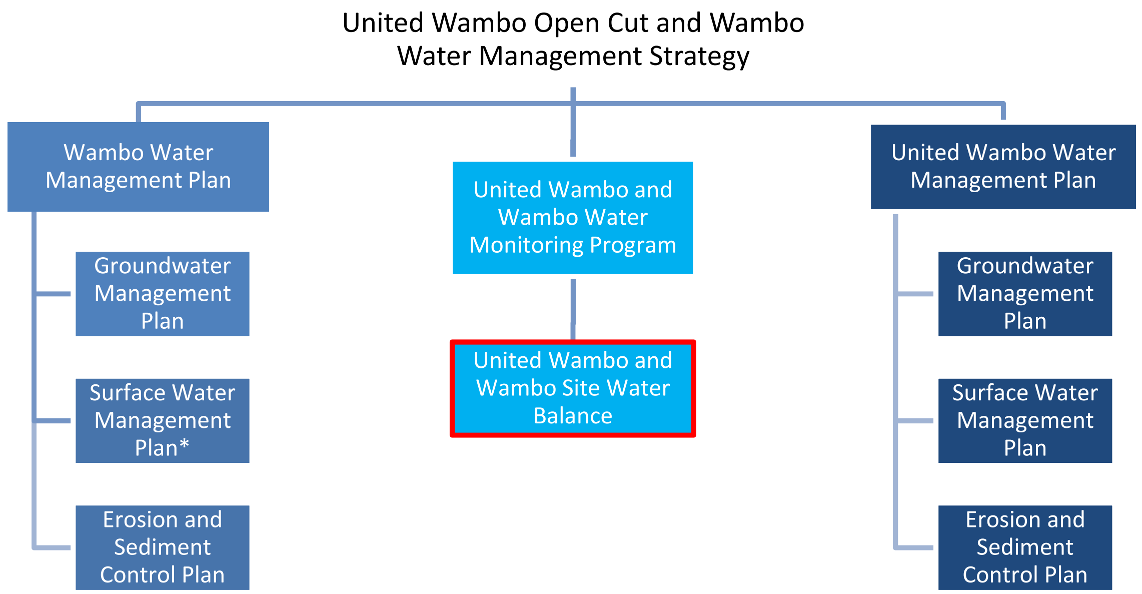
This SWB also applies to **Phase 2** mining operations at the United Wambo Open Cut Mine (United Wambo), as defined in Development Approval SSD 7142, dated 29 August 2019.

> *The phase of the development that comprises mining operations at United open cut mine and Wambo open cut mine within the blue operational area identified in Figure 3 of Appendix 2*

The Phase 2 approved operational mining area is shown on **Figure 3** (Section 1.3).

Figure 1 shows the relationship of this SWB with the Wambo Water Management Plan (WMP) and the United Wambo WMP. This SWB sits under the United Wambo Open Cut and Wambo Water Management Strategy (Water Strategy) This SWB should be read in conjunction with the Wambo and United Wambo WMPs and the combined Water Management Strategy.

Further detail on how water will be managed across the two operations can be found in the Water Management Strategy (WA-ENV-MNP-509.7).




Key:

Document applies to both operations – controlled by Wambo Coal Pty Ltd

Document applies to Wambo Phase 2 operations – controlled by Wambo Coal Pty Ltd

Document applies to United Wambo Phase 2 operations – controlled by United Wambo JV

* Wambo SWMP incorporates the North Wambo Creek Diversion Management Plan

**Figure 1: Water Management Strategy for Wambo and United Wambo**

# 1.0 Introduction

## 1.1 Background

The Wambo Coal Mine (Wambo) and United Wambo Open Cut Coal Mine (United Wambo) are situated approximately 15 kilometres west of Singleton, near the village of Warkworth, New South Wales (**Figure 2**). Wambo is owned and operated by Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited. United Wambo is a 50:50 joint venture between neighbouring mines operated by United Collieries Pty Limited (United), owned 95 per cent by Abelshore Pty Limited, a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore) and five per cent by the Construction, Forestry, Maritime, Mining and Energy Union (CFMMEU), and managed by Glencore, and WCPL, a subsidiary of Peabody Energy Australia Pty Limited (Peabody).

Several open cut and underground mine operations have been conducted at Wambo since mining operations commenced in 1969. Mining under the current Development Consent (DA 305-7-2003) commenced in 2004 and permits both open cut, underground operations and associated activities to be conducted. The latest modification to DA305-7-2003 (Modification 16), approved by the Independent Planning Commission of NSW on 29 August 2019, requires development at Wambo to be undertaken in the following stages:

- Phase 1 - open cut mining operations at Wambo open cut mine, underground mining operations at Wambo underground mine and the operation of Wambo mine infrastructure (including minor upgrades to this infrastructure) within the green operational area identified in Figure 1 of Appendix 2[1];
- Phase 2 - underground mining operations at Wambo underground mine, the operation of Wambo mine infrastructure within the green operational area identified in Figure 2 of Appendix 2[2] and associated surface development; and
- Phase 3 - following the cessation of underground mining operations that includes mine closure.

United Wambo received Development Consent (SSD 7142) in accordance with Part 4 of the Environmental Planning & Assessment Act 1979 (EP&A Act) from the NSW Department of Planning, Industry and Environment (DPIE), on 29 August 2019. SSD 7142 requires development at United Wambo to be undertaken in the following stages:

- Phase 1A - construction works at United open cut mine within the blue operational area identified in Figure 1 of Appendix 2[3];
- Phase 1B - mining operations at United open cut mine within the blue operational area identified in Figure 2 of Appendix 2[4];
- Phase 2 - mining operations at United open cut mine and Wambo open cut mine within the blue operational area identified in Figure 3 of Appendix 2[5]; and
- Phase 3 - following the cessation of mining operations that includes mine closure.

[1] Of DA305-7-2003 (Mod 16)

[2] Of DA305-7-2003 (Mod 16)

[3] Of SSD 7142

[4] Of SSD 7142

[5] Of SSD 7142

The operation of WCPL's rail and coal loading infrastructure is undertaken in accordance with DA177-8-2004. The latest modification to DA177-8-2004 (Modification 3) was approved by the Independent Planning Commission of NSW on 29 August 2019.

The approved run-of-mine (ROM) coal production rate from Wambo and United Wambo is 14.7 million tonnes per annum (Mtpa) and all product coal is transported from Wambo by rail. A summary of the approved Wambo Coal Mine is provided in **Table 1**. A summary of the approved United Wambo Open Cut Mine is provided in **Table 2**.

**Table 1: Summary of the Approved Wambo Coal Mine**

| Component | Approved Wambo Coal Mine[1] |
|---|---|
| Open Cut Mining | Phase 1 – A maximum of 8 Mt of ROM coal may be extracted from the Wambo open cut mine in a calendar year |
| | Phase 2 – ROM coal from the Wambo open cut mine may be received, processed and/or stockpiled onsite. No open cut mining may take place during Phase 2. |
| | Mining operations under current approved Mining Operations Plan/Rehabilitation Management Plan (MOP/RMP) |
| Underground Mining | Phase 1 and 2 - A maximum of 9.75 Mt of ROM coal may be extracted from the Wambo underground mine in a calendar year |
| | Underground mining operations within the approved mine plan until 31 August 2042 |
| Subsidence commitments and management. | The subsidence performance measures listed in Conditions B1-B10 of the Development Consent (DA305-7-2003). |
| ROM Coal Production Rate | Up to 14.7 Mt of ROM coal from the Wambo Mining Complex and United Wambo open cut coal mine in a calendar year |
| Waste Rock Management | Waste rock deposited in open cut voids and in waste rock emplacements adjacent open cut operations |
| | Overburden may be transferred to the United open cut mine for emplacement during Phase 2. |
| Coal Washing | Coal handling and preparation plant (CHPP) capable of processing approximately 1,800 tonnes per hour (tph) |
| Coal transportation | A maximum of 15 Mt of coal transported from the United Wambo Mining Complex in a calendar year |
| | A maximum of 8 laden trains may leave site in any 24hr period |
| | Coal transportation may be carried out until 31 August 2042. |
| CHPP Reject Management | Coarse rejects and tailings would be incorporated, encapsulated and/or capped within open cut voids in accordance with existing Wambo management practices |
| | Coal rejects may be transferred to the United open cut mine for emplacement during Phase 2. |
| Water Supply | Make-up water demand to be met from runoff recovered from tailings storage areas, operational areas, dewatering, licensed extraction from Wollombi Brook and Hunter River |
| Mining Tenements | Coal Lease (CL) 365, CL374, CL397, Consolidated Coal Lease (CCL) 743, Mining Lease (ML) 1402, ML1572, ML1594, Authorisation (A) 444, Exploration Licence (EL) 7211. |

**Note:** [1] Development Consents DA305-7-2003 and DA177-8-2004 (as modified August 2019)

**Table 2: Summary of the Approved United Wambo Open Cut Mine**

| Component | Approved United Wambo Open Cut Mine[2] |
|---|---|
| Open Cut Mining | Phase 2 – a maximum of 10 million tonnes of ROM coal may be extracted from the site in any calendar year |
| | Mining operations may be carried out on the site until 31 August 2042 |
| | Not commence Phase 1B until the Rehabilitation Management Plan is approved by the Resources Regulator |
| Highwall or Auger Mining | Phase 2 - may undertake highwall or auger mining on the site, within the approved disturbance areas, subject to the approval of the Resources Regulator |
| ROM Coal | Phase 2 - ROM coal from the site may be transferred to Wambo mine infrastructure for processing, stockpiling and transportation |
| Waste Rock Management | Waste rock deposited in open cut voids and in waste rock emplacements adjacent open cut operations |
| | Phase 2 and Phase 3 - overburden and coal reject material may be received from the Wambo Mining Complex for emplacement. |
| Water Supply | Make-up water demand to be met from runoff recovered from tailings storage areas, operational areas, dewatering, licensed extraction from Wollombi Brook and Hunter River |
| Mining Tenements | Coal Lease (CL) 374, CL397, Consolidated Coal Lease (CCL) 743, CCL775, Mining Lease (ML) 1402, ML1572, ML1594, Authorisation (A) 444, Exploration Licence (EL) 7211, EL8452, EL8456. |

**Note:** [2] Development Consent SSD 7142 (as issued August 2019)

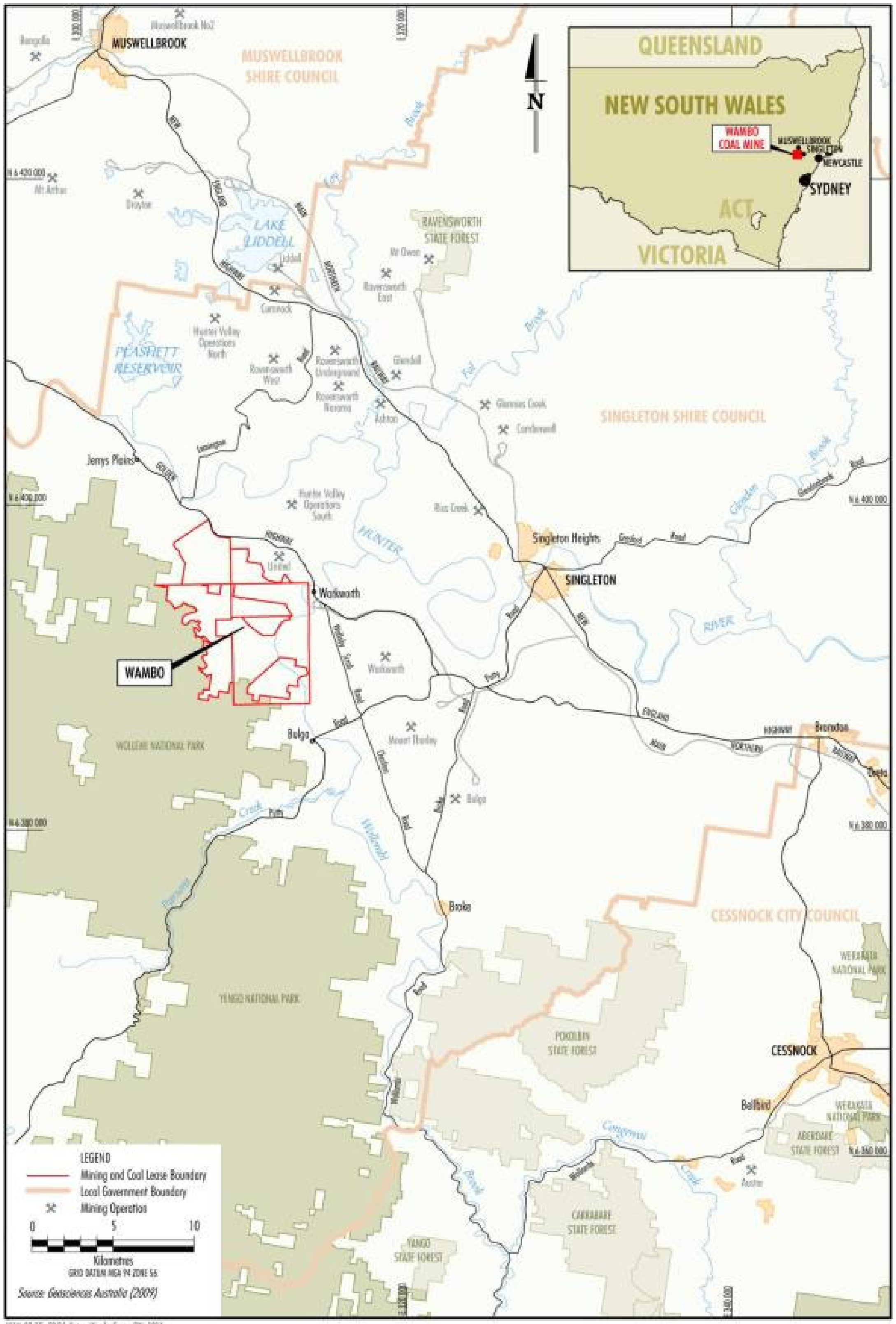



**Figure 2: Wambo Coal Regional Location**

## 1.2 Purpose

This SWB has been developed to address the relevant requirements of SSD 7142 and DA 305-7-2003, as relevant to Phase 2 mining operations at Wambo and United Wambo.

In accordance with Condition B66(d)(i) and (ii) of DA 305-7-2003, and Condition B52(e)(i) and (ii) of SSD 7142, Wambo has prepared this SWB to provide information on:

- The water management system (WMS) for Wambo and United Wambo as a Complex;
- Sources of water;
- Water use;
- Water supply security;
- Wambo and United Wambo's combined Water Balance Model, including,
    - Predicted annual inflows and outflows;
- Saline material and saline water management;
- The predicted salt balance for the Complex;
- Review and reporting requirements; and
- Responsibilities for site personnel (specifically in relation to this SWB).

## 1.3 Scope

This SWB applies to all Phase 2 operational activities at the Wambo Coal Mine including all underground mining operations, CHPP and train loading operations. It also applies to open cut mining operations associated with the United Wambo Open Cut Mine (**Figure 3**).

This SWB addresses the relevant conditions of DA 30-57-2003, SSD 7142, EPL 529 and water licences as detailed in **Section 2.0.**

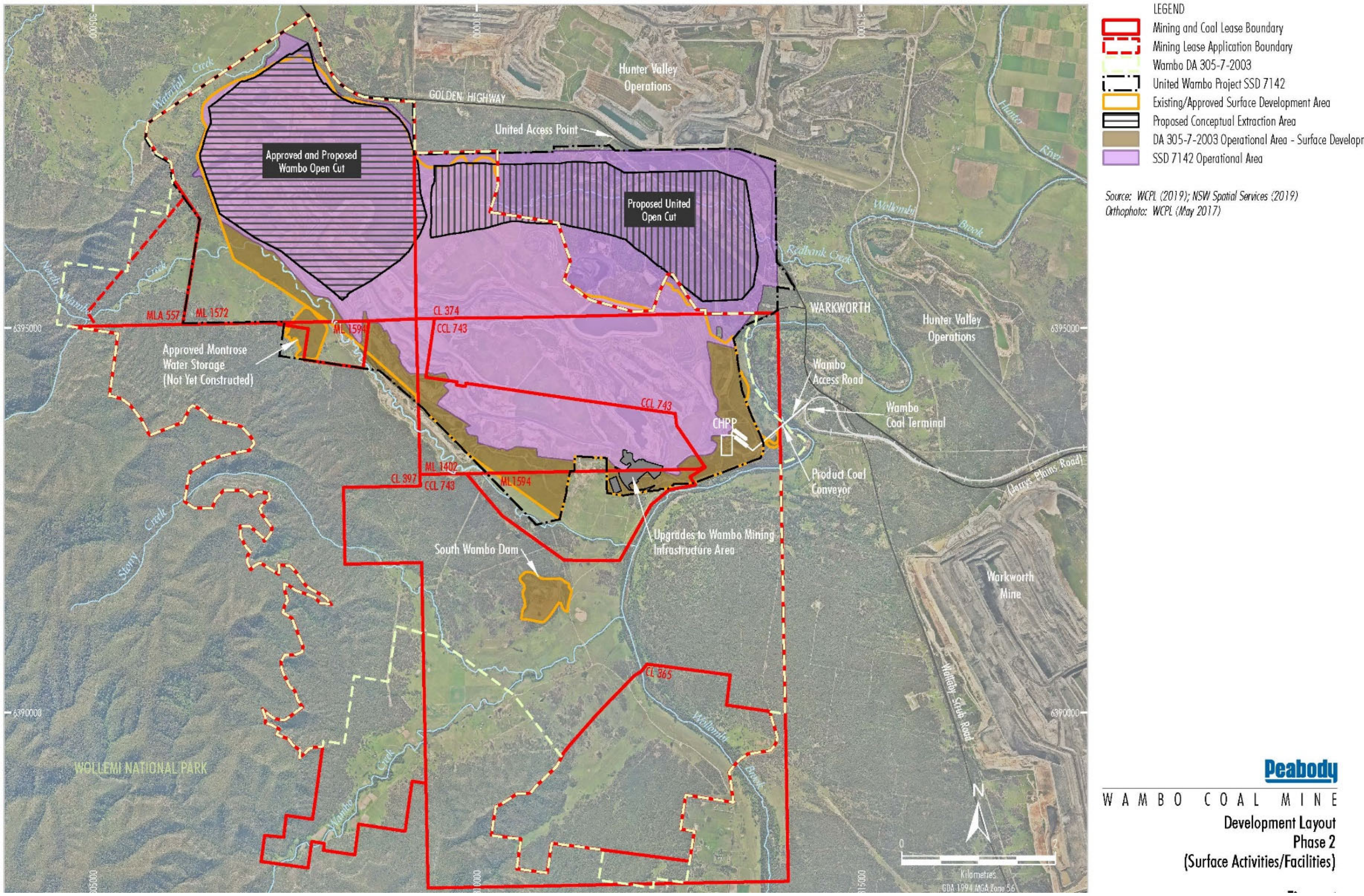



**Figure 3: Approved United Wambo Project – Phase 2**

## 1.4 Stakeholder Consultation

In accordance with Condition B66(b) of DA 305-7-2003, the development of the Wambo SWB (Version 1) was undertaken in consultation with Division of Resources and Geoscience (DRG) within the Department of Primary Industry (formerly the Department of Resources and Energy or DRE) and Crown Lands and Water Division (CLWD, formerly the NSW Office of Water or NOW), prior to submitting to the Secretary of the NSW Department of Planning, Industry and Environment (DPIE, formally DP&E)) for approval. Version 1 of the SWB was approved by DP&E on 27 November 2015.

The United Wambo Water Management Plan (WMP) (Version 1) including the United Wambo Site Water Balance was approved on 17 December 2019. Consultation was undertaken in accordance with Condition B52(b) of SSD 7142. See United Wambo WMP for further information.

As required by Condition B66 of DA 305-7-2003 and Condition B52(b) of SSD 7142, this SWB (Version 2) must be prepared in consultation with DPIE Water and the EPA, to the satisfaction of the Planning Secretary. A copy of this SWB (including all appendices) was provided to DPIE Water and the EPA 26 August 2020. The EPA provided correspondence dated 4 September 2020 advising that it is not the role of the EPA to review such plans. No comments were received from DPIE Water/NRAR.

Correspondence in relation to this SWB is attached as **Appendix A**. A summary of how comments from stakeholders have been addressed in previous versions of the SWB is are included in the Wambo Water Management Plan (WMP) and United Wambo WMP respectively.

This SWB has also been prepared in accordance with Condition D5 of DA305-7-2003 and Condition E5 of SSD 7142.

In recognition of the requirements of Condition B66 (a) of DA305-7-2003 and Condition B52(a) of SSD 7142, this SWB prepared by WCPL has been reviewed by suitably experienced and qualified person:

- Mr Chris Bonomini (Umwelt)

Mr Bonomini was endorsed as a suitably qualified expert 2 September 2020. Relevant correspondence is provided in **Appendix A.**

Version 2 of the SWB was approved by DPIE 20 November 2020.

## 2.0 Statutory and Other Requirements

### 2.1 Project Approvals

#### 2.1.1 DA 305-7-2003 Conditions of Consent

DA 305-7-2003 requirements related to the development of this SWB are summarised in **Table 3**.

**Table 3: DA305-7-2003 Requirements for this SWB**

| Condition | Condition Details | SWB Section |
|---|---|---|
| B66 | The Applicant must prepare a Water Management Plan for the Wambo Mining Complex to the satisfaction of the Planning Secretary. This plan must: | **Wambo WMP** |
| | (a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary; | **Section 1.4 and Appendix A** |
| | (b) be prepared in consultation with DPIE Water and the EPA; | **Section 1.4 and Appendix A** |
| | (d) include a:<br>(i) Site Water Balance that includes details of: | **This SWB** |
| | • predicted annual inflows and outflows on the site; | **Section 4.2.3** |
| | • sources and security of water supply for the life of the development (including authorised entitlements and licences); | **Section 3.2 and Section 4.2.4** |
| | • water storage capacity; | **Section 4.2.2.11** |
| | • water use and management on the site, including any water transfers or sharing with neighbouring mines; | **Section 3.4** |
| | • licensed discharge points and limits; and | **Section 3.5** |
| | • reporting procedures, including the annual preparation of an updated site water balance; | **Section 6.0** |
| | (ii) Salt Balance that includes details of: | **Section 5.0** |
| | • sources of saline material on the site; | **Section 5.1** |
| | • saline material and saline water management on the site; | **Section 5.1 and Section 5.2** |
| | • measures to minimise discharge of saline water from the site; and | **Section 5.2** |
| | • reporting procedures, including the annual preparation of an updated salt balance; | **Section 6.0** |
| | (vi) a protocol to report on the measures, monitoring results and performance criteria identified above, in the Annual Review referred to in condition D10. | **Wambo WMP** |

### 2.1.2 SSD 7142 Conditions of Consent

SSD 7142 requirements related to the development of this SWB are summarised in **Table 3**.

**Table 4: SSD 7142 Requirements for this SWB**

| Condition | Condition Details | SWB Section |
|---|---|---|
| B52 | The Applicant must prepare a Water Management Plan for the Wambo Mining Complex to the satisfaction of the Planning Secretary. This plan must: | **United Wambo WMP** |
| | (a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary; | **Section 1.4 and Appendix A** |
| | (b) be prepared in consultation with DPIE Water and the EPA; | **Section 1.4 and Appendix A** |
| | (e) include a:<br>(i) Site Water Balance that includes details of: | **This SWB** |
| | • predicted annual inflows and outflows on the site; | **Section 4.2.3** |
| | • sources and security of water supply for the life of the development (including authorised entitlements and licences); | **Section 3.2 and Section 4.2.4** |
| | • water storage capacity; | **Section 4.2.2.11** |
| | • water use and management on the site, including any water transfers or sharing with neighbouring mines; | **Section 3.4** |
| | • licensed discharge points and limits; and | **Section 3.5** |
| | • reporting procedures, including the annual preparation of an updated site water balance; | **Section 6.0** |
| | (ii) Salt Balance that includes details of: | **Section 5.0** |
| | • sources of saline material on the site; | **Section 5.1** |
| | • saline material and saline water management on the site; | **Section 5.1 and Section 5.2** |
| | • measures to minimise discharge of saline water from the site; and | **Section 5.2** |
| | • reporting procedures, including the annual preparation of an updated salt balance; | **Section 6.0** |
| | (vi) a protocol to report on the measures, monitoring results and performance criteria identified above, in the Annual Review referred to in condition D10. | **United Wambo WMP** |

## 2.2 Environment Protection Licence 529

Under EPL 529, Wambo may discharge water into the Hunter River system in accordance with the Hunter River Salinity Trading Scheme (HRSTS) through a designated Licenced Discharge Point (LDP). The HRSTS is a cap-and- trade system designed to facilitate saline discharges into the Hunter River by its many industrial and agricultural users, without compromising sustainable water quality. The HRSTS is administered under the *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002.*

There is currently one LDP in the Wambo EPL 529. As of July 2020, Wambo currently holds 30 credits under the HRSTS.

## 2.3 Water Licences

### 2.3.1 Water Access and Surface Water Licences

Wambo and United hold a number of WALs under the *Water Management Act 2000* (WM Act) for the Hunter Regulated River Water Source Water Sharing Plan (WSP) and Hunter Unregulated and Alluvial Water Source WSP. **Table 5** presents the WALs held by United and Wambo.

Wambo and United Wambo will report performance against relevant surface water licence conditions in the Annual Review (refer **Section6.0**).

**Table 5: Water Access and Surface Water Licences**

| Licence No | Water Source | Category | Holder | Share Component (units) | Tenure Type |
|---|---|---|---|---|---|
| WAL718 | Hunter Regulated River Water Source | Regulated River (High Security) | Wambo | 1000 | Continuing |
| WAL8599 | Hunter Regulated River Water Source | Regulated River (High Security) | Wambo | 6 | Continuing |
| WAL8600 | Hunter Regulated River Water Source | Regulated River (General Security) | Wambo | 868 | Continuing |
| WAL8604 | Hunter Regulated River Water Source | Supplementary Water | Wambo | 240 | Continuing |
| WAL10541 | Hunter Regulated River Water Source | Regulated River (High Security) | United | 300 | Continuing |
| WAL1369 | Hunter Regulated River Water Source | Regulated River (Supplementary) | Wambo and United | 15 | Continuing |
| WAL15459 | Hunter Regulated River Water Source | Regulated River General Security) | Wambo and United | 21 | Continuing |
| WAL18445 | Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source) | Unregulated River | United | 200 | Continuing |

| Licence No | Water Source | Category | Holder | Share Component (units) | Tenure Type |
|---|---|---|---|---|---|
| WAL18549 | Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source) | Unregulated River | United | 100 | Continuing |
| WAL18437 | Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source) | Unregulated River | Wambo | 350 | Continuing |
| WAL 23897 | Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source) | Aquifer | Wambo | 70 | Continuing |

### 2.3.2 Groundwater Licences

United and WCPL also hold WALs under the WM Act for the North Coast Fractured and Porous Rock Groundwater Sources WSP, for the operation of groundwater extraction. **Table 6** presents the WALs held by United and Wambo.

Wambo and United Wambo will report performance against relevant groundwater licence conditions in the Annual Review (refer **Section 6.0**).

**Table 6: Groundwater Extraction Licences**

| Licence No | Description | Category | Holder | Share Component (units) | Tenure Type |
|---|---|---|---|---|---|
| WAL 42373[1] | Dewatering bores | Aquifer | Wambo | 1549 | Continuing |
| WAL41532 | Dewatering | Aquifer | Wambo | 98 | Continuing |
| WAL41510 | Dewatering | Aquifer | United | 300 | Continuing |

1. Consolidated licence including WALs 39735, 39738, 39803, 41494, 41528 and 41520.

# 3.0 Water Management System

## 3.1 System Description

The site water management strategy for Wambo and United Wambo is based on the containment and re-use of mine water and on the control of sediment that may be potentially carried with runoff from disturbed areas such as the waste rock emplacements. The WMS controls waters generated from development and operational areas while diverting upstream water around such areas. It includes both permanent structures that will continue to operate post-closure and temporary structures that will only be required until the completion of rehabilitation works. The WMS includes:

- Up-catchment diversion structures;
- Water storage dams;
- Sediment dams;
- Water transfer infrastructure (i.e. pumps and pipelines);
- Licenced Discharge Points; and
- The North Wambo Creek Diversion.

The WMS operates predominately as a closed self-contained system. The water balance of the system fluctuates with climatic conditions and as the extent of the mining operations evolves over time.

A network of storages and drains has been established to capture runoff from mine water catchment areas. Runoff from areas disturbed by mining (including the CHPP and associated industrial areas) is collected in open cuts and mine water storages. These storages are used as priority sources of water for the CHPP and dust suppression. Runoff from haul roads is treated in sediment traps or is diverted to mine water storages.

CHPP tailings are currently discharged to the Homestead Inpit Tailings Dam and from Q1 2021 will be discharged into a new facility constructed within the Homestead Main Pit. Water liberated from the settled tailings is pumped from the decant location to various water storages for reuse primarily by the CHPP.

An extensive reticulation system has been developed to transfer water between open cut pits, inclusive of United Wambo, Wambo underground operations and mine water storages, to source water from Wollombi Brook and the Hunter River, to facilitate controlled releases to Wollombi Brook (in accordance with EPL 529 and the Hunter River Salinity Trading Scheme) and to provide water to the CHPP.

A schematic of the WMS is provided in **Figure 4**. Note that not all storages shown have been modelled and that not all storages and linkages may be present at any given point in time. Refer to the notes at the bottom of the figure which shows indicative start and end dates for applicable storages (for modelling purposes only). **Table 7** below provides an indicative schedule for key changes to the WMS which will be constructed and modified as and when required to support the required infrastructure and mine development. The water balance model (Section 4.0) has been developed based on **Figure 4** and the indicative schedule shown in **Table 7**.

Runoff from rehabilitated and establishing revegetated mine areas is directed to sediment retention storages. These are either allowed to drain to local drainages or, depending upon the water quality, are directed to mine water storages. Modelled sediment dams (ME1, ME2, MIA Sediment Dam) are drawn down on a daily basis to ensure capacity to contain subsequent inflows is maximised.

The available water sources and the relatively large surface and underground storage capacity for mine water have provided Wambo and Wambo United with significant flexibility to manage the water system.

As part of the United Wambo Joint Venture, ongoing operation of the site is as follows:

- United Wambo – all open cut pit operations including Montrose and United open cut pits as well as all relevant water storages (refer to **Figure 4**);
- Wambo – all underground operations (South Bates and South Bates extension) including South Bates Pit (infrastructure area), as well as all tailings storage facilities and water storages as per **Figure 4**.

**Table 7: Key Mine Water Management Infrastructure Milestones**

| Date | Key Water Management Operations | Comments |
|---|---|---|
| **End 2020** | Decommissioning of UWJV Tailings Dams 1, 2, Dam 3 and Dam 6 | |
| **March 2021** | Commencement of tailings deposition in new facility located in former Homestead open cut pit | Decant and all existing water transfers directed to West Cut Dam |
| **March 2021** | UWJV C11 Dam decommissioned | |
| **June 2021** | Wambo South Dam recommissioned and available for mine water storage | Includes second licensed discharge point (LDP, 19) for HRSTS |
| **2022** | Option to temporarily store mine water in South Bates Wambo Underground Mine workings | Estimated capacity of up to 1GL. Note that current simulation results indicate this option is not required. |
| **October 2022** | Glen Munro Void available for mine water storage | In addition to Wambo South Dam |
| **2025** | UWJV Dam U2 and Drain 9 decommissioned | |
| **End 2025** | End of South Bates Underground extension | |
| **End 2026** | End of tailings deposition in Homestead open cut pit and commencement of deposition in South Bates open cut pit. | Decant from South Bates to West Cut Dam |
| **2030** | UWJV Dam 2 decommissioned, UWJV Dam C1 commissioned | |
| **End 2032** | | End of model simulation |

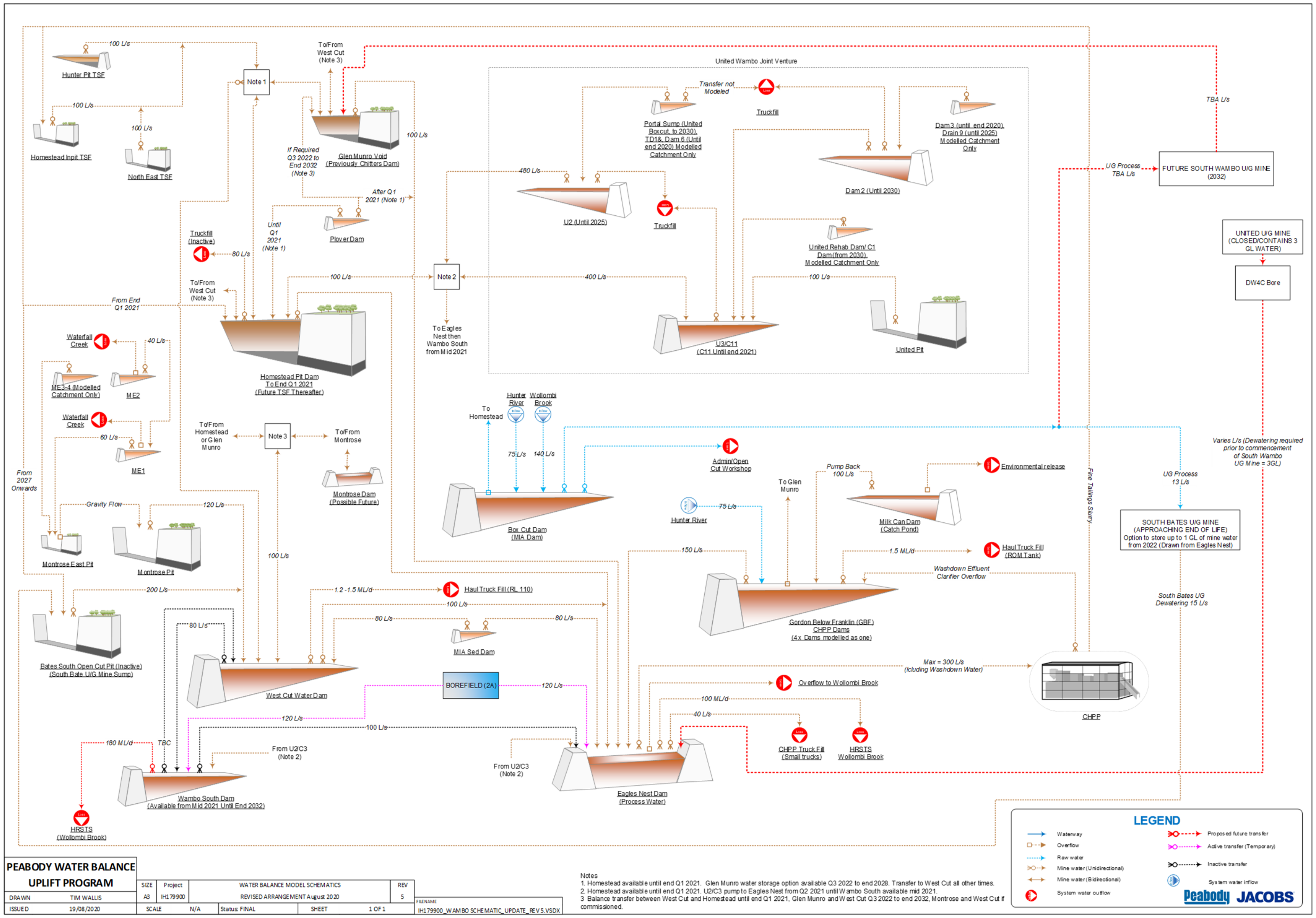



**Figure 4: Water Management System**

## 3.2 Water Sources

The sources of water supply to Wambo and United Wambo are:

- Direct rainfall onto the surface of water storages;
- runoff captured from the footprint of the mining disturbance area by the WMS;
- water imported from other mines (MTW, HVO) on an adhoc basis;
- groundwater inflows to the underground mining areas;
- dewatering boreholes to existing underground mine workings;
- tailings decant – this is water liberated from tailings slurry as it settles in within a tailings storage facility;
- water extracted from the Hunter River and Wollombi Brook under licence; and
- potable water trucked to site from a private supplier.

## 3.3 External Water Supply

WCPL and United hold water access licences (WALs) for licensed extraction from the Hunter River and Wollombi Brook as per **Table 5**. Hunter River WALs are subject to available water determinations (AWDs) announced by Water NSW which determine how much water may be drawn per unit up to a maximum of 1 megalitre (ML) per unit.

WCPL and United also hold WALs for licensed extraction from unregulated North Coast Fractured Rock groundwater source as per **Table 6**. These WALs are for passive and active water take and therefore includes all seepage into underground and open cut pit workings as well as dewatering of the water volume contained within underground mine workings (**Table 9** summarises WCPL and United WALs and assumed AWDs for the purpose of the water balance model).

The above annual allocations apply to a 'water' year which commences on 1st July each year.

## 3.4 Water Uses

Water uses at Wambo and United Wambo include:

- gross water requirements for the CHPP, including water lost to product, coarse rejects and tailings and washdown water;
- washdown of plant and equipment;
- dust suppression of haul roads and stockpiles etc;
- water exported to other mines (MTW, HVO) on an adhoc basis; and
- potable water used at the United and Wambo administration buildings and bathhouses.

The water demand for haul road and stockpile dust suppression varies due to climatic conditions and the length and usage of haul roads. Similarly, the CHPP water demand varies with coal production.

Water is also used in the underground mine for dust suppression sprays, cooling of longwall miner motors and gearboxes and cooling of couplings and drives. Some water is also used for watering vegetation establishment areas, firefighting and other non-potable uses. Underground water demand varies with underground mining rate.

### 3.5 Water Discharge

Discharge to Wollombi Brook occurs under the HRSTS from the Process Water Dam (Eagles Nest Dam) – Wambo licensed discharge point (LDP) 4 under Environment Protection Licence (EPL) 529. Upon recommissioning of Wambo South Dam a second LDP (19) will also be available. WCPL currently holds 30 HRSTS credits. Discharges from site into Wollombi Brook may occur only during an announced River Register and, according to the conditions of Wambo's EPL529, when flow exceeds 500 ML/day in Wollombi Brook as measured at the Bulga gauging station. Recorded streamflow data indicates that this has occurred for 9.2% of the period of record (1945 to present).

A total of 30 HRSTS credits and the above EPL529 discharge conditions have been used in determining the operation of the WMS. Refer to **Section 4.2.2.10** for additional information pertaining to the HRSTS.

# 4.0 Water Balance Model

## 4.1 Original Water Balance Model Development

A water balance model was initially developed for the Wambo WMS as part of the Wambo Development Project EIS studies in 2003 (June 2003). The model simulated inflows, outflows, transfers and changes in storage of water on site on a daily basis, under variable climatic conditions. This initial model adopted a number of simplifications including lumped consideration of site storages and other hydrological processes as well as a simple linear relationship to simulate runoff and seepage from rainfall on the various catchments and mine landforms.

A detailed water balance assessment was completed for United Wambo by Hydro Engineering and Consulting Pty Ltd (HEC) and forms an appendix to the Surface Water Assessment (Umwelt 2016a). Given the integrated nature of the United Wambo and Wambo WMS, the water balance assessment included consideration of water use and make in the Wambo and United pits as well as the Wambo underground, CHPP and train loading facility.

## 4.2 2020 Water Balance Model Update

The current GoldSim water balance model was developed by Jacobs in 2019 and updated in 2020 as part of a Peabody mine water governance initiative. The initiative, in part, comprises a consistent approach to development and use of water balance models across multiple mine sites and provides for a common approach to key model aspects such as model coding and architecture, functionality and results reporting. Where relevant, the 2020 model has built upon previous models presented in HEC (2016 and 2017) as well as Engeny (2018). Key assumptions such as rainfall-runoff model (AWBM, Australian Water Balance Model) parameters and catchment landuse water quality have been adopted; additional inputs such mine catchments, ROM coal production and water management infrastructure have been updated to reflect the current mine plan.

### 4.2.1 Model Description

The water balance model has been developed using GoldSim software to simulate the storages and water transfer network shown in Figure 4. The model simulates all major water and salt fluxes as follows:

- Inflows:
  - Direct rainfall to water storage surfaces, runoff, groundwater inflow (to both mine open cut pits and underground mines), tailings decant water[6] from active tailings storages, raw water sourced from the WALs and all pumped inflows from other storages; and
- Outflows:
  - Evaporation, seepage, licensed discharge to Wollombi Brook via the HRSTS and all pumped outflows to other storages.

The model runs on a daily time step using a boot-strapped simulation. Model simulations begin on 1 January 2020, with the current stored water volumes and simulate the period to the end of 2032 – the current proposed end of Wambo, including MOD17 and the United Wambo Open Cut Coal Mine Project. The model simulates 119 "realisations" derived using the historical

[6] Tailings bleed water is water liberated from tailings slurry as it settles within a tailings storage. This water reports to the tailings surface, ponds and is available for reclaim pumping

daily climatic record[7] from 1900 to 2020. Realisation 1 uses climatic data from 1900 to 1912, realisation 2 uses data from 1901 to 1913, realization 3 uses data from 1903 to 1914, and so on. The results from all realizations are used to generate water storage volume estimates, supply reliability and other relevant water balance statistics. This method effectively includes all recorded historical climatic events in the water balance model, including high, low and median rainfall periods.

The water balance model has been linked to output from the Hunter River IQQM. The IQQM is the model used by the DPI-Water to set licence allocation levels in the Hunter Valley, in accordance and in conjunction with the Water Sharing Plan for the Hunter Regulated River Water Source 2003 (herein referred to as the WSP). The IQQM data was used to assist in the development of model functionality to estimate the occurrence of river registers and facilitate modelled controlled releases of water into Wollombi Brook.

Salinity values have been assigned to runoff (for each storage), groundwater, Hunter River and Wollombi Brook water and tailings bleed water consistent with United Wambo Complex water balance assessment (Engeny 2018). Water and salt balance (assuming fully conserved advective mass transport) checks are performed for every modelled storage as well as the entire model.

### 4.2.2 Model Assumptions and Data

#### *4.2.2.1 Rainfall Runoff Simulation and Catchment Areas*

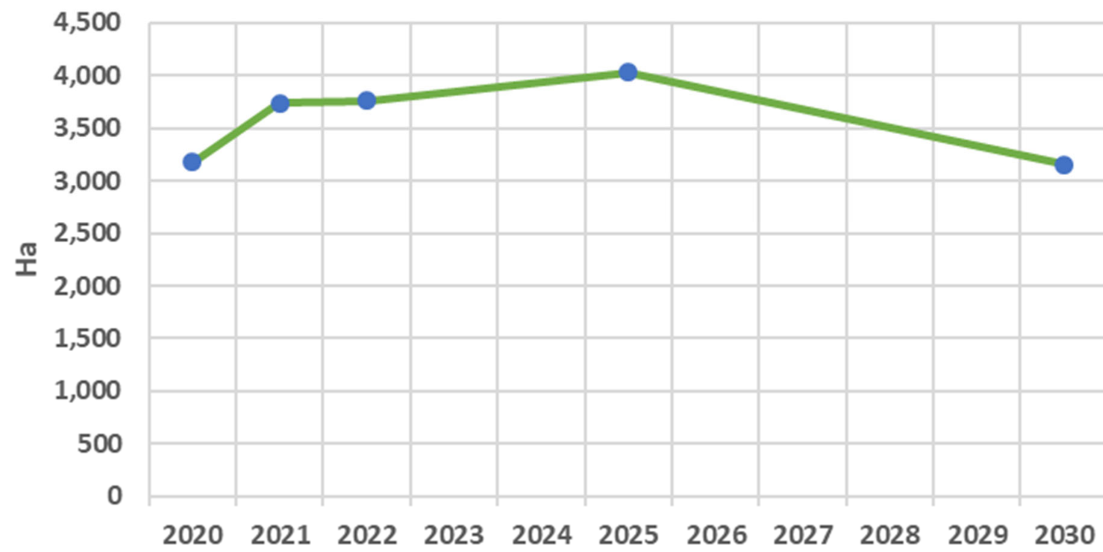
Rainfall runoff in the water balance model is simulated using the Australian Water Balance Model (AWBM) (Boughton, 2004). The AWBM is a nationally-recognised catchment-scale water balance model that estimates catchment yield (flow) from rainfall and evaporation.

AWBM simulation of flow from six different sub-catchment types was undertaken, namely: undisturbed (natural) areas, hardstand (for example, roads and infrastructure areas), open cut pit, overburden emplacements, rehabilitated overburden and tailings. AWBM simulation of flow from each of the sub-catchment types was undertaken. Parameter values were adopted from (Engeny, 2018). Model parameters were derived from calibration to recorded water volumes from 2014 to 2018. For water surface areas, rainfall was assumed to add directly to the storage volume with no losses.

Each modelled storage catchment area was divided into sub-catchment areas corresponding with the above sub-catchment types. **Figure 5** summarises the total catchment area reporting to the WMS over the simulation period. The figure indicates that the catchment area increases at the start and peaks at a maximum of approximately 40 $km^2$ in approximately 2025, before decreasing as runoff from rehabilitated areas is directed off site.

**Figure 6** to **Figure 12** show mine catchments and landuse for the years 2020, 2021, 2022, 2025 and 2030.

[7] Data was sourced from 'Data Drill' generated climatic data for the mine location. The Data Drill is a system which provides synthetic data sets for a specified point by interpolation between surrounding point records held by the Bureau of Meteorology (QLD Government, 2014). Both rainfall and pan evaporation data were obtained from this source.




| | 2020 | 2021 | 2022 | 2025 | 2030 |
|---|---|---|---|---|---|
| Total Area | 3,177 | 3,739 | 3,764 | 4,033 | 3,152 |

**Figure 5: Modelled Total Catchment Area versus Time**

Peabody

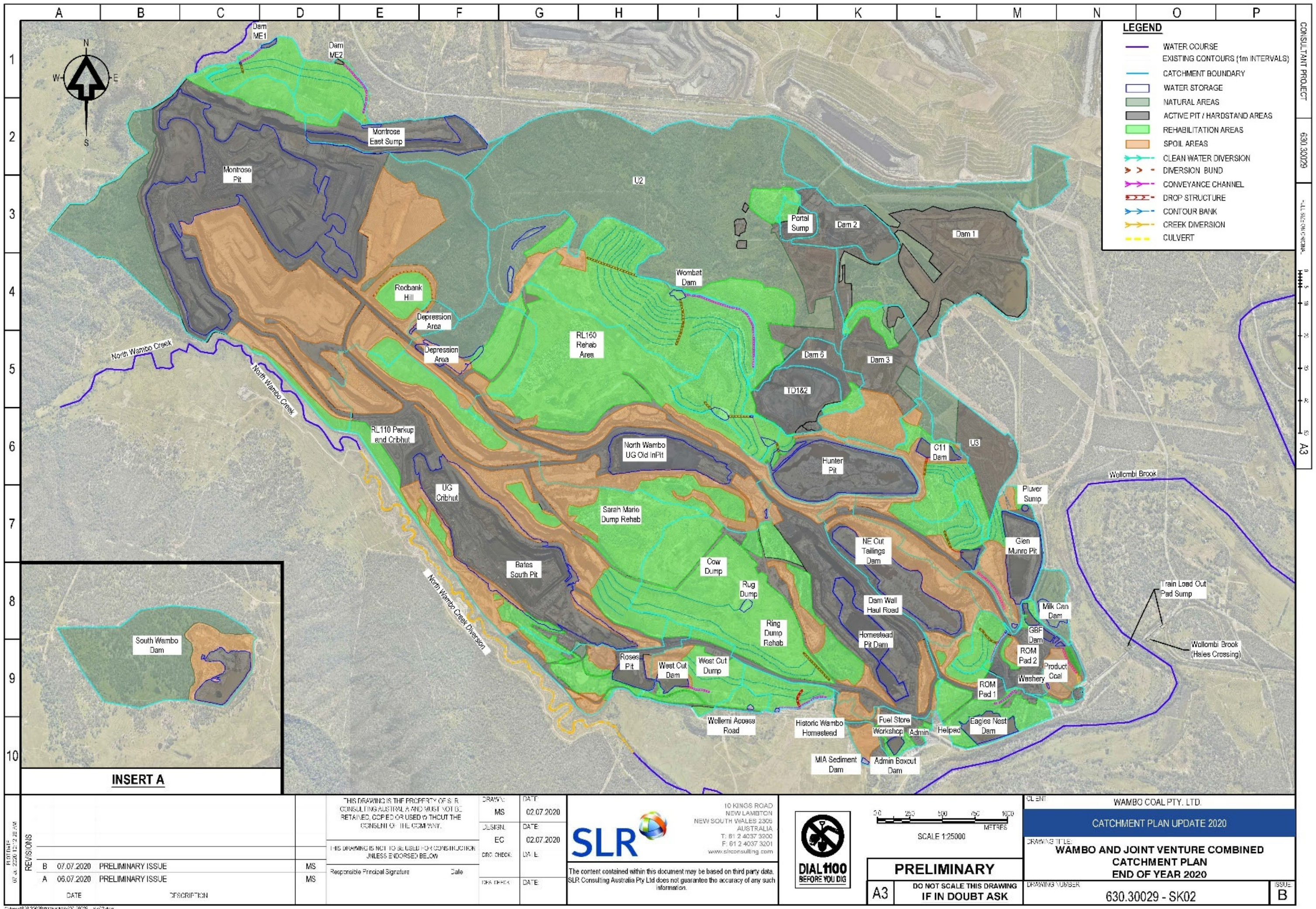



**Figure 6: Catchment Areas and Land Use (2020)**

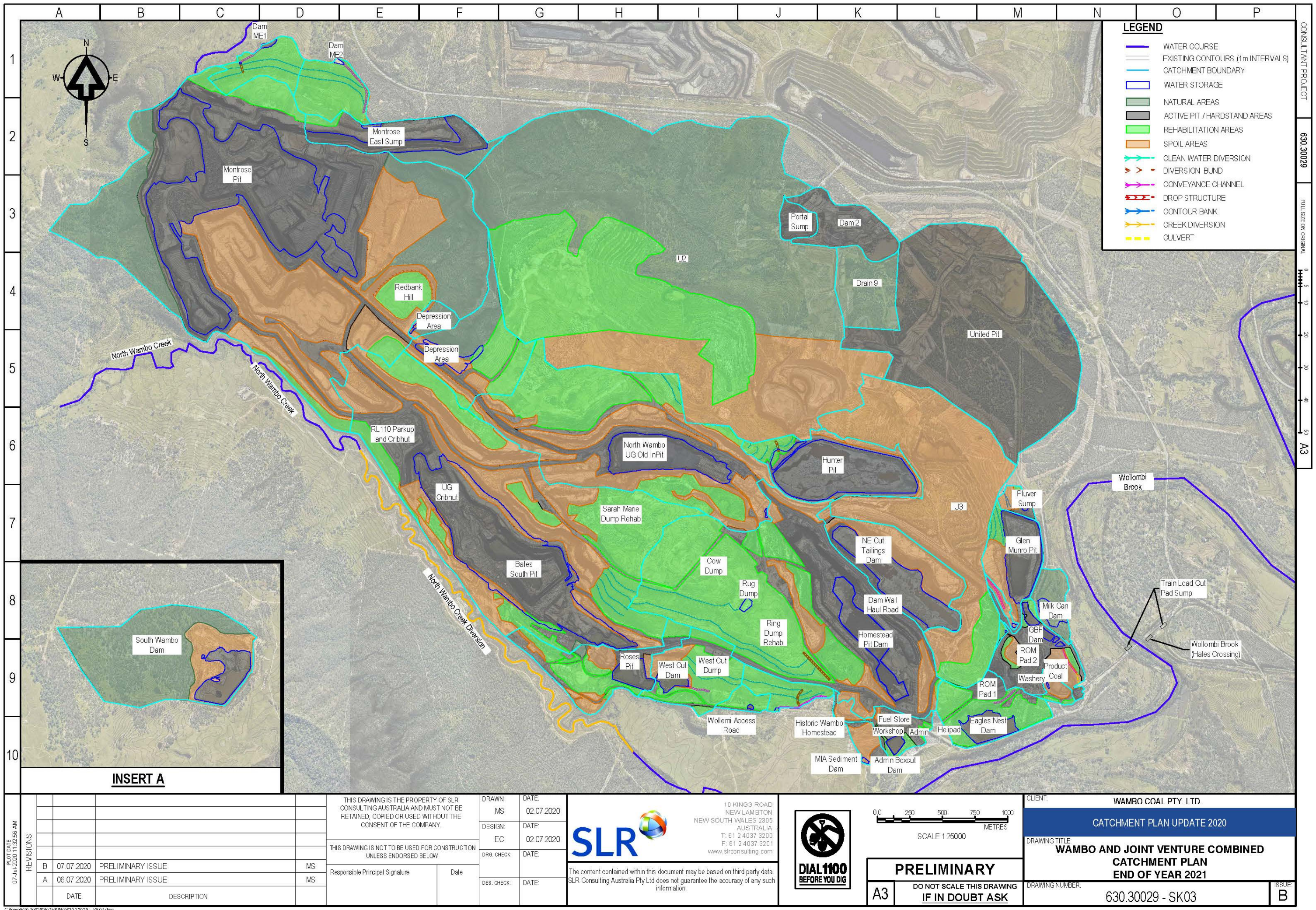



**Figure 7: Catchment Areas and Land Use (2021)**

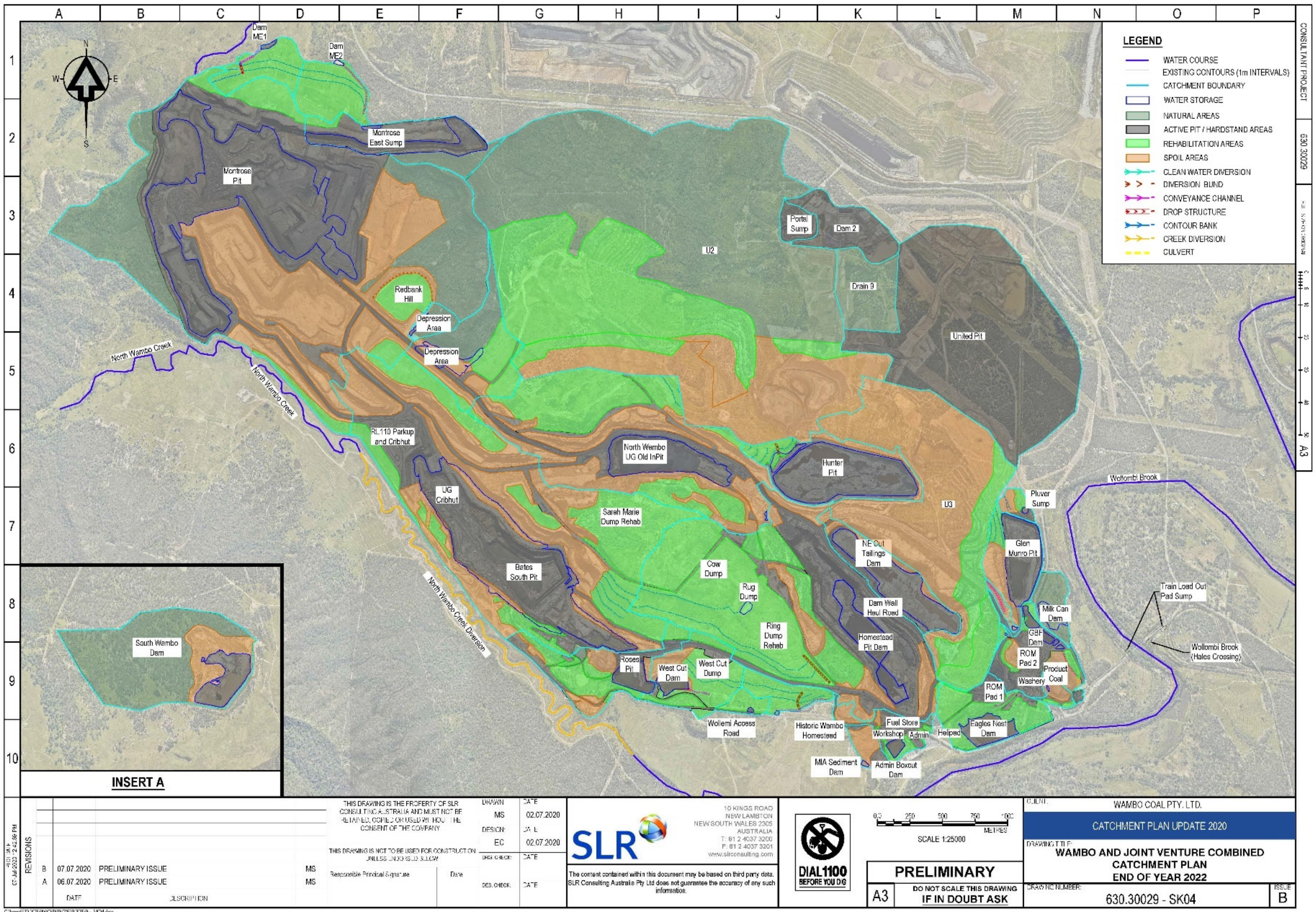



**Figure 8: Catchment Areas and Land Use (2022)**


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**Figure 9: Catchment Areas (2025)**


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**Figure 10: Catchment Areas (2030)**

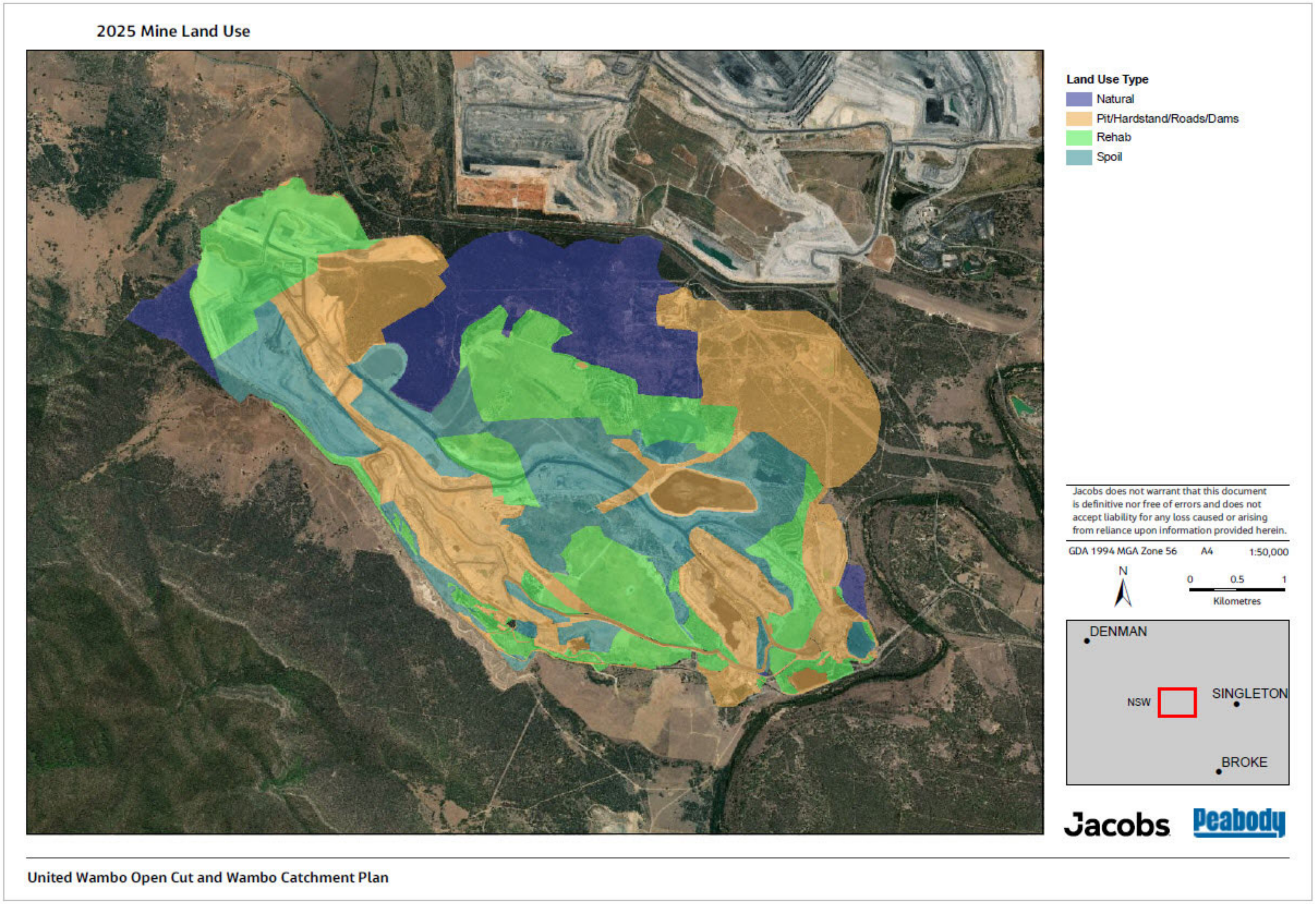


**Figure 11: Land use (2025)**

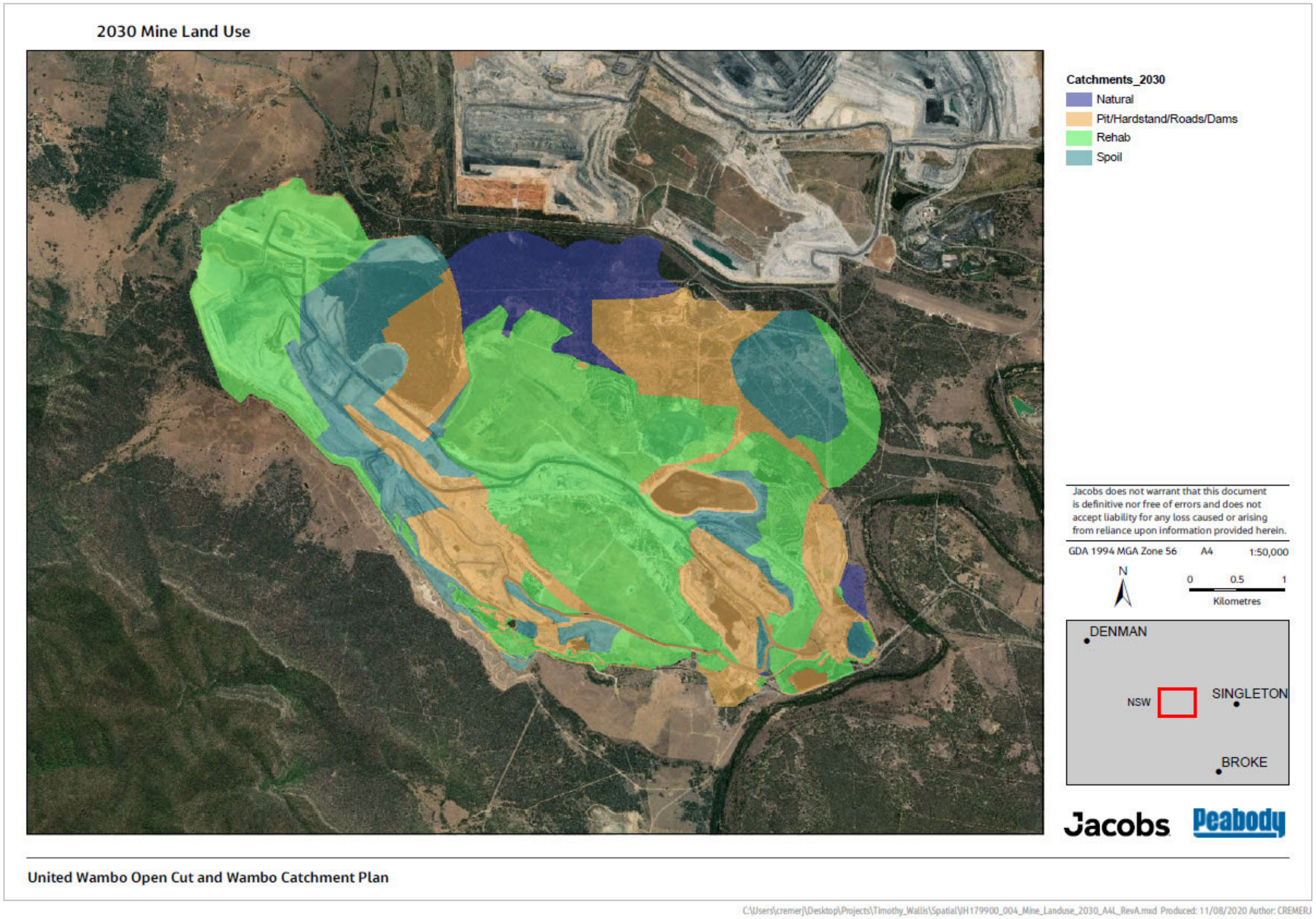


**Figure 12: Land use (2030)**

### *4.2.2.2 Evaporation from Storage Surfaces*

Storage volumes simulated by the model are used to calculate storage surface area (i.e. water area) based on storage level-volume-area relationships for each water storage based survey data acquired in 2020. A pan factor of 0.75 was adopted for all months.

### *4.2.2.3 Tailings Disposal*

Tailings disposal to the Homestead Inpit TSF is proposed to continue until commencement of deposition in a new facility within the Homestead Main Pit. Tailings disposal into Homestead Main Pit is planned to commence from Q1 2021 through 2026. An overall tailings decant water recovery of 76.6% was assumed based on recorded CHPP data.

### *4.2.2.4 CHPP Demand*

Relevant coal and tailings properties which affect CHPP water demand and tailings water calculations in the model are summarised below:

- ROM (CHPP feed) moisture: 3%
- Product coal moisture: 10%
- Coarse rejects moisture: 15%
- Tailings moisture content: 64%

**Figure 13** shows future CHPP feed, product and tailings tonnages for the life of mine for Wambo and United Wambo. **Figure 14** shows the calculated CHPP make-up demand based on these tonnages and the above moisture contents.

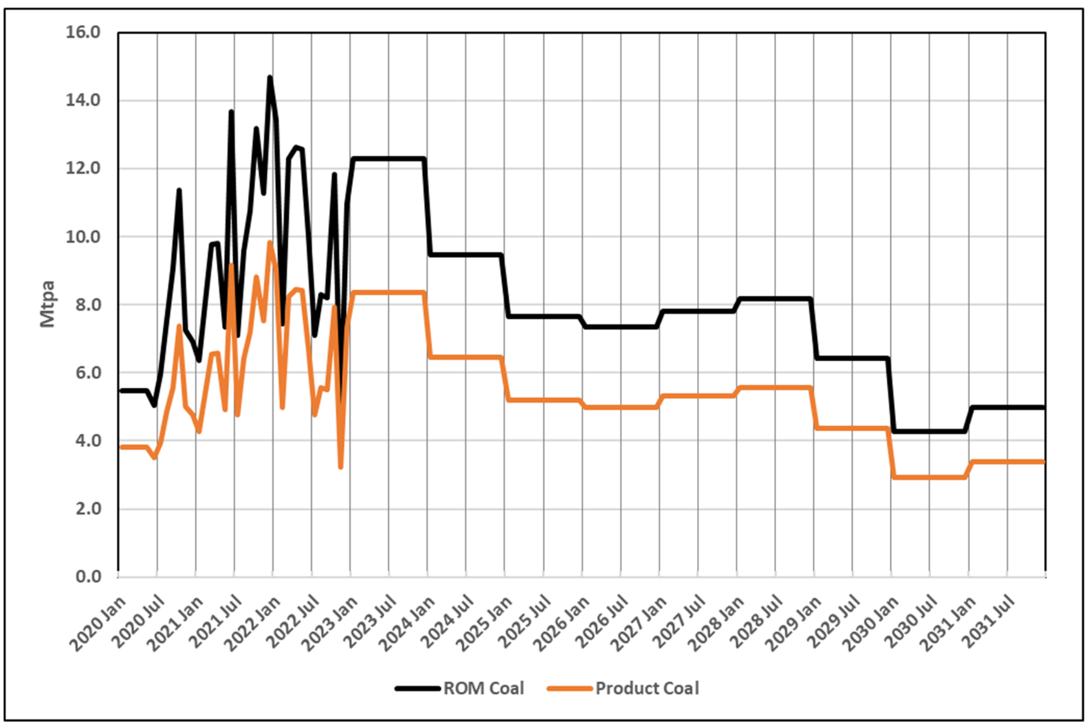


**Figure 13: Annual CHPP ROM and Product Coal**

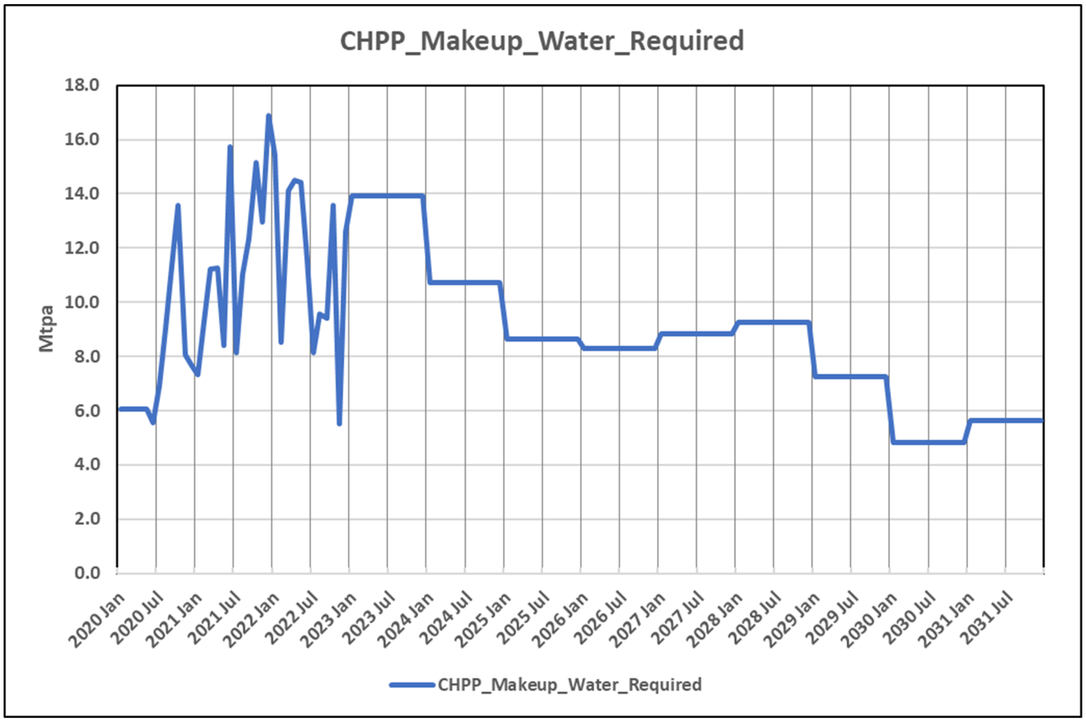


**Figure 14: Calculated CHPP Water Demand**

#### *4.2.2.5 Haul Road Dust Suppression Demand*

Simulated haul road dust suppression demands were based on average dust suppression rates for an average haul road area from similar nearby mining operations. The rates were assumed to vary between 5.36 ML/d in January (summer) and 1.84 ML/d in July (winter) with rates for intermediate months interpolated between these two extremes. Monthly rates are summarised in **Table 8**. An additional 2 ML/d until 2025 then 1 ML/d thereafter was made for United Wambo dust suppression activities.

**Table 8: Dust Suppression Demand**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Demand (ML/d)** | 5.36 | 4.77 | 4.19 | 3.60 | 3.01 | 2.43 | 1.84 | 2.43 | 3.01 | 3.60 | 4.19 | 4.77 |

#### *4.2.2.6 Underground Operations*

Wambo’s North Wambo Underground portal access was sealed 2017. Mining of South Bates Underground (Wambo and Whybrow seams) was completed in 2018. Currently mining is progressing in South Bates Extension Underground (Whybrow seam). Water is actively pumped to South Bates Pit sump which forms part of the WMS outlined in **Figure 4**.

#### *4.2.2.7 Metered Data*

Wambo and United Wamo have installed a number of flow meters to monitor water movement around the Complex. Metered data for flow meters, CHPP operations, mine water inventories and site discharges are used to calibrate and verify the water balance model.

#### *4.2.2.8 Groundwater Inflow*

Groundwater inflow rates to the Wambo (Montrose and Montrose East) and United open cut pits and the Wambo and United underground workings were based groundwater assessments for the United Wambo Project Environmental Impact Statement (AGE, 2016) and DA 305-7-2003 Modification 17 South Bates Extension Environmental Assessment (Hydrosimulations, 2017).

As the South Bates Underground Mine and the South Bates Extension will become water storages after active mining is completed, groundwater inflow rates have been assumed to remain constant following transition to water storage. When the volume of water stored in the South Bates Underground Mine and the South Bates Extension reaches 2,000 ML and 3,000 ML respectively, groundwater inflows have been assumed to be zero.

#### *4.2.2.9 Hunter River and Wollombi Brook Supply*

Development of the water balance model utilised simulated streamflow data from DPI-Water's Hunter River IQQM which was run using the same period of climate data as used in the water balance model. The output was used to investigate if a suitably robust relationship could be derived between AWDs for Hunter Regulated River Water Supply and climate and streamflow data. However, for the 15 years of historical data available, only 1 year had a closing AWD of less than 100% and therefore no suitable relationship was found.

Key outputs sourced from the IQQM and used to inform development of the water balance model included:

- Daily Hunter River flows at Singleton, Greta and Glennies Creek gauging stations – used to determine periods of uncontrolled flows, when extractions are not limited by AWDs, in accordance with the WSP.
- Daily Wollombi Brook flows at Bulga – used to determine available water for extraction based on flow rate.
- Daily simulated volume stored in Glenbawn Dam and Glennies Creek Dam (the two Hunter River major regulating storages), used to estimate AWD for High Security Entitlement (HSE) WALs.

Pumping rate limitations were assumed to apply for both Hunter River and Wollombi Brook extractions. Sourcing of water from the Hunter River and Wollombi Brook was only simulated when certain 'trigger' conditions occurred. Wollombi Brook extraction was assumed to occur in preference to Hunter River extraction because Hunter River WALs are 'held' in the two regulating storages whereas Wollombi Brook unregulated flows are subject to natural variations and supply is opportunistic. Table 9 summarises AWD and carry over assumptions adopted for WALs held by WCPL and United in the water balance model.

Table 9: WALs and Assumed AWDs, Carry Over and Current Draw

| Water Allocation License (WAL) | Assumed Annual Available Water Determination (%) | Carry Over (%) | Current Draw (ML) |
|---|---|---|---|
| Wollombi Brook Unregulated River | 100 | 0 | 64 |
| Hunter River High Security | 100 | 0 | 38 |
| Hunter River General Security | 100 | 25 | 0 |
| North Coast Fractured Rock Groundwater | 100 | 25 | 0 |

#### *4.2.2.10 Licensed HRSTS Discharges*

WCPL currently participates and has bought credits in the Hunter River Salinity Trading Scheme (HRSTS) on behalf of both Wambo and United Wambo. Upon receipt of confirmation (from the NSW Water) of flow type (Low, High or Flood) and total salinity tonnage that can be released on a certain day, WCPL reviews the salinity in the Process Water Dam (Eagles Nest Dam) and calculates (based on the credits) the volumetric contribution that can be made to the adjacent Hunter River.

WCPL is also constrained by a requirement to have more than 500 ML/day flowing down the adjacent Wollombi Brook before discharge can occur as this tributary carries the Mine's discharge to the Hunter River.

Existing WCPL release infrastructure for discharge from the Process Water Dam to Wollombi Brook is available and will be augmented by additional release capacity from Wambo South Dam upon recommissioning. The approved maximum release rate is 250 ML/d and WCPL currently holds 30 HRSTS credits. The simulated salinity of water in the Process Water Dam was used to calculate the daily volume able to be discharged during "high" flow events in accordance with the provisions of the HRSTS.

Simulating periods available for licensed discharge involved developing a relationship between Hunter River flow rate and river registers for declared "high" flow events. This relationship was developed using historical river registers sourced from DPI-Water records, correlated against recorded Hunter River daily flows. This correlation was extended to "flood" flow events in the Hunter River (during which no daily discharge restriction applies). Hunter River flow rates at Singleton were simulated by the IQQM for the same period of historical climate data as used in the water balance model and these flows used with the above correlation relationship to simulate future river registers.

#### *4.2.2.11 Storage Capacities and Initial Storage Volumes*

Modelled storage capacities and maximum operating levels (MOLs) are summarised in **Table 10** with assumed initial model stored water volumes (as at August 2020).

#### *4.2.2.12 Pumping Rates and Transfers*

Model pumping transfer rates between storages and pits are summarised in Table 11. Note that not all transfers are available for the duration of the simulation as they are dependent on the infrastructure sequence outlined in Table 7. In addition, some transfers are only available should additional storage options be identified as necessary e.g. Montrose Dam, South Bates Underground storage.

Modelled transfers adopt a number of rules to ensure correct operation of each transfer and to ensure storages are not allowed to exceed MOLs. Relevant MOLs are shown in Table 10.

**Table 10: Modelled Storage Capacities, MOLs and Initial Volumes**

| Storage | Capacity (ML) (MOL) | Comments | Initial Stored Water Volume (ML) |
|---|---|---|---|
| **Water Storages Managed by Wambo** | | | |
| Process Water Dam (Eagles Nest) | 122.4 (57.8) | | 61 |
| MIA Dam (Admin Box Cut) | 150 (112) | | 61 |
| CHPP Dams (Gordon Below Franklin) | 38.1 (19.5) | | 6.6 |
| Milk Can Dam | 21.5 | MOL not applicable, no transfers in | 1.9 |
| West Cut Water Dam | 162 (132) | | 22 |
| South Wambo Dam | 817.5 (678) | Available from Q2 2021 | 0 |
| Hunter Pit Tailings | 1,884 | | 0 |
| North East Tailings | 1,875 | | 0 |
| Homestead In-Pit Tailings | 5,922 | | 0 |
| South Bates Pit Storage | 800 (50) | MOL only applicable until end of mining | 10 |
| Homestead Pit Dam | 5,923 (5,575) | | 583 |
| Glen Munro Void Storage | 4,160 (2,000) | | 97 |
| South Bates Underground | 2,000 | Only applies to when mining is complete and deemed a water storage. | 1,000 |
| South Bates Extension Underground | | No storage assumed available | 0 |
| South Wambo Underground | | No storage assumed available | 0 |
| United Underground Workings | 3,000 | | 3,000 |
| Montrose Dam | 1,518 (1,441) | Possible future dam | N/A |
| **Water Storages Managed by United Wambo** | | | |
| Dam 2 | 88 | | 0 |
| U2 | 652 | | 0 |
| U3 | 645 | Modelled Dam U3 includes additional catchment areas for Dams C11 (decommissioned end 2020) and Dam C1 and the United Rehab Dam (from 2030). These dams are not modelled explicitly. The Modelled dam capacity therefore contains an additional volume to accommodate inflows from 2030 onwards. | 115 |
| Montrose East Pit Sump | 1 | Gravity discharge to Montrose Pit | 0 |
| Montrose Pit | 113,000 | | 0 |
| United Pit | 104,000 | | 0 |
| Plover Dam | 5.3 | MOL not applicable, no transfers in | 0 |
| MIA Sediment Dam | 2.7 | MOL not applicable, no transfers in | 0 |
| ME1 Sediment Dam | 6.0 (4.9) | | 0 |
| ME2 Sediment Dam | 2.9 | MOL not applicable, no transfers in | 0 |

**Table 11: Modelled Pump Rates**

| Source Storage | Destination | Pump Rate (L/s) | Comment |
|---|---|---|---|
| West Cut Dam | Eagles Nest Dam | 100 | |
| West Cut Dam | Wambo South Dam | 150 | After Q2 2021. U2 dam decommissioned in 2025 |
| U2 Dam | | 280 | |
| U3 Dam | | 400 | |
| Wambo South Dam | West Cut Dam | 70 | After Q2 2021 |
| Homestead Pit Dam | Eagles Nest Dam | 170 | |
| | West Cut Dam | 70 | |
| North East Tailings | West Cut Dam | 50 | After transition of Homestead Pit Dam into tailings storage and if Glen Munro void unavailable |
| MIA Sed Dam | | 80 | |
| Homestead In-Pit Tailings | | 50 | |
| Hunter Pit Tailings | | 100 | |
| Glen Munro | | 50 | |
| North East Tailings | Glen Munro void storage | 50 | Available from Q3 2022 if required |
| Homestead In-Pit Tailings | | 50 | |
| Hunter Pit Tailings | | 100 | |
| Homestead Pit Dam/Tailings | | 70 | |
| West Cut Dam | | 100 | |
| Plover Dam | | 50 | |
| U2 Dam | Homestead Pit Dam | 280 | Until end Q1 2021. U2 dam decommissioned in 2025 |
| U3 Dam | | 400 | |
| North East Tailings | | 50 | |
| Homestead In-Pit Tailings | | 50 | |
| Hunter Pit Tailings | | 100 | |
| West Cut Dam | | 100 | |
| Milk Can Dam | Gordon Below Franklin (GBF) | 100 | |
| Gordon Below Franklin (GBF) | Eagles Nest Dam | 110 | |
| United Underground | | 20 | From 2024 |
| Wambo South Dam | | 100 | |
| U2 Dam | | 280 | Dam decommissioned in 2025 |
| U3 Dam | | 400 | |
| Plover Dam | | 50 | |
| MIA Sed Dam | | 80 | |
| Glen Munro | | 100 | |
| Glen Munro | Homestead Pit Dam | 50 | Until end Q1 2021 |
| ME 2 Sed Dam | ME 1 Sed Dam | 50 | |
| ME1 Sed Dam | East Montrose Pit Sump | 50 | |
| Dam 2 | U3 Dam | 50 | Until 2030 |
| West Cut Dam | Montrose Dam (future optional) | 80 | Possible future option |
| Montrose Dam (future optional) | West Cut Dam | 50 | Possible future option |
| Eagles Nest Dam | South Bates Underground mine storage | 50 | Option |
| South Bates Underground mine storage | Eagles Nest Dam | 50 | Option |
| South Bates Pit | West Cut Dam | 200 | |
| Montrose Pit | | 120 | |
| United Pit | U3 Dam | 100 | |

#### *4.2.2.13 Water Management Infrastructure*

The water balance model incorporates the key water management infrastructure outlined in **Table 7** as follows:

- The following UWJV dams are not explicitly modelled however their relevant catchment areas are still incorporated into the model and where relevant, are reflective of the decommissioning and commissioning timelines presented in Table 7:
  - Decommissioning of Tailings Dams 1, 2, Dam 3, Dam 6, Drain 9 and C11; and
  - Commissioning of Dam C1.
- Homestead Pit Dam transition to tailings storage in March 2021,
- Wambo South Dam available from June 2021,
- Glen Munro void available for water storage from October 2022; and
- Option to use up to 1 GL of storage in the South Bates Wambo Underground Mine workings from 2022.

Only disturbed area water storages have been included in the water balance model. Modelling does not include dams which intercept runoff from undisturbed or rehabilitated areas and direct this water around disturbed areas to local creeks.

### 4.2.3 Predicted Water Balance Model Results

#### *4.2.3.1 Overall Site Water Balance*

Model predicted average inflows and outflows, averaged over all 119 realisations and the full simulation period, are shown in **Figure 15** and are calculated per the NSW water year (July to June).

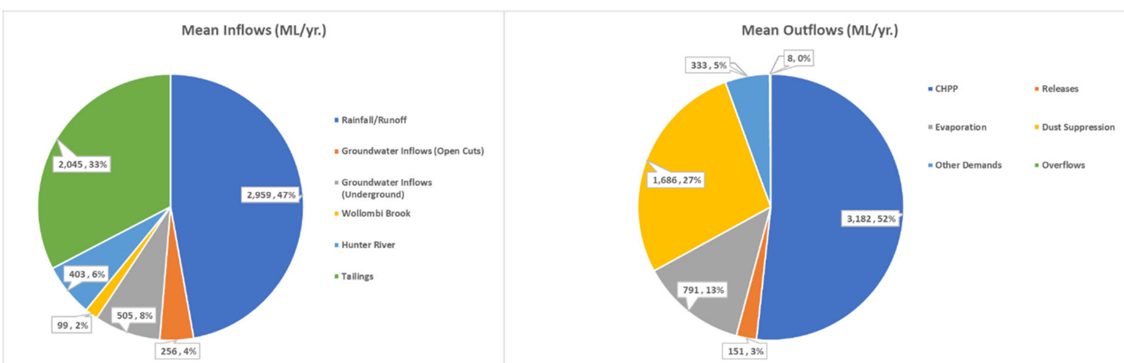


**Figure 15: Average Modelled System Inflows and Outflows**

Runoff and rainfall (direct to water storage surfaces and applied without loss) provides the greatest average modelled system inflow, accounting for 47% of total inflows, followed by tailings decant (33%). Licensed extraction (WALs for Wollombi Brook and Hunter River) account for approximately 8% of inflows on average. Average outflows are dominated by supply to the CHPP (52%) and haul road dust suppression (27%), followed by evaporation (13%). Licensed discharge to Wollombi Brook comprises 151 ML/year (2%) on average.

**Table 12** below summarises the key water balance inputs and outputs.

Average inflows are predicted to total 6,267 ML/year, while average outflows total 6,143 ML/year. There is a relatively low average reliance on water obtained from existing Wollombi Brook and Hunter River Water Allocation Licences (average 502 ML/year).

**Table 12: Mean Water Year Input and Output Summary**

| Component | ML/yr. |
|---|---|
| **Inflows** | |
| Rainfall/Runoff | 2,959 |
| Groundwater Inflows (Open Cuts) | 256 |
| Groundwater Inflows (Underground) | 505 |
| Wollombi Brook | 99 |
| Hunter River | 403 |
| Tailings | 2,045 |
| **Outflows** | |
| CHPP | 3,182 |
| Releases | 151 |
| Evaporation | 791 |
| Dust Suppression | 1,686 |
| Other Demands | 333 |
| Overflows[8] | 8 |
| **Total Inflows** | **6,267** |
| **Total Outflows** | **6,143** |
| **Change in WMS Storage (Balance = Inflow - Outflow)** | **124** |

The performance of the Wambo and United Wambo combined WMS has been reviewed and water balance modelling results (**Figure 16**) indicate the following:

- The 95th percentile (95%) results indicate that the surface water management system is has a positive water balance gaining approximately 326 ML/yr. (water year) based on an annualised water balance for the life of mine;
- The median (50%) results indicate that the surface water management system has a positive water balance of approximately 97 ML/yr. (water year) based on an annualised water balance for the life of mine; and
- The 5th percentile (5%) results indicate that the surface water management system has a moderately negative water balance (-47 ML/yr.) based on an annualised water balance for the life of mine.

The water balance model results indicate the proposed surface water management system is capable of managing stored inventories during the median, 5th percentile (dry) and 95th percentile (wet) climate conditions. Under the 5th percentile (dry) climate conditions, water supply will be accessed from the from the existing Wambo and United WALs to maintain surface water inventories for site processes. The majority of external water supply is sourced from the Wambo Underground boreholes during these conditions. A combination of surface

[8] Overflows from the modelled sediment dams (ME1, ME2 and the MIA Sediment Dam. On average, overflows from the sediment dams occur less than 5 days per year (due to daily dewatering) which is significantly less than the target containment event of the P80 5-day rainfall total (26.4mm) which occurs, on average, 37 days per year.

water storages and underground water storages (post 2022) will cater for stored inventories under the 5th percentile (wet) climate conditions.

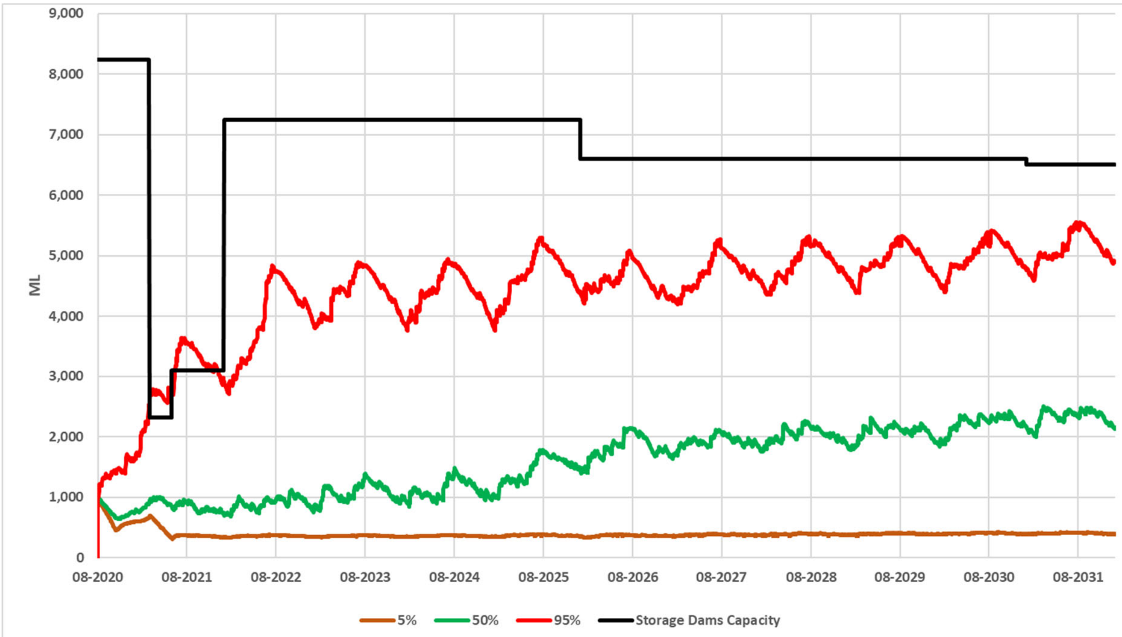


**Figure 16: Surface Water Inventory Forecast**

Note that while the 95th percentile result shows that the estimated water inventory exceeds the capacity of the water storage dams (2021), this does not indicate the potential for uncontrolled discharges. The water storage capacity is comprised of the following dams, which when exceeded may require the temporary storage of additional water in either the open cut pits until inventories are drawn down of additional releases under the HRSTS are made:

- Eagles Nest, Admin Boxcut, West Cut, GBF,
- Homestead (prior to tailings deposition),
- South Bates Sump,
- South Wambo Dam (once recommissioned); and
- Glen Munro Void

### 4.2.4 Security of Supply

The site water balance model indicates that Wambo and United Wambo, as a Complex, is predicted to have a high level of water supply reliability. This indicates that the mine plan, associated water management infrastructure and available existing WALs should be able to provide a reliable supply of water in the majority of climatic scenarios. The water balance model will be updated throughout the mine life to forecast supply reliability as part of the water management planning process. In the event of reductions in the forecast reliability due to low rainfall conditions, water conservation measures shall be considered.

## 5.0 Site Salt Balance

A site salt balance (SSB) has been developed as an extension of the SWB for Wambo and United Wambo. The salt balance model allows the salt load and salinity of water exported from United Wambo to be predicted, which is an important consideration for the management of water on-site.

Given the integrated nature of the United Wambo and Wambo WMS, the water balance assessment has included consideration of water use and make in the Wambo and United pits as well as the Wambo underground, CHPP and train loading facility. Salt transfers were simulated within the site water balance model in parallel with the water transfers. The SSB provides the expected salt loads and concentration of salt associated with each water transfer within the model.

### 5.1 Saline Material

Saline material is any material moved on site that has the potential to generate saline water. Salt is chemically released by weathering and then has the potential to be transported by water. The sources of saline material at Wambo and United Wambo are:

- Overburden and interburden;
- ROM coal;
- Product coal;
- Coarse coal rejects; and
- Tailings.

Saline material has the potential to generate saline water while it is exposed to the surface. Saline material will be managed though storage and emplacement such that the saline water that is generated is contained in the WMS. The details of the management of the different source of saline material are summarised in **Table 13**.

Table 13: Management of Saline Material

| Source | Management |
| --- | --- |
| Overburden and interburden | Emplaced in dumps that are constructed such that runoff is contained in the water management system before being capped and revegetated. |
| ROM coal | Stored in stockpiles that are constructed such that runoff is contained in the water management system before being processed in the CHPP.<br><br>Currently managed by Wambo. |
| Product coal | Stored in stockpiles that are constructed such that runoff is contained in the water management system before being exported off site.<br><br>Currently managed by Wambo. |
| Coarse coal rejects | Emplaced in dumps that are constructed such that runoff is contained in the water management system capped and revegetated. |
| Tailings | Emplaced in tailings dams that are constructed such that runoff is contained in the water management system capped and revegetated.<br><br>Currently managed by Wambo. |

## 5.2 Saline Water

The sources of saline water at United Wambo are:

- Surface water runoff – in addition to the salt released by weathering of the saline material, salt also accumulates by deposition from rainfall in soil. The salt on the surface of the soil or material is dissolved by rainfall and enters the WMS dissolved in runoff;
- Groundwater inflows into open cut pits and/or underground mine workings;
- water imported from other mines;
- water imported from the Hunter River and Wollombi Brook; and
- direct rainfall onto water storages.

As salt lost via evaporation is negligible, salt will typically concentrate in the water stored and used at Wambo and United Wambo. Once dissolved, the salt remains in solution as it is transferred through the WMS, unless the water is discharged under EPL 529 and Hunter River Salinity Trading Scheme (HRSTS).

Salt passes through the CHPP in solution and either remains with the product or coarse reject material or is pumped as tailings slurry in proportion to the water volumes. Salt dissolved in the tailings slurry is either retained in the tailings or transferred in solution with decant water in proportion to the water volumes. Salt dissolved in water used for dust suppression accumulates on the haul roads as the water evaporates. The salt is redissolved when runoff occurs and re-enters the WMS.

Where possible, the water management strategy involves segregating water sources high in salinity (i.e. pit groundwater inflow and runoff from coal handling areas) from those with lower salinity (i.e. sediment dams and raw water extracted from the Hunter River and Wollombi Brook). Water that is high in salinity is utilised as a first priority for coal processing and dust suppression to minimise the quantity of high saline water requiring off-site discharge. Water storages used to store high salinity water are designed and managed to accommodate volumes of water from more significant rainfall events than sediment dams.

Salt outflows from the WMS include:

- In water bound with tailings and coarse rejects;
- In product coal moisture;
- Haul road dust suppression; and
- Controlled discharges via the HRSTS.

## 5.3 Salt Balance Model

The Wambo predictive water and salt balance model (the Model) is a daily time step model developed in the GoldSim® software modelling platform. The Model utilises a range of information to predict water and salt inflows and outflows including:

- Silo data drill climatic data;
- Mine plans;
- Anticipated ROM coal, product coal and rejects production;
- WMS catchments;
- Water quality monitoring results, namely electrical conductivity (EC) and total dissolved solids (TDS);
- Site operational procedures relating to water management;
- Historical Hunter River flow gauging; and
- Historical allocations for water licences.

### 5.3.1 Model Inputs

Salt inflows to the Mine's WMS have been modelled as follows:

- Groundwater inflows to the operating open cut and underground pits, approximately 6,380 mg/L;
- Catchment runoff (undisturbed, overburden emplacement, pit, tailings, coal handling); and
- Hunter River and Wollombi Brook extraction, approximately 425 mg/L.

The sources of saline water are shown in **Table 14** along with representative salinity values. Typical salinity has been defined for runoff into each storage based on values used in the United Wambo EIS Water Balance Assessment (HEC, 2016).

**Table 14: Catchment Salinity Assumptions**

| Runoff Catchment Source | Typical Salinity (mg/L) |
|---|---|
| Natural | 400 |
| Spoil | 1,500 |
| Hardstand | 600 |
| Open Cut | 4,000 |
| Tailings | 4,600 |
| Hunter River and Wollombi Brook | 425 |

## 5.4 Salt Balance Predictions

Median salinity[9] can be expected to increase over time and stabilise at approximately 5,800 mg/L throughout the operational forecast. An improvement in reported water quality is likely as catchments are rehabilitated.

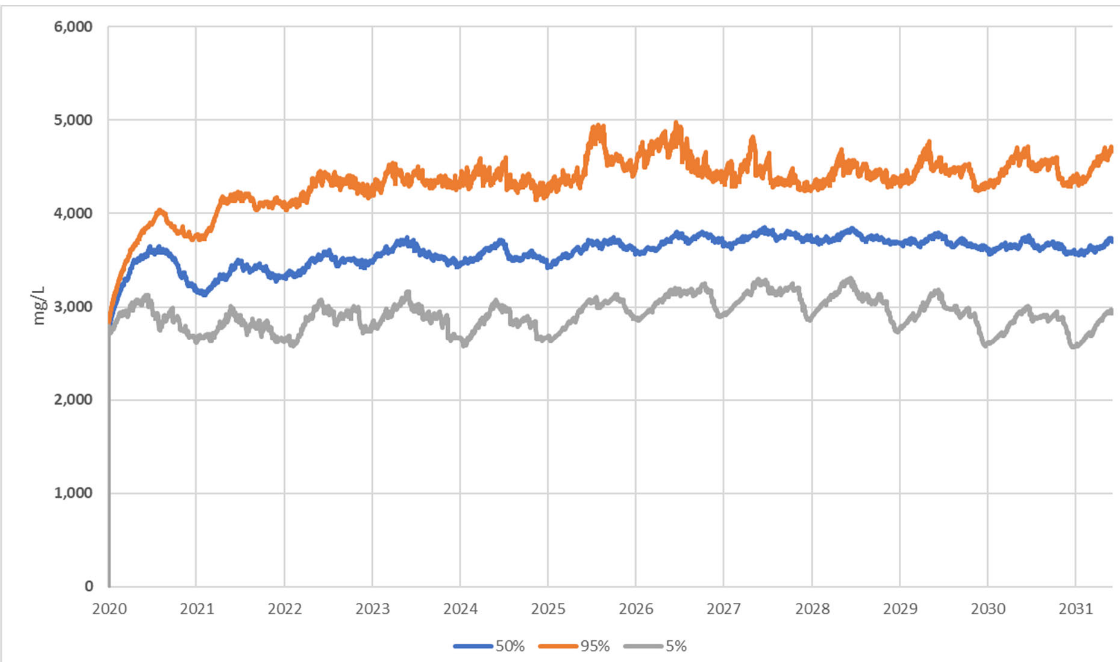


**Figure 17: Mean Salinity**

[9] Calculated as the sum of all salt stored in all surface storages divided by the sum of all water in all surface water storages

# 6.0 Review and Reporting

## 6.1 Water Balance Monitoring

Water inflows and outflows to the Wambo and Wambo United WMS, including water imported to site, water used onsite and water discharged from site shall be monitored based on a range of measured and estimated flows and measured salinity concentrations of the corresponding water source or storage (**Table 15**). Monitoring shall be undertaken on a monthly basis.

**Table 15: Predicted Water Balance Monitoring**

| Component | Monitoring |
|---|---|
| **Water Inflows** | |
| Groundwater | Water Volume – measured using flow metering (active take), estimated based on groundwater model (passive take) |
| Hunter River and Wollombi Brook Extraction | Water Volume – measured using flow metering |
| Transfer from Other Mines | Water Volume – measured using flow metering |
| Catchment Runoff | Water Volume - estimated using recorded rainfall and runoff model |
| **Water Outflows** | |
| Product Coal | Water Volume - estimated based on coal moisture |
| Coarse Rejects | Water Volume - estimated based on coarse rejects moisture |
| Tailings | Water Volume - estimated based on tailings water balance |
| Haul Road Dust Suppression | Water Volume – measured using flow metering and/or water cart fill numbers |
| Evaporation | Water Volume – estimated based on pan evaporation rates |
| HRSTS | Water Volume – measured using flow metering |
| Transfers to Other Mines | Water Volume – measured using flow metering |
| **Water Storage** | |
| Change in Water Storage | Water Volume – measured change in water storage inventories |
| **Water Balance** | **Inflows – Outflows – Change in Water Storage** |

The SWB will be recalculated on an annual basis and reported in the Annual Review as per Section 6.3. In addition, a review of the SWB will occur:

- When there are changes to consent or licence conditions relating to aspects of this site water balance; or
- Following a significant change to the water management regime.

The revised SWB will be re-submitted to the Secretary for approval as required by Condition B66 of DA305-7-2003 and Condition B52 of SSD 7142.

## 6.2 Salt Balance Monitoring

Salt inflows and outflows to the Wambo and Wambo United WMS shall be monitored based on a range of measured and estimated flows and measured salinity concentrations of the corresponding water source or storage (outlined in **Table 16**). Monitoring shall be undertaken on a monthly basis.

**Table 16: Predicted Salt Balance Monitoring**

| Component | Monitoring |
|---|---|
| **Salt Inflows** | |
| Groundwater | Water Volume – measured using flow metering (active take), estimated based on groundwater model (passive take)<br>Salinity – measured groundwater EC or TDS, including seepage quality where practicable |
| Hunter River and Wollombi Brook Extraction | Water Volume – measured using flow metering<br>Salinity – measured raw water EC or TDS |
| Catchment Runoff | Water Volume - estimated using recorded rainfall and runoff model |
| **Salt Outflows** | |
| Product Coal | Water Volume - estimated based on coal moisture<br>Salinity – measured groundwater and process water EC or TDS |
| Coarse Rejects | Water Volume - estimated based on coarse rejects moisture<br>Salinity – measured groundwater and process water EC or TDS |
| Tailings | Water Volume - estimated based on tailings water balance<br>Salinity – measured groundwater and process water EC or TDS |
| Haul Road Dust Suppression | Water Volume – measured using flow metering and/or water cart fill numbers<br>Salinity – measured water storage EC or TDS |
| HRSTS | Water Volume – measured using flow metering<br>Salinity – measured discharge EC or TDS |
| **Salt Storage** | |
| Change in Salt Storage | Water Volume – measured change in water storage inventories<br>Salinity – measured water storage EC or TDS |
| **Salt Balance** | **Inflows – Outflows – Change in Salt Storage** |

The SSB will be recalculated on an annual basis and reported in the Annual Review as per Section 6.3. In addition, a review of the SSB will occur when the SWB is reviewed and/or updated as above.

The revised SSB will be re-submitted to the Secretary for approval as required by Condition B66 of DA305-7-2003 and Condition B52 of SSD 7142.

## 6.3 Annual Review

Prior to the end of March each year, Wambo and United Wambo will review the environmental performance of their respective operations and submit an Annual Review report to the DPIE.

In accordance with Condition B66(d) of DA305-7-2003, and Condition B52(e) of SSD 7142, Wambo and United Wambo will also include information specifically related to the SWB, including:

- A re-calculated site water balance and salt balance for Wambo and United Wambo combined, based on the monitoring data collated as per Sections 6.1 and 6.2; and
- A review of the site water balance against the predictions in the EIS;

- An assessment of the current and forecast compliance with the rules of the HRSTS.

Wambo and United Wambo will also report water extracted or discharged from the site each year (direct and indirect) in the Annual Review, including water taken under each water licence as per Condition B53 of DA 305-7-2003 and Condition B40 of SSD 7142.

## 6.4 Website Updates

The SWB will be made publicly available on Wambo's website: https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports

Information on this website will be updated regularly as required by DA305-7-2003.

The SWB will also be made publicly available on United Wambo's website: https://www.unitedproject.com.au/en/publications/Pages/management-plans.aspx

Information on this website will be updated regularly as required by SSD 7142.

# 7.0 Responsibilities

**Table 17** below summarises responsibilities documented in the SWB. Responsibilities may be delegated as required.

**Table 17: Site Water Balance Responsibilities**

| No | Task | Responsibility | Timing |
|---|---|---|---|
| 1 | Review and update the SWB (including salt balance) in accordance with Section 5.1 | Wambo E&C Manager | As required by Section 6.1 |
| | Ensure that the water balance model is updated throughout the mine life to forecast reliability supply | Wambo E&C Manager | As required |
| 2 | Ensure that controlled releases are undertaken in accordance with the Environmental Protection Licence and the Hunter River Salinity Trading Scheme. | Wambo E&C Manager | As required |
| 3 | Report site water balance and salt balance in the Annual Review | Wambo E&C Manager and Wambo United E& C Manager, each for respective sites. | Annually |
| 4 | Ensure water level and meter data relevant to the CHPP is collated and provided to the Environmental Department in a timely manner | Wambo CHPP Manager | As required |
| 5 | Ensure water level and meter data relevant to the Mine (other than CHPP area) is collated and provided to the Wambo Environmental Department in a timely manner | Wambo Water Infrastructure Manager and Wambo United Water Infrastructure Manager, each for respective sites. | As required |
| 6 | Ensure water level meters and pumps around the CHPP are properly maintained and calibrated | Wambo CHPP Manager | As required |
| 7 | Ensure water level meters and pumps around the Complex (other than the CHPP area) are properly maintained and calibrated | Wambo Water Infrastructure Manager and Wambo United Water Infrastructure Manager, each for respective sites. | As required |
| 8 | Ensure water balance monitoring is undertaken on a monthly basis and is collated and provided to the Wambo Environmental Department in a timely manner | Wambo Water Infrastructure Manager and Wambo United Water Infrastructure Manager, each for respective sites. | Monthly |
| 9 | Ensure that water quality monitoring is undertaken on a monthly basis and is collated and provided to the Wambo Environmental Department in a timely manner. | Wambo E&C Manager and Wambo United E& C Manager, each for respective sites | Monthly |

## 8.0 References


- AGE (2016), United Wambo Open Cut Coal Mine Project Groundwater Impact Assessment. Australasian Groundwater and Environmental Consultants Pty, Ltd. Prepared for Umwelt Australia Pty Ltd.
- Development Consent for Wambo Coal Mine (DA305-7-2003)
- Development Consent for United Wambo Open Cut Mine (SSD 7142)
- Engeny (2018), United Wambo Complex Water Balance Assessment
- Environmental Planning and Assessment Act 1979
- Gilbert and Associates (April 2006) Wambo Coal – Site Water Balance (Version 2)
- Gilbert and Associates (June 2003) Surface Water Assessment [(Appendix E of the Wambo Development Project - Environmental Impact Statement July 2003)].
- Gilbert and Associates (March 2010) Wambo Coal – Site Water Balance Review
- Gilbert and Associates (September 2005) Wambo Coal – Site Water Balance (Version 1)
- HEC (Hydro Engineering & Consulting Pty Ltd) (February 2017) – Wambo Coal Mine
- HEC (Hydro Engineering & Consulting Pty Ltd) (July 2016) – United Wambo Open Cut Coal Mine Project Surface Water Assessment Water Balance, Prepared for Umwelt (Australia) Pty Ltd
- Hunter Unregulated and Alluvial Water Sources Water Sharing Plan
- Hydrosimulations (2017), South Bates Extension Modification Groundwater Assessment. NPM Technical Pty Ltd Trading as Hydrosimulations
- Resource Strategies (2017) South Bates Extension Modification Environmental Assessment for the Modification of DA 305-7-2003 (MOD 17) Extension of the Approved South Bates Underground Mine
- South Bates Extension Modification Site Water Balance, Prepared for Wambo Coal Pty Ltd
- Wambo Development Project Environmental Impact Statement (EIS), July 2003
- Wambo Environment Protection Licence (529)
- Water Act 1912
- Worley Parsons (January 2014) OPSIM Water Balance Model Initial Investigations – January 2014.

## APPENDIX A - Evidence of Consultation

Planning, Industry & Environment

Nicole Dobbins
Senior Environmental Advisor
Wambo Coal Mine
PMB 1
Singleton NSW 2330

20/11/2020

Dear Ms Dobbins

**Wambo Coal Mine (DA 305-7-2003-i)**
**Water Management Plan**

I refer to the Wambo Water Management Plan (WMP), submitted in accordance with condition B66 of the approval for the Wambo Coal Mine (DA 305-7-2003-i). I understand that revisions to the WMP are required prior to Phase 2 of operations between the Wambo Coal Mine and United Wambo Joint Venture, which are scheduled to start on 1 December 2020.

I note that the WMP includes the following sub – plans:

- Site Water Balance;
- Salt Balance;
- Erosion and Sediment Control Plan;
- Surface Water Management Plan (including the North Wambo Creek Diversion Management Plan);
- Groundwater Management Plan; and
- Water Monitoring Plan.

The Department notes that the Site Water Balance, Salt Balance and Water Monitoring Program cover both the Wambo Coal Mine and United Wambo Joint Venture operations.

The Department has carefully reviewed the WMP and is satisfied that it adequately addresses the relevant requirements of the approval. Accordingly, the Planning Secretary has approved the WMP (Revision 2, November 2020) for Phase 2 of the operations. Please continue to operate in accordance with the previously approved WMP until Phase 2 commences.

Please also ensure that the approved plan is placed on the project website at the earliest convenience. If you wish to discuss the matter further, please contact Melanie Hollis on 8217 2043.

Yours sincerely

Matthew Sprott
Director
Resource Assessments (Coal & Quarries)

as nominee of the Planning Secretary

## Evidence of Consultation on this SWB

**Consultation for this SWB**

**(For Phase 2 Activities at the Wambo Coal Mine)**

| Stakeholder | Consultation |
|---|---|
| EPA | Copy of draft Version 2, prepared for the commencement of Phase 2 activities at the Wambo Coal Mine and United Wambo JV was provided to the EPA 26 August 2020 via the DPIE - Major Projects Planning Portal. The EPA provided correspondence dated 4 September 2020 advising that it is not the role of the EPA to review management plans. No further comments received. |
| DPIE Water | Copy of draft Version 2, prepared for the commencement of Phase 2 activities at the Wambo Coal Mine and United Wambo JV, provided to the DPIE Water via the DPIE - Major Projects Planning Portal 26 August 2020. DPIE requested the WMP be sent directly to nrar.servicedesk.@industry.com.au. A copy of the WMP was sent to NRAR 31 August 2020. No comments have been received. |

Planning, Industry & Environment

Ms Nicole Dobbins
Senior Environmental Advisor
Wambo Coal Pty Ltd
PMB 1
Singleton, NSW, 2330

02/09/2020

Dear Ms Dobbins

**Wambo Coal Mine (DA 305-7-2003)**
**Endorsement of Water Expert**

I refer to your letter dated 13 August 2020, requesting the Planning Secretary's approval of a suitably qualified person to prepare the Water Management Plan, required by condition B66 of the Wambo Coal Mine Development Consent (DA 305-7-2003).

This plan includes several sub-management plans including a Site Water Balance, Surface Water Management Plan, Monitoring Program, Groundwater Management Plan and Erosion and Sediment Control Plan. I also note that it is proposed to combine the Wambo and United Wambo (SSD 7142) Site Water Balance and Monitoring Program under condition A23(d). These joint aspects of the Water Management Plan would be prepared by Chris Bonomini from Umwelt Australia.

I note that previously endorsed experts for Wambo, Ms Claire Stephenson and Dr Noel Merrick from SLR and Mr Rohan Lucas from Alluvium will remain the endorsed experts for groundwater and the North Wambo Creek Diversion.

The Department has reviewed the nomination and information you have provided and is satisfied that all four experts are suitably qualified and experienced. Consequently, I can advise that the Planning Secretary approves the additional appointment of Chris Bonomini to prepare the relevant sections of the Water Management Plan alongside the existing endorsed experts.

If you wish to discuss the matter further, please contact Sarah Clibborn on (02) 82 896 184 or via email at sarah.clibborn@planning.nsw.gov.au.

Yours sincerely

Matthew Sprott
Director
Resource Assessments (Coal & Quarries)

as nominee of the Planning Secretary