

**UNITED WAMBO OPEN CUT AND WAMBO
WATER MONITORING PROGRAM**

Document No. WA-ENV-MNP-509.8
November 2020

Document Control

Document No.	WA-ENV-MNP-509.8
Title	United Wambo Open Cut and Wambo Water Monitoring Program
General Description	Water monitoring program for the Wambo Coal Mine and United Wambo Open Cut Coal Mine
Document Owner	WCPL Environment & Community Manager

Revisions

Rev No	Date	Description	By	Checked	Signature
1	August 2020	New document detailing the shared water monitoring program for the Wambo Coal Mine and United Wambo Open Cut Coal Mine. Addresses monitoring requirements associated with Wambo's and United Wambo's statutory approvals including development approvals (DA305-7-2003 & SSD7142) and Environment Protection Licences (529 & 3141).	WCPL	CB	
2	November 2020	Revised to address minor comments from DPIE	WCPL	-	

CONTENTS

1.0 INTRODUCTION.....1

1.1 PURPOSE AND OBJECTIVE1

1.2 SCOPE1

1.3 RELATIONSHIP TO OTHER MANAGEMENT PLANS.....2

1.4 PREPARATION OF THE WMPROG3

1.5 STAKEHOLDER CONSULTATION3

2.0 PLANNING4

2.1 STATUTORY REQUIREMENTS4

2.2 BASELINE DATA.....4

2.3 TRIGGERS AND PERFORMANCE CRITERIA.....4

2.4 CHANGES TO MONITORING INFRASTRUCTURE, PROGRAM OR LOCATION...4

3.0 WATER MONITORING PROGRAM.....5

3.1 SURFACE WATER MONITORING PROGRAM5

3.2 GROUNDWATER MONITORING PROGRAM5

3.3 MONITORING METHODOLOGY5

3.4 DATA MANAGEMENT7

3.5 DATA SHARING8

3.6 DATA REVIEW AND INVESTIGATION8

4.0 REVIEW AND REPORTING9

4.1 REVIEW9

4.2 REPORTING.....9

5.0 RESPONSIBILITIES10

5.1 WAMBO10

5.2 UNITED WAMBO.....11

6.0 REFERENCES.....12

6.1 RELATED DOCUMENTS12

6.2 REFERENCE INFORMATION.....12

APPENDIX A: EVIDENCE OF CONSULTATION13

APPENDIX B: MONITORING PROGRAM TABLES AND FIGURES.....16

Tables

Table 1: WMProg Responsibilities - Wambo	10
Table 2: WMProg Responsibilities- United Wambo	11
Table 3: Related Documents	12
Table 4: Reference Information	12

Figures

Figure 1: Approved Mining Operations – Phase 2	1
Figure 2: Wambo and United Wambo Water Management Plans	2

1.0 Introduction

1.1 Purpose and Objective

This Water Monitoring Program (WMProg) has been developed by Wambo Coal Pty Ltd (WCPL) to consolidate the surface and ground water monitoring requirements associated with:

- Wambo Coal Mine (Wambo), operated by WCPL; and
- United Wambo Open Cut Coal Mine (United Wambo), operated by Glencore on behalf of the United Wambo Joint Venture (UWJV).

The objective of this WMProg is to provide a consolidated water monitoring program that satisfies the statutory requirements for water monitoring at Wambo and United Wambo and assist in maintaining consistent monitoring of the integrated water management system and regional groundwater monitoring network for the two sites.

This WMProg is a shared document, which is maintained by WCPL. Any changes to this document will be undertaken in consultation with UWJV. The revised document will be submitted to the Planning Secretary of the NSW Department of Planning, Industry and Environment (DPIE) by WCPL.

1.2 Scope

This WMProg applies to surface and ground water monitoring for all Phase 2 operational activities associated with Wambo and United Wambo, including underground and open cut mining operations, Coal Handling and Preparation Plant (CHPP) and train loading operations (**Figure 1**).

The WMProg also includes monitoring of regional groundwater bores and surface water monitoring sites outside the project approval boundaries.

This WMProg applies to all employees and contractors, engaged by WCPL or UWJV, who are responsible for water monitoring activities.

UNITED WAMBO
JOINT VENTURE



GLENCORE

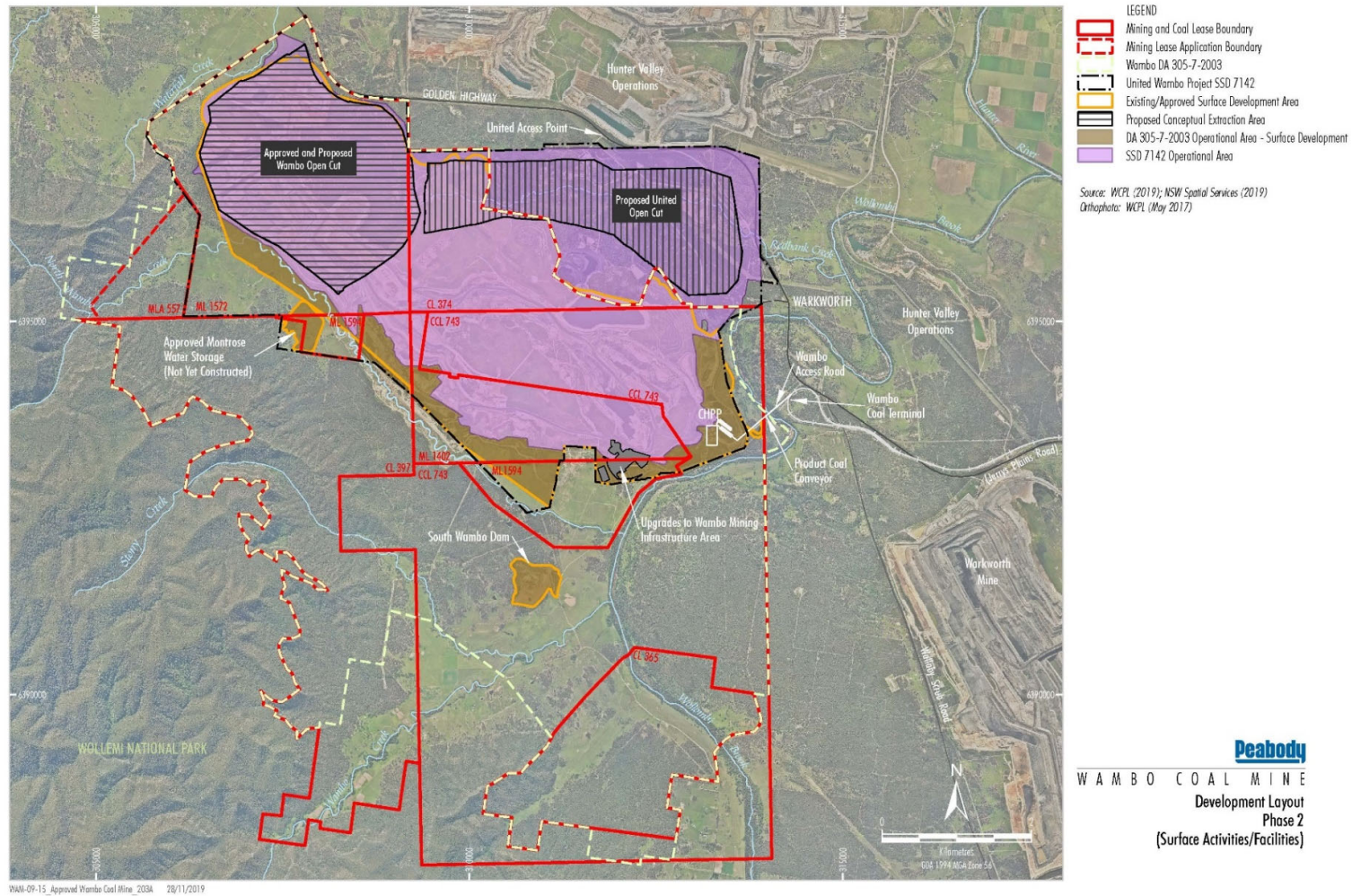


Figure 1: Approved Mining Operations – Phase 2

1.3 Relationship to other Management Plans

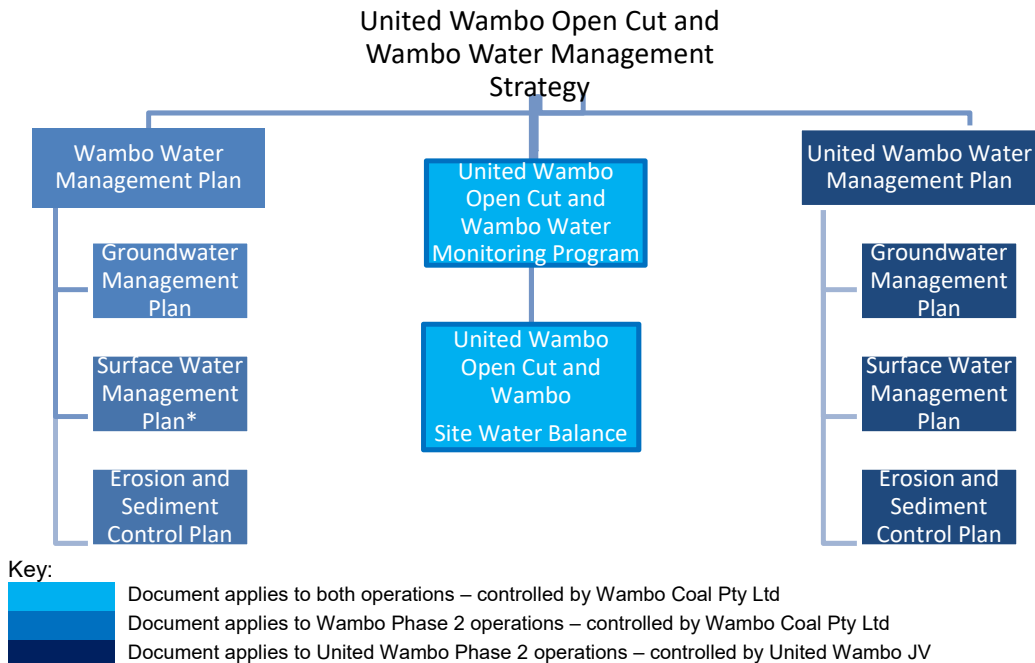
This WMProg is part of a set of documents that together form the Water Management Plans (WMPs) for Wambo and United Wambo (**Figure 2**).

Statutory approvals for both Wambo and United Wambo require the WMP to include proposed monitoring programs to monitor impacts from the respective operations. Monitoring requirements for water are described in the following documents:

- Wambo Surface Water Management Plan (**Wambo SWMP**) (WA-ENV-MNP-509-2);
- Wambo Groundwater Management Plan (**Wambo GWMP**) (WA-ENV-MNP-509-1);
- United Wambo Surface Water Management Plan (**UW SWMP**) (UWOC-1689771511-364); and
- United Wambo Groundwater Management Plan (**UW GWMP**) (UWOC-1689771511-370).

As part of the *United Wambo Open Cut Project Environmental Assessment* (Umwelt 2016), WCPL’s site water balance (and salt balance) was expanded to include the United Wambo Open Cut project. The **United Wambo Open Cut and Wambo Site Water and Salt Balance (SWSB)** (WA-ENV-MNP-509.4) is now a shared document, managed by WCPL. The **SWSB** will be updated annually using monitoring data from this WMProg.

This WMProg should be read in conjunction with the other components of the Wambo and United Wambo Water Management Plans, particularly the documents mentioned above.



* Wambo SWMP incorporates the North Wambo Creek Diversion Management Plan

Figure 2: Wambo and United Wambo Water Management Plans

1.4 Preparation of the WMProg

This WMProg has been prepared using information from the existing monitoring programs described in the Wambo and United Wambo SWMPs and GWMPs.

In recognition of the requirements of Condition B66(a) of DA305-7-2003 and Condition B52(a) of SSD7142, this WMProg prepared by WCPL has been reviewed by suitably experienced and qualified persons, i.e. Ms Claire Stephenson from SLR Consulting (Groundwater) and Chris Bonomini from Umwelt Australia Pty Ltd (other components of the water management plans).

Correspondence from DPIE endorsing Ms Stephenson and Mr Bonomini is included in the Wambo and United Wambo water management plans.

1.5 Stakeholder Consultation

1.5.1 Historic Consultation

Consultation has previously been undertaken for the development of the Wambo and United Wambo water management plans as well as for the *United Wambo Open Cut Project Environmental Impact Statement (EIS)* (Umwelt, 2016). This included consultation relating to the water monitoring programs for Wambo and United Wambo.

Details of this consultation are included in the EIS (Umwelt 2016) and in the Wambo and United Wambo SWMPs and GWMPs.

1.5.2 Consultation for this WMProg

Consultation specifically related to the development of this WMProg is described below: e.g,

- Copies of the Water Management Plan and sub-components provided for consultation to DPIE Water and the EPA on Wednesday 26 August 2020.
- EPA provided correspondence 4 September 2020 to advise that the role of the EPA is not to provide advice on management plans; and
- No comments were received from DPIE Water.

The WMProg was approved by DPIE 20 November 2020. Correspondence specifically related to this WMProg is attached as **Appendix A**.

2.0 Planning

2.1 Statutory Requirements

This WMProg has been prepared to fulfil all statutory requirements relating to surface and ground water monitoring at Wambo and United Wambo. These requirements are detailed in the respective water management plans for Wambo and United Wambo.

2.2 Baseline Data

Baseline data relevant to this WMProg is included in the respective water management plans for Wambo and United Wambo. Management triggers for a number of surface and ground water monitoring locations has been established based on a statistical analysis of this data.

2.3 Triggers and Performance Criteria

Management triggers and performance criteria relevant to this WMProg are included in the respective water management plans for Wambo and United Wambo.

Where triggers have been developed for individual monitoring locations, these have been included in the monitoring program (refer **Section 3.0** and **Appendix B**).

2.4 Changes to Monitoring Infrastructure, Program or Location

Changes to the water monitoring infrastructure, program or locations may be required for a number of reasons e.g. equipment failure or blockage, inability to access sites due to safety, sites impacted by mining, additional monitoring site required, changes to monitoring parameters, frequency, addition of or change to triggers etc.

Where a change is required, the party (i.e. Wambo or United Wambo) proposing the change will consult with the other party **prior to** any changes being made.

Details of the proposed change will be provided including:

- The monitoring location affected by the change; and
- The nature of the change e.g. equipment replacement, site removal or relocation due to mining impacts, new monitoring site, changes to existing monitoring parameters or frequency, addition of or change to triggers etc.

If a monitoring site requires relocation or a new monitoring site is required, the following details will also be provided:

- Details relating to new monitoring location e.g. proposed site ID, coordinates (easting, northing), site description, monitoring program, responsibility for monitoring, triggers etc
- Whether any new approvals are required; and
- Access requirements for the new site

Any changes to the water monitoring network will trigger a review of this WMProg (refer **Section 4.1.2**).

3.0 Water Monitoring Program

A general description of the water monitoring program for Wambo and United Wambo is provided in the respective water management plans for Wambo and United Wambo.

The water monitoring locations, parameters, frequency and methodology of monitoring are outlined below and included as tables and figures in **Appendix B**.

The water monitoring program is split into Surface and Ground Water monitoring. These programs are then split into 3 components:

1. Combined monitoring;
2. Wambo Only monitoring; and
3. United Wambo Open Cut Only monitoring.

Monitoring parameters and frequency may differ between the three program components, depending on statutory requirements and commitments made in the respective water management plans (refer to respective water management plans for more detail).

3.1 Surface Water Monitoring Program

The surface water monitoring program is summarised in **Tables A, B and C (Appendix B)** and shown on **Figure A (Appendix B)**. The program includes:

- Water quality monitoring in creeks, licensed discharge points (LDPs) and water storage dams and voids;
- Stream flow monitoring in creeks; and
- Discharge monitoring at LDPs.

A number of monitoring locations are monitored for internal management purposes – results from this monitoring are not shared publicly. These sites are identified in the monitoring program tables in **Appendix B**.

3.2 Groundwater Monitoring Program

The groundwater monitoring program is summarised in **Tables D, E and F (Appendix B)** and shown on **Figure B (Appendix B)**. The program includes monitoring of water quality and depth to groundwater in bores within the project approval boundaries as well as regional bores.

3.3 Monitoring Methodology

3.3.1 Surface Water

Surface water quality sampling and analysis will be conducted in accordance with *Approved Methods for Sampling and Analysis of Water Pollutants in New South Wales (DEC, 2004)*; *Australian Standard/New Zealand Standard (AS/NZS) 5667:1998 Parts 1, 4 and 6*; and the requirements of the Hunter River Salinity Trading Scheme (HRSTS).

Field physio-chemical water quality parameters (at a minimum pH and electrical conductivity) will be measured using calibrated equipment.

Flow monitoring will be undertaken using instream flow monitoring equipment. This equipment will be calibrated and maintained to manufacturer's specifications by qualified, experienced field technicians.

3.3.2 Groundwater

The groundwater monitoring program was developed with consideration of the *Murray-Darling Basin Groundwater Quality. Sampling Guidelines. Technical Report No 3* (Murray-Darling Basin Commission [MDBC, 1997]).

In general, the groundwater monitoring methodology will include the following:

- assessment of groundwater level (manual measurement and datalogger download prior to purging/sampling);
- sampling of groundwater (direct sampling, sampling after purging, or low-flow sampling); and
- implementation of a quality control plan including appropriate chain-of-custody for laboratory analysis and provision of appropriate documentation.

3.3.2.1 Groundwater Level and Purging

The static groundwater level within each groundwater monitoring bore will be measured to the nearest millimetre prior to purging (if required) or sampling, using an electronic groundwater level dip meter (dipper) referenced to a known (and consistent) surveyed point at the top of the bore casing. The groundwater level below top of casing will be corrected to mAHD using the survey data. Recorded groundwater level will be tabulated in both metres below top of casing (mbTOC) and mAHD.

The base of the bore will be measured and recorded to the nearest millimetre periodically by lowering the dipper to the base of the bore until it touches the bottom.

Following water level measurement, the monitoring bore will be purged using an appropriate pump (selected based on the hydraulic characteristics of the bore) and a groundwater sample will be collected. If insitu low-flow sampling techniques are used (e.g. micropurge or hydrosleeve), purging will not be required.

Field physio-chemical water quality parameters (at a minimum pH and electrical conductivity) will be measured using calibrated equipment. Field parameters will also be measured during purging (if applicable).

The groundwater monitoring bore will be sufficiently purged when one of the following criteria is achieved (whichever occurs first):

- three bore volumes of water have been purged;
- the bore is purged until no more water can be removed (considered dry); or
- the water quality parameters have stabilised within 10 per cent over three consecutive recorded measurements.

In cases where a water level datalogger is installed in a monitoring bore, it will be removed from the bore and checked/maintained as necessary before being re-calibrated (if required) and returned to the bore at a known depth below the top of casing.

At the completion of purging (if applicable), groundwater samples will be collected.

3.3.3 Sample Collection

Water samples will be collected following the protocols outlined in the *Australian Guidelines for Water Quality Monitoring and Reporting* (ANZECC 2000). Samples will be collected in dedicated laboratory-supplied sampling bottles with sufficient volume to satisfy the requirements for all analytes.

The following details will be recorded at the time of sampling for all groundwater monitoring samples:

- the date(s) and time(s) at which the sample was taken;
- the point at which the sample was taken; and
- the name of the person who collected the sample.

The samples will be placed into a chilled ice-chest for transport to the nominated laboratory(s). Where required (i.e. for dissolved metals analysis), the water sample will also be filtered in the field using a dedicated 0.45 micrometre water filter to remove fine suspended particles.

Cross-contamination of samples will be prevented through either dedicated tubing at the pump, dedicated sampling devices, or by decontamination of equipment with phosphate-free detergent and clean water between sampling locations.

3.3.4 Quality Assurance and Documentation

Quality assurance and control protocols during sampling will be undertaken in accordance with ANZECC (2000) to ensure the integrity of the dataset.

Samples will be transported to a NATA-accredited laboratory(s) under appropriate documented chain-of-custody. Laboratory guidelines on holding times for samples will be complied with where practicable.

Laboratory and field results will be checked for accuracy on receipt of all sampling data and laboratory certificates of analyses. Errors or discrepancies will be cross-checked with field and laboratory records and further investigation initiated if required.

In the event of an apparently anomalous result, Wambo or United Wambo (depending on who is responsible for the monitoring site – refer tables in **Appendix B**) will organise a re-test as soon as is practicable to do so.

3.4 Data Management

3.4.1 Wambo

Water monitoring data from monitoring sites managed by WCPL is collated and stored in WCPL's environmental monitoring database. Validated data from the monitoring program will be entered into Wambo's Environmental Monitoring Database in a form suitable for analysis.

3.4.2 United Wambo

Water monitoring data from monitoring sites managed by UWJV is collated and stored in UWJV's environmental monitoring database. Validated data from the monitoring program will

be entered into the GCAA Environmental Monitoring Database (EMD) in a form suitable for analysis.

3.5 Data Sharing

The Water Monitoring program contains monitoring sites for the United Wambo open cut, the Wambo Mine and sites shared for both operations. Where data sharing is required, spreadsheets containing monitoring data will be shared bi-monthly.

3.6 Data Review and Investigation

The monitoring program clearly identifies the triggers applicable to individual monitoring sites and who is responsible for responding when trigger thresholds are exceeded (refer **Tables A-F** in **Appendix B**). Responses to these triggers have been developed and included in the respective water management plans for Wambo and United Wambo.

Upon receipt of monitoring results, the following review processes will be undertaken:

- Data will be compared to the impact assessment criteria where applicable (refer **Section 2.3**).
- If result(s) do not meet impact assessment criteria a response procedure will be initiated in accordance with the respective SWMP or GWMP.

Each operation will undertake an annual review of monitoring data and compare the results to the water impact assessment criteria. Results of the review will be included in the Annual Review (**Section 4.2.1**).

When monitoring results exceed the impact assessment criteria or the Annual Review identifies surface or groundwater impacts, an investigation appropriate for the situation will be initiated to determine the cause. The investigation will include a review of monitoring results, climate data, mining activities and changes to land use. Further details outlining these response procedures are outlined in the respective SWMPs and GWMPs.

4.0 Review and Reporting

4.1 Review

4.1.1 Environmental Performance

The performance of the water monitoring program outlined in this WMProg will be reviewed annually as part of the Annual Review (refer **Section 4.2.1**).

4.1.2 Document Review

This WMProg will be reviewed as part of any review of the Wambo or United Wambo water management plans. Any changes to the WMProg will be undertaken in consultation with United Wambo.

The WMProg will reflect any changes in environmental requirements, technology, and operational procedures.

Where significant changes to the monitoring program are proposed, the appointed expert (as outlined in **Section 1.4**) will be consulted prior to the changes being made. WCPL will also consult with DPIE Water and the NSW EPA prior to submission to the Planning Secretary for approval.

4.2 Reporting

4.2.1 Annual Review

Results of the water monitoring program will be reported annually as part of the Annual Review for Wambo and United Wambo (refer to Wambo and United Wambo water management plans for more detail).

The Annual Review will also include details of any trigger exceedances, in accordance with the requirements of the Wambo and United Wambo water management plans.

4.2.2 Reporting of Results

Internal reporting of results will be undertaken in accordance with the procedures outlined in the Wambo and United Wambo water management plans.

Water monitoring results will be made publicly available via the Wambo and United Wambo websites (refer to Wambo and United Wambo water management plans for more detail).

5.0 Responsibilities

Responsibilities for water management are described in detail in the Wambo and United Wambo water management plans. The sections below summarise the responsibilities relating to this WMProg.

5.1 Wambo

Table 1 summarises responsibilities documented in the WMProg for Wambo personnel. Responsibilities may be delegated as required.

Table 1: WMProg Responsibilities - Wambo

No	Task	Responsibility	Timing
1	Ensure the water monitoring program for Wambo Underground is implemented, as per program included in Appendix B).	WCPL Environment and Community Manager	As per program in Appendix B
2	Ensure the water monitoring program for shared bores (that are the responsibility of Wambo) is implemented, as per program included in Appendix B.	WCPL Environment and Community Manager	As per program in Appendix B
3	Facilitate access to water monitoring locations on Wambo managed land, for United Wambo personnel and contractors.	WCPL Environment and Community Manager	As required
4	Ensure all personnel undertaking monitoring are inducted, trained and authorised to perform required duties.	WCPL Environment and Community Manager	As required
5	Manage data from the monitoring program in accordance with Section 3.4	WCPL Environment and Community Manager	As required
6	Share data from the monitoring program with United Wambo in accordance with Section 3.5	WCPL Environment and Community Manager	As required
7	Assess water monitoring data from relevant monitoring sites (that are the responsibility of Wambo) against relevant trigger levels and respond in accordance with protocols and TARPs in the WCPL SWMP and GWMP.	WCPL Environment and Community Manager	Monthly
8	Undertake reporting of data in accordance with Section 4.2.	WCPL Environment and Community Manager	As required
9	Consult with United Wambo prior to any changes to monitoring infrastructure, monitoring program or location (refer Section 2.4).	WCPL Environment and Community Manager	As required
10	Review the WMProg in accordance with Section 4.1.2 and update as required.	WCPL Environment and Community Manager	Annually and as required
11	Resubmit WMProg to DPIE for approval.	WCPL Environment and Community Manager	As required

5.2 United Wambo

Table 2 summarises responsibilities documented in the WMProg for United Wambo personnel. Responsibilities may be delegated as required.

Table 2: WMProg Responsibilities- United Wambo

No	Task	Responsibility	Timing
1	Ensure the water monitoring program for United Wambo Open Cut is implemented, as per program included in Appendix B).	UWJV Environment and Community Manager	As per program in Appendix B
2	Ensure the water monitoring program for shared bores (that are the responsibility of United Wambo) is implemented, as per program included in Appendix B).	UWJV Environment and Community Manager	As per program in Appendix B
3	Facilitate access to water monitoring locations on United Wambo managed land, for Wambo personnel and contractors.	UWJV Environment and Community Manager	As required
4	Ensure all personnel undertaking monitoring are inducted, trained and authorised to perform required duties.	UWJV Environment and Community Manager	As required
5	Manage data from the monitoring program in accordance with Section 3.4	UWJV Environment and Community Manager	As required
6	Share data from the monitoring program with Wambo in accordance with Section 3.5	UWJV Environment and Community Manager	As required
7	Assess water monitoring data from relevant monitoring sites (that are the responsibility of United Wambo) against relevant trigger levels and respond in accordance with protocols and TARPs in the WCPL SWMP and GWMP.	UWJV Environment and Community Manager	Monthly
8	Undertake reporting of data in accordance with Section 4.2 .	UWJV Environment and Community Manager	As required
9	Consult with Wambo prior to any changes to monitoring infrastructure, monitoring program or location (refer Section 2.4).	UWJV Environment and Community Manager	As required
10	Review the WMProg in accordance with Section 4.1.2 and provide any changes to WCPL ¹ .	UWJV Environment and Community Manager	Annually and as required

Notes to **Table 2**:

1. The WCPL Environment and Community Manager will be responsible for submitting the revised WMProg to DPIE (refer **Table 1**).

6.0 References

6.1 Related Documents

Related documents, listed in **Table 3** below, are internal or United Wambo documents directly related to or referenced from this document.

Table 3: Related Documents

Number	Title
WA-ENV-MNP-509	Wambo Water Management Plan
WA-ENV-MNP-509.1	Wambo Groundwater Management Plan
WA-ENV-MNP-509.2	Wambo Surface Water Management Plan
WA-ENV-MNP-509.3	Wambo Erosion and Sediment Control Plan
WA-ENV-MNP-509.5	United Wambo Open Cut and Wambo Site Water and Salt Balance
WA-ENV-MNP-509.6	North Wambo Creek Diversion Management Plan
WA-ENV-MNP-509.7	United Wambo Open Cut and Wambo Water Management Strategy
UWOC-1689771511-365	United Wambo Water Management Plan
UWOC-1689771511-370	United Wambo Groundwater Management Plan
UWOC-1689771511-364	United Wambo Surface Water Management Plan
UWOC-1689771511-369	United Wambo Erosion and Sediment Control Plan

6.2 Reference Information

Reference information, listed in **Table 4** below, is information that is directly related to the development of this document or referenced from within this document.

Table 4: Reference Information

Reference	Title
DA 305-7-2003	Wambo Coal Mine Notice of Modification of DA305-7-2003 (Modification 16)
EPL 529	Environment Protection Licence 529 for Wambo Coal Mine
WCPL 2003	Wambo Development Project Environmental Impact Statement (EIS), July 2003
SSD 7142	United Wambo Open Cut Coal Mine Development Consent SSD 7142
EPL 3141	Environment Protection Licence for United Wambo Coal Mine
Umwelt 2016	United Wambo Open Cut Coal Mine Project – Environmental Impact Statement (EIS)
AS/NZS 5667:1998	Australian Standard/New Zealand Standard (AS/NZS) 5667:1998 Parts 1, 4 and 6
DEC, 2004	Approved Methods for Sampling and Analysis of Water Pollutants in New South Wales
MDBC, 1997	Murray-Darling Basin Groundwater Quality. Sampling Guidelines. Technical Report No 3

APPENDIX A: Evidence of Consultation



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

A handwritten signature in black ink, appearing to read 'M Sprott'.

Matthew Sprott
Director
Resource Assessments (Coal & Quarries)

as nominee of the Planning Secretary

Consultation for Water Monitoring Program

Stakeholder	Consultation
DPIE	Copy of draft Version 1, provided 26 August 2020 via the DPIE - Major Projects Planning Portal. Minor comments were received 18 November 2020 and have been addressed in Version 2.
EPA	Copy of draft Version 1, 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 1, 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.

APPENDIX B: Monitoring Program Tables and Figures

Surface Water Monitoring Program

Table A: Surface Water Monitoring Program- Combined Program

United Site ID	Wambo Site ID	Former United Site ID	Site Description	Easting (MGA94 Zone 56)	Northing	Monitoring Program	Responsibility for monitoring	Trigger ¹	Responsibility for trigger response
Water Quality									
WB01	SW40	-	Wollombi Brook - Upstream	311910	6391093	WQ – Monthly ² , full suite annually ³	Wambo	N/A	N/A
WB02	SW03	SW03	Wollombi Brook - Pumps	312509	6392866		United Wambo	N/A	N/A
WB03	SW02	SW04	Wollombi Brook - Warkworth	314376	6395037		United Wambo	pH: 7.4-8.1 EC: 599-1947 TSS: 17-308 (low flow-high flow)	United Wambo
NWC01	SW04	-	North Wambo Creek - Upstream	306887	6396024		Wambo	N/A	N/A
NWC02	SW32a	-	North Wambo Creek - Midstream	309905	6393191		Wambo	N/A	N/A
NWC03	SW05	SW02	North Wambo Creek - Downstream	311927	6392157		Wambo	pH:7.3-8.0 EC: 1155-2350 TSS: 53-1110 (low flow-high flow)	Wambo
WFC01	SW39	-	Waterfall Creek	307194	6398519		Wambo	pH:7.3-7.9 EC: 159-435 TSS: 582-1922 (low flow-high flow)	Wambo
W08 ⁴	SW52	C11 Void	C11 Void	312677	6395220		United Wambo	N/A	N/A
W09 ⁴	SW31	-	CHPP Dams	313276	6393987		Wambo	N/A	N/A
W11 ⁴	SW14	-	Wambo MIA Box Cut Dam	312179	6392939		Wambo	N/A	N/A
W12 ⁴	SW38	-	Homestead Pit	311750	6394190		United Wambo	N/A	N/A

Notes to Table A:

- 1 Units: pH in pH units, EC in µS/cm and TSS in mg/L. All triggers include 10th and 90th percentile limits
- 2 Monthly WQ suite = pH, EC (µS/cm), TSS (mg/L) & TDS (mg/L) as well as description of flow conditions by observation (i.e. high, medium or low flow; or no flow).
- 3 Annual WQ suite = Monthly WQ Suite plus:
 - Total Metals / Metalloids - Aluminium (Al), Arsenic (As), Cobalt (Co), Copper (Cu), Iron (Fe), Manganese (Mn), Nickel (Ni), Selenium (Se), Zinc (Zn), Mercury (Hg), Lead (Pb), Potassium (K), Silver (Ag), Flouride (Fl), Boron (B), Calcium (Ca), Barium (Ba), Magnesium (Mg), Cadmium (Cd), Sodium (Na);
 - Nutrients - total phosphorous (P), Nitrite, Nitrate, Total Kjeldahl Nitrogen (TKN), Total nitrogen (Total N); and Ions - Chloride (Cl), Bicarbonate (CaCO3), Sulphate (SO4).
4. Data from this monitoring point is used for operational purposes and is reported internally as required. This data is not reported publicly.

Table B: Surface Water Monitoring Program- Wambo Only Program

Site ID	Site Description	Easting (MGA94 Zone 56)	Northing	Monitoring Program	Responsibility for monitoring	Trigger ¹	Responsibility for trigger response
Water Quality							
SW01	Wollombi Brook, upstream of Wambo Coal Operations	314429	6385707	pH, EC, TSS, metals and ions (including sulfates) - monthly & during rainfall events	Wambo	N/A	N/A
SW06	South Wambo Creek upstream of Wambo Coal former operations	309056	6389550	pH, EC, TSS, metals and ions (including sulfates) - monthly & during rainfall events	Wambo	N/A	N/A
SW07	South Wambo Creek downstream of Wambo Coal former operations and junction with Stony Creek	311263	6390718	pH, EC, TSS - monthly & during rainfall events	Wambo	pH: 7.4-7.9 EC: 360-724 TSS: 29-331 (low flow-high flow)	Wambo
SW08	Stony Creek	308536	6392133	pH, EC, TSS, metals and ions (including sulfates) - monthly & during rainfall events	Wambo	pH: 6.8-7.4 EC: 288-416 TSS: 5-15 (low flow-high flow)	Wambo
SW15	Eagles Nest (Process Water Dam) (EPA ID No. 4)	313133	6393073	pH, EC, TSS, monthly & during discharge events	Wambo	pH: 6.5-9.5 (EPL 529 criteria) TSS: 120 (EPL 529 criteria)	Wambo
SW27a	North Wambo Creek (middle of diversion)	309431	6393558	pH, EC, TSS - monthly & during rainfall events	Wambo	N/A	N/A
SW41	Waterfall Creek Downstream	307257	6398952	pH, EC, TSS - monthly & during rainfall events	Wambo	N/A	N/A
USFM1	Upper reaches of North Wambo Creek	305250	6395200	pH, EC, TSS, metals and ions (including sulfates) - monthly & during rainfall events	Wambo	N/A	N/A
SW53 ³	South Wambo Dam – (EPL 529, ID No.19)	311904	6391464.	pH, EC - continuous during discharge & monthly grab sample	Wambo	N/A	N/A
US FM1	North Wambo Creek - upstream	305257	6395201	pH, EC, TSS - monthly	Wambo	N/A	N/A

Site ID	Site Description	Easting (MGA94 Zone 56)	Northing	Monitoring Program	Responsibility for monitoring	Trigger ¹	Responsibility for trigger response
STP001	Monitoring of water quality from the sewage treatment plant discharge (EPL 529, ID No. 18)	312057	6393219	pH, EC, TSS, metals and ions (including sulfates) - monthly & during rainfall events ⁵	Wambo	N/A	N/A
Flow & Volume							
FM1A	Monitoring of flow in North Wambo Creek – confluence	307013	6396135	Flow monitoring - continuous	Wambo	N/A	N/A
FM2	Monitoring of flow in North Wambo Creek – middle of diversion	308181	6395028	Flow monitoring - continuous	Wambo	N/A	N/A
FM3	Monitoring of flow in North Wambo Creek – middle of diversion	309114	6393813	Flow monitoring - continuous	Wambo	N/A	N/A
FM4	Monitoring of flow in North Wambo Creek - downstream near confluence of Wollombi Brook	311890	6392288	Flow monitoring - continuous	Wambo	20mm	Wambo
FM9	Monitoring of flow in South Wambo Creek - upstream of confluence of Stony Creek	308666	6389176	Flow monitoring - continuous	Wambo	N/A	N/A
FM10 ²	Monitoring of flow in Wollombi Brook - downstream from Wambo Coal at Warkworth	314228	6395064	Flow monitoring - continuous	Wambo	N/A	N/A
FM11 ²	Monitoring of flow in Wollombi Brook - upstream from Wambo Coal at the Bulga Village	314360	6385900	Flow monitoring - continuous	Wambo	N/A	N/A
FM12	Monitoring of flow in Stony Creek - Upstream	307607	6392828	Flow monitoring - continuous	Wambo	N/A	N/A
FM13	Monitoring of flow in Stony Creek - Downstream	309530	6391043	Flow monitoring - continuous	Wambo	20mm	Wambo
FM14	Monitoring of flow in Stony Creek - Tributary	307730	6392246	Flow monitoring - continuous	Wambo	N/A	N/A

Site ID	Site Description	Easting (MGA94 Zone 56)	Northing	Monitoring Program	Responsibility for monitoring	Trigger ¹	Responsibility for trigger response
FM15	Monitoring of flow in South Wambo Creek	311680	6391089	Flow monitoring - continuous	Wambo	20mm	Wambo
FM16	Monitoring of flow in South Wambo Creek	311259	6390666	Flow monitoring - continuous	Wambo	N/A	N/A
US FM1	Monitoring of flow in North Wambo Creek - upstream	305257	6395201	Flow monitoring - continuous	Wambo	N/A	N/A
SW15	Eagles Nest Process Water Dam (EPA ID No. 4)	313133	6393073	Discharge volume - continuous during discharge	Wambo	250ML/day	
SW53 ³	South Wambo Dam – (EPL 529, ID No.19)	311904	6391464.	Discharge volume - continuous during discharge	Wambo	250ML/day	Wambo

Notes to Table B:

1. Units: pH in pH units, EC in $\mu\text{S}/\text{cm}$ and TSS in mg/L , 20mm = Daily rainfall when flow commenced on 80% of recorded occasions
2. Gauging Stations on Wollombi Brook at Bulga (FM11) [GS21004] and Warkworth (FM10) [GS210028]
3. Subject to recommissioning

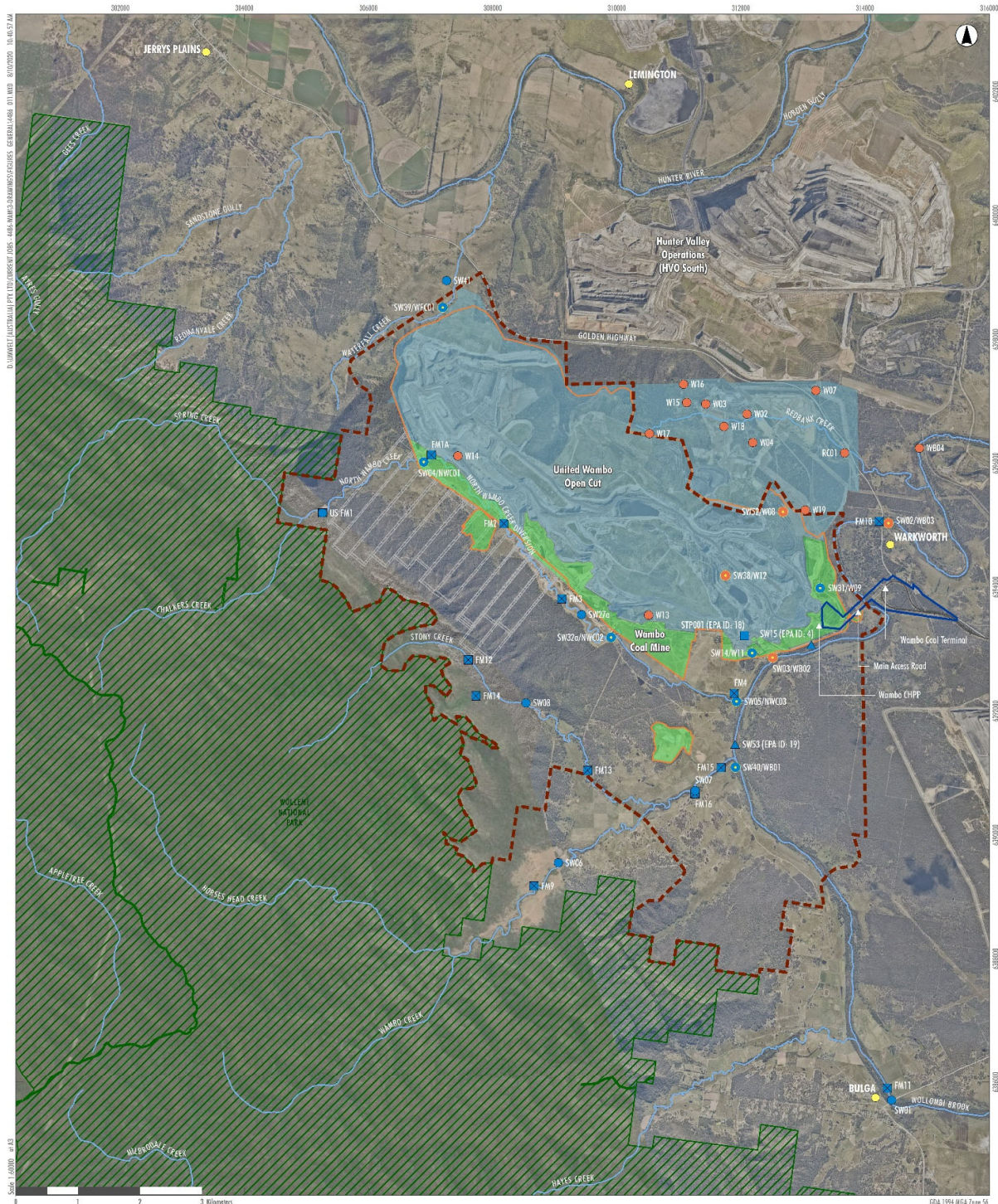
Table C: Surface Water Monitoring Program- United Wambo Open Cut Only Program

Site ID	Former Wambo Site ID	Former United Site ID	Site Description	Easting (MGA94 Zone 56)	Northing	Monitoring Program	Responsibility for monitoring	Trigger ¹	Responsibility for trigger response
WB04	-	-	Wollombi Brook - Downstream	314874	6396247	WQ – Monthly ² , full suite annually ³	United Wambo	N/A	N/A
RC01	-	SW05	Redbank Creek - Downstream	313672	6396168		United Wambo	pH: 7.9-8.3 Max EC: 8482 TSS: 22	United Wambo
W02 ⁴	-	Dam 2	Dam 2	312097	6396796		United Wambo	N/A	N/A
W03 ⁴	-	-	United UG Boxcut	311432	6396959		United Wambo	N/A	N/A
W04 ⁴	-	Dam 3	Dam 3	312191	6396336		United Wambo	pH: 6.5-8 EC: 2200 TSS: 50	United Wambo
W07 ⁴	-	Dam 14	Dam 14	313207	6397177		United Wambo	N/A	N/A
W13 ⁴	SW12	-	West Cut Dam	310510	6393550		United Wambo	N/A	N/A
W14 ⁴	SW54	-	Montrose Pit Inflows	307440	6396120		United Wambo	N/A	N/A
W15 ⁴	-	Dam 7	Dam 7	311126	6396981		United Wambo	N/A	N/A
W16 ⁴	-	Dam 15	Dam 15	311075	6397280		United Wambo	N/A	N/A
W17 ⁴	Wombat Dam	-	Wombat Dam	310526	6396481		United Wambo	N/A	N/A
W18 ⁴	-	-	U2	311727	6396595		United Wambo	N/A	N/A
W19 ⁴	-	-	U3	313035	6395248		United Wambo	N/A	N/A

Notes to Table C:

- Units: pH in pH units, EC in $\mu\text{S/cm}$ and TSS in mg/L
- Monthly WQ suite = pH, EC ($\mu\text{S/cm}$), TSS (mg/L) & TDS (mg/L) as well as description of flow conditions by observation (i.e. high, medium or low flow; or no flow).
- Annual WQ suite = Monthly WQ Suite plus:
 - Total Metals / Metalloids - Aluminium (Al), Arsenic (As), Cobalt (Co), Copper (Cu), Iron (Fe), Manganese (Mn), Nickel (Ni), Selenium (Se), Zinc (Zn), Mercury (Hg), Lead (Pb), Potassium (K), Silver (Ag), Fluoride (F), Boron (B), Calcium (Ca), Barium (Ba), Magnesium (Mg), Cadmium (Cd), Sodium (Na);
 - Nutrients - total phosphorous (P), Nitrite, Nitrate, Total Kjeldahl Nitrogen (TKN), Total nitrogen (Total N); and
 - Ions - Chloride (Cl), Bicarbonate (CaCO_3), Sulphate (SO_4).
- Data from this monitoring point is used for operational purposes and is reported internally as required. This data is not reported publicly.

Surface Water Monitoring Program



- Legend**
- Wambo DA 305-7-2003
 - Rail DA 177-8-2004
 - Approved Wambo Surface Development Area
 - DA 305-7-2003 Operational Area - Surface Development (Phase 2)
 - SSD 7142 Operational Area (Phase 2)
 - National Park
 - Approved Underground Development (Current)
 - Drainage Line
 - Railway
 - Road
 - Town
- Monitoring Locations**
- UW OC Only Monitoring Sites**
 - Water Quality
 - Wambo Only Monitoring Sites**
 - Water Quality
 - Water Quality and Discharge Volume - LDP
 - Water Quality - LDP
 - Flow Monitoring
 - Shared Monitoring Sites**
 - UW OC Water Quality
 - Wambo Water Quality

Peabody
WAMBO COAL MINE
 Surface Water Monitoring Locations

Image Source: Newsmap (May 2020), ESRI Basemap. Data source: DPSI (2020)

Groundwater Monitoring Program

Table D: Groundwater Monitoring Program- Combined Program

Site ID	Easting (MGA94 Zone 56)	Northing	Targeted Unit	Current Status ¹	Monitoring Program ²	Responsibility for monitoring	Trigger ³	Responsibility for trigger response
Standpipe Monitoring Bores								
GW02 ⁴	309109	6389680	South Wambo Creek Alluvium	A	SWL and WQ - 2m – full suite	Wambo	Depth to Water: N/A Max EC: 715 pH: 6.7-7.4	Wambo
GW8.2	311869	6392326	North Wambo Creek Alluvium	B	SWL and WQ - 2m – full suite ⁵	Wambo	N/A	N/A
GW9.2	311743	6392326	North Wambo Creek Alluvium	B	SWL and WQ - 2m – full suite ⁵	Wambo	N/A	N/A
GW10.2 & GW10.2a	311872	6392264	North Wambo Creek Alluvium & Permian	B	SWL and WQ - 2m – full suite ⁴	Wambo	N/A	N/A
GW11 ⁴	309228	6389699	South Wambo Creek Alluvium	A	SWL and WQ - 2m – full suite	Wambo	Depth to Water: N/A Max EC: 592 pH: 6.8-7.5	Wambo
GW13	313810	6388990	Regolith	A	SWL and WQ - 2m – full suite	United Wambo	N/A	United Wambo
GW15	313164	6392807	Wollombi Brook (east) Alluvium	A	SWL and WQ - 2m – full suite	Wambo	Depth to Water: 10.4-11.1 Max EC:730 pH: 6.7-7.2	Wambo
GW16	306641	6396034	North Wambo Creek Alluvium and Regolith	A	SWL and WQ - 2m – full suite	Wambo	N/A	N/A
GW17 ⁵	306895	6396048	Regolith	A	SWL and WQ - 2m – full suite	Wambo	N/A	N/A
GW21	308647	6393378	Whybrow Coal Interburden	B	SWL and WQ - 2m – full suite	Wambo	N/A	N/A
GW22	311335	6389535	Whybrow Coal Interburden	A	SWL and WQ - 2m – full suite	Wambo	N/A	N/A
GW23	305791	6395668	North Wambo Creek – Consolidated Bedrock	B	SWL and WQ - 2m	Wambo	N/A	N/A
GW25	305299	6395288	North Wambo Creek – Consolidated Bedrock	B	SWL and WQ - 2m	Wambo	N/A	N/A
P1	312199	6395840	Interburden- Blakefield Seam	EX	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A
P2	312403	6395552	Interburden- Blakefield Seam	EX	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A
P11	312728	6395462	Alluvium	A	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A

Site ID	Easting (MGA94 Zone 56)	Northing	Targeted Unit	Current Status ¹	Monitoring Program ²	Responsibility for monitoring	Trigger ³	Responsibility for trigger response
P16	313480	6394655	Wollombi Brook (west) Colluvium	A	SWL and WQ - 2m – full suite	Wambo	Depth to Water: 7.1-7.8 Max EC:10832 pH: 7.0-7.7	Wambo
P20	313639	6394166	Wollombi Brook (west) Colluvium	A	SWL and WQ - 2m – full suite	Wambo	Depth to Water: 7.1-8.2 Max EC:10625 pH: 7.0-7.6	Wambo
P28	311396	6392632	Whybrow Coal Overburden	EX	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A
P29	311820	6392560	Whybrow Coal Overburden	EX	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A
P106	311518	6391082	Wambo Creek Alluvium	A	SWL and WQ - 2m – full suite	Wambo	Depth to Water: 6.6-10.7 Max EC:941 pH: 6.7-7.9	Wambo
P109 (Replacement)	311215	6390766	Wambo Creek Alluvium	A	SWL and WQ - 2m – full suite	United Wambo	Depth to Water: 6.7 Max EC: 695 pH: 6.5-7.6	United Wambo
P109 (Replacement)	311215	6390766	Permian overburden	A	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A
P206	311777	6391261	Whybrow Interburden	A	SWL and WQ - 2m – full suite	Wambo	Depth to Water: N/A Max EC: 2630 pH: 7.3-8.1	Wambo
P316a, b & c	311255	6391087	North Wambo Creek alluvium, Weathered Permian & Permian	B	SWL and WQ – 2m - full suite ⁴	Wambo	N/A	N/A
P202	311854	6391262	Whybrow Interburden	A	SWL and WQ - 2m – full suite	Wambo	Depth to Water: N/A Max EC: 8172 pH: 6.7-7.7	Wambo
P301	309360	6391466	Whybrow Interburden	A	SWL and WQ - 2m	Wambo	N/A	N/A
P315	309084	6391856	Stony Creek Alluvium/Regolith	A	SWL and WQ - 2m	Wambo	Depth to Water: N/A Max EC: 552 pH: 6.0-7.4	Wambo

Site ID	Easting (MGA94 Zone 56)	Northing	Targeted Unit	Current Status ¹	Monitoring Program ²	Responsibility for monitoring	Trigger ³	Responsibility for trigger response
Vibrating Wire Piezometers								
P317	307115	6394439	Regolith, Overburden, Whybrow Seam, & Wambo Seam	EX	SWL (continuous, download quarterly) and WQ – full suite	Wambo	N/A	N/A
P318	312599	6388922	Regolith, Whybrow Seam, Wambo Seam & Arrowfield Seam	EX	SWL (continuous, download quarterly) and WQ – full suite	Wambo	N/A	N/A
P319	311125	6391412	Regolith, Whybrow Seam, Wambo Seam & Interburden Sandstone	EX	SWL (continuous, download quarterly) and WQ – full suite	Wambo	N/A	N/A
P320	307573	6398890	Coal Seams - Middle Barrett, Lower Arties, Pikes Gully, Bayswater, Vaux & Warkworth	EX	SWL (continuous, download quarterly) and WQ – full suite	Wambo	N/A	N/A
P321	307999	6399498	Coal Seams – Arrowfield, Warkworth, Vaux & Bayswater	EX	SWL (continuous, download quarterly) and WQ – full suite	Wambo	N/A	N/A
UG139	306665	6395172	Coal seams – Unnamed (D & E), Blakefield, Glen Munro, Arrowfield & Bowfield	EX	SWL and WQ – full suite	United Wambo	N/A	N/A
UG166A	306488	6398075	Coal seams – Unnamed (D & E), Interburden, Glen Munro, Interburden, Arrowfield & Bowfield	EX	SWL and WQ – full suite	United Wambo	N/A	N/A

Notes to Table D:

1. A = bore currently monitored under existing GWMP, with individual trigger level for SWL, pH and EC,
B = bore currently monitored under existing GWMP, individual trigger to be established once sufficient data has been collected
EX = existing monitoring bore with baseline data available
Proposed = bore proposed to be installed and included in the monitoring network
SWL = Static water level - VWP sensors record daily pressure (converted to SWL) – download results every six months, 2m = monitoring frequency every two months, measuring water level, field pH and EC, full suite
= conduct water quality testing annually for revised full water quality suite as follows:
 - physio-chemical indicators – pH, EC, total dissolved solids (TDS);
 - major ions – calcium, fluoride, magnesium, potassium, sodium, chloride, sulphate;
 - total alkalinity as CaCO₃, HCO₃, CO₃; and
 - dissolved and total metals – aluminium, arsenic, barium, boron, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, strontium, silver, vanadium, and zinc.
- 2.
3. Units: Depth to Water (metres below top of casing (MBTOC) – 10th and 90th percentile triggers, pH in pH units, EC in µS/cm – 10th and 90th percentile triggers
4. Private bore
5. Annually from Oct 2020

Table E: Groundwater Monitoring Program- Wambo Only Program

Site ID	Eastings (MGA94 Zone 56)	Northing	Targeted Unit	Current Status ¹	Monitoring Program ²	Responsibility for monitoring	Trigger ³	Responsibility for trigger response
Standpipe Monitoring Bores								
BH1	313265	6394804	Alluvium	B	SWL and WQ - 2m – full suite	Wambo	N/A	N/A
BH1G	310104	6391551	Whybrow Seam		SWL – 2m	Wambo	N/A	N/A
BH2	308867	6390147	Whybrow Seam		SWL (continuous – real time)	Wambo	N/A	N/A
BH2A	308868	6390096	Whybrow Seam		SWL (continuous – real time)	Wambo	N/A	N/A
BH3	313399	6394644	Woodlands Hill Seam	B	SWL and WQ - 2m – full suite	Wambo	N/A	N/A
BH4C	309323	6391080	Whybrow Seam		SWL (continuous – real time)	Wambo	N/A	N/A
BH4D			Whybrow Seam, Wambo Seam		SWL – 2m	Wambo	N/A	N/A
GW27	305736	6395614	North Wambo Creek - Alluvium	B	SWL and WQ - 2m – full suite	Wambo	N/A	N/A
GW28	306008	6395769	North Wambo Creek - Alluvium	B	SWL and WQ - 2m – full suite	Wambo	N/A	N/A
GW30	305867	6395617	North Wambo Creek - Alluvium	B	SWL and WQ - 2m – full suite	Wambo	N/A	N/A
GW31	306076	6395720	North Wambo Creek - Alluvium	B	SWL and WQ - 2m – full suite ⁴	Wambo	N/A	N/A
GW32	305876	6395581	North Wambo Creek - Alluvium	B	SWL and WQ - 2m – full suite ⁴	Wambo	N/A	N/A
GW33	306393	6395828	North Wambo Creek - Alluvium	B	SWL and WQ - 2m – full suite ⁴	Wambo	N/A	N/A
GW34	306592	6395946	North Wambo Creek - Alluvium	B	SWL and WQ - 2m – full suite ⁴	Wambo	N/A	N/A
GW35	307356	6395779	North Wambo Creek - Alluvium	B	SWL and WQ - 2m – full suite ⁴	Wambo	N/A	N/A
GW36	306988	6396012	North Wambo Creek - Unconsolidated sediments	B	SWL and WQ - 2m – full suite ⁴	Wambo	N/A	N/A
P325a	312062	6390137	Wambo Creek Alluvium	B	SWL and WQ – 2m - full suite ⁴	Wambo	N/A	N/A

Site ID	Easting (MGA94 Zone 56)	Northing	Targeted Unit	Current Status ¹	Monitoring Program ²	Responsibility for monitoring	Trigger ³	Responsibility for trigger response
P329a	307456	6400352	Hunter River Alluvium	B	SWL and WQ – 2m - full suite ⁴	Wambo	N/A	N/A
P330a	306533	6400052	Hunter River Alluvium	B	SWL and WQ – 2m - full suite ⁴	Wambo	N/A	N/A
Wambo-03	311699	6392752	Wambo Seam	A	SWL (continuous – real time)	Wambo	N/A	N/A
Wambore South	311812	6392555	Wambo Seam	A	SWL – 2m	Wambo	N/A	N/A
Vibrating Wire Piezometers								
N2	308663	6393376	Permian Overburden, Whybrow Seam, Redbank Creek Seam & Wambo Seam	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
N3	308314	6394575	Permian Overburden, Whybrow Seam, Redbank Creek Seam & Wambo Seam	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
N5	306755	6395963	Permian Overburden, Whybrow Seam, Redbank Creek Seam & Wambo Seam	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
P316	311252	6391128	Alluvium, Regolith, Regolith Overburden & Whybrow Seam	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
P322	312572	6395026	Regolith, Whynot Seam, Interburden (between Whynot & Woodlands Hill)	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
P323	309797	6393428	Overburden siltstone, Whybrow Seam, Wambo Seam	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
	309799	6393431	Woodlands Hill Seam, Arrowfield Seam	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
P324	310471	6391983	Regolith	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A

Site ID	Easting (MGA94 Zone 56)	Northing	Targeted Unit	Current Status ¹	Monitoring Program ²	Responsibility for monitoring	Trigger ³	Responsibility for trigger response
	310471	6391984	Coal Seams - Whybrow, Wambo & Woodlands Hill and Interburden	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
P325	311806	6390306	Siltstone & Coal Seams - Whybrow, Wambo, Whynot, Woodlands Hill & Arrowfield	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
P326	310087	6392874	Overburden & Coal Seams – Wambo, Woodlands Hill & Arrowfield	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
P327	303000	6400000	Overburden Sandstone & Coal Seams – Whybrow, Wambo & Whynot	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
P328	303160	6398870	Overburden, Whybrow, Wambo, Whynot	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
P329	307454	6400351	Vaux, Bayswater & Pikes Gully coal seams	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A
P330	306533	6400050	Vaux & Pikes Gully coal seams	EX	SWL (continuous, download quarterly)	Wambo	N/A	N/A

Notes to Table E:

1. A = bore currently monitored under existing GWMP, with individual trigger level for SWL, pH and EC,
B = bore currently monitored under existing GWMP, individual trigger to be established once sufficient data has been collected
EX = existing monitoring bore with baseline data available
Proposed = bore proposed to be installed and included in the monitoring network
2. SWL = Static water level - VWP sensors record daily pressure (converted to SWL) – download results every six months, 2m = monitoring frequency every two months, measuring water level, field pH and EC, full suite = conduct water quality testing annually for revised full water quality suite as follows:
 - physio-chemical indicators – pH, EC, total dissolved solids (TDS);
 - major ions – calcium, fluoride, magnesium, potassium, sodium, chloride, sulphate;
 - total alkalinity as CaCO₃, HCO₃, CO₃; and
 - dissolved and total metals – aluminium, arsenic, barium, boron, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, strontium, silver, vanadium, and zinc.
3. Units: Depth to Water (metres below top of casing (MBOC) – 10th and 90th percentile triggers, pH in pH units, EC in µS/cm – 10th and 90th percentile triggers
4. Annually from Oct 2020

Table F: Groundwater Monitoring Program- United Wambo Open Cut Only Program

Site ID	Easting (MGA94 Zone 56)	Northing	Targeted Unit	Current Status ¹	Monitoring Program ²	Responsibility for monitoring	Trigger ³	Responsibility for trigger response
Standpipe Monitoring Bores								
GW14 ⁴	312478	6391358	Regolith	B	SWL	United Wambo	N/A	N/A
P12 ⁵	313644	6394797	Wollombi Brook (east) Alluvium	EX	SWL and WQ - 2m – full suite	United Wambo	Depth to Water: 6.3-7.7 Max EC: 1002 pH: 7.3-7.7	United Wambo
P13	313722	6394412	Wollombi Brook (east) Alluvium	EX	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A
P401	313660	6395336	Overburden	Proposed	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A
P402	313660	6395336	Arrowfield Seam	Proposed	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A
P404	307023	6398634	Overburden	Proposed	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A
P405	307025	6398634	Arrowfield Seam	Proposed	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A
P407	312599	6392933	Wollombi Brook (west) Alluvium	Proposed	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A
P408a	307282	6399576	Hunter River Alluvium	B	SWL and WQ - 2m – full suite	United Wambo	N/A	N/A
Vibrating Wire Piezometers								
P33	313757	6394659	Unnamed Seams (C, D and E), Blakefield Seam & Arrowfield Seam	EX	SWL	United Wambo	N/A	N/A
P34	313757	6393961	Glen Munro Seam, Blakefield Seam & Bowfield Seam	EX	SWL	United Wambo	N/A	N/A
P35	313611	6395196	Interburden, Blakefield Seam & Arrowfield Seam	EX	SWL	United Wambo	N/A	N/A
P403	308565	6397958	Overburden & Coal Seams – Arrowfield, Warkworth & Vaux	Proposed	SWL	United Wambo	N/A	N/A
P406	307681	6398872	Overburden	Proposed	SWL	United Wambo	N/A	N/A
P408	307000	6399500	Vaux, Bayswater, Pikes Gully Semas	B	SWL	United Wambo	N/A	N/A

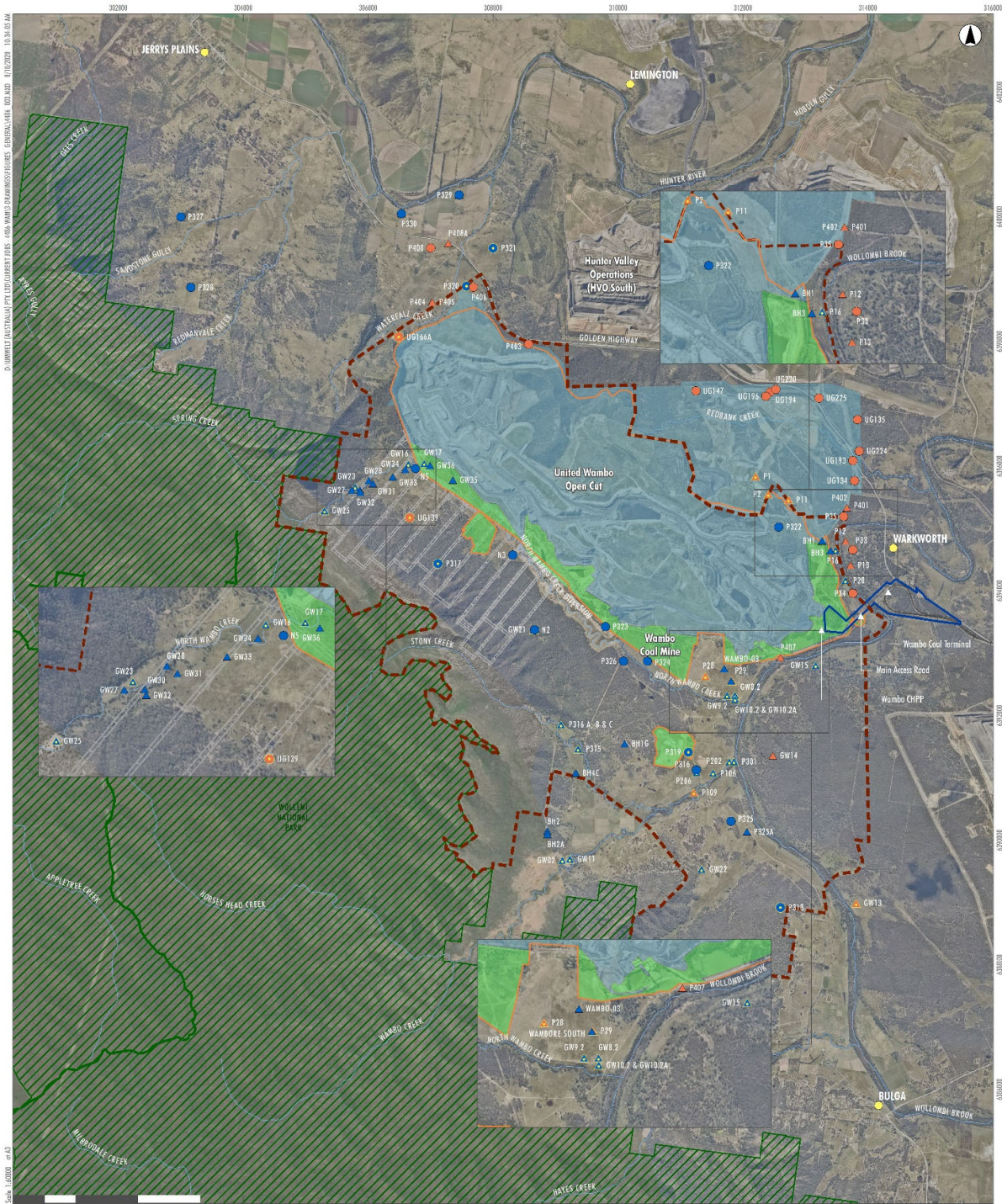
Site ID	Easting (MGA94 Zone 56)	Northing	Targeted Unit	Current Status ¹	Monitoring Program ²	Responsibility for monitoring	Trigger ³	Responsibility for trigger response
UG134	313782	6395767	Interburden & Coal Seams – Warkworth, Mt Arthur, Piercefield & Vaux	EX	SWL	United Wambo	N/A	N/A
UG135	313831	6396748	Interburden & Coal Seams – Warkworth, Mt Arthur, Piercefield & Vaux	EX	SWL	United Wambo	N/A	N/A
UG147	311245	6397207	Interburden & Coal Seams – Glen Munro, Mt Arthur, Piercefield, Vaux & Broonie	EX	SWL	United Wambo	N/A	N/A
UG193	313757	6396090	Coal Seams – Glen Munro, Arrowfield, Bowfield, Warkworth, Piercefield & Broonie	EX	SWL	United Wambo	N/A	N/A
UG194	312436	6397191	Interburden & Coal Seams – Blakefield & Vaux	EX	SWL	United Wambo	N/A	N/A
UG196	312364	6397122	Interburden & Coal Seams – Glen Munro, Arrowfield, Mt Arthur & Broonie	EX	SWL	United Wambo	N/A	N/A
UG220	312522	6397233	Interburden, Overburden & Coal Seams - Arrowfield, Warkworth, Mt Arthur & Vaux	EX	SWL	United Wambo	N/A	N/A
UG224	313860	6396243	Interburden & Coal Seams - Piercefield & Vaux	EX	SWL	United Wambo	N/A	N/A
UG225	313214	6397095	Interburden, Overburden & Coal Seams - Arrowfield, Bowfield, Mt Arthur, Vaux & Warkworth	EX	SWL	United Wambo	N/A	N/A
P33	313757	6394659	Unnamed Seams (C, D and E), Blakefield Seam & Arrowfield Seam	EX	SWL	United Wambo	N/A	N/A
P34	313757	6393961	Glen Munro Seam, Blakefield Seam & Bowfield Seam	EX	SWL	United Wambo	N/A	N/A

Site ID	Easting (MGA94 Zone 56)	Northing	Targeted Unit	Current Status ¹	Monitoring Program ²	Responsibility for monitoring	Trigger ³	Responsibility for trigger response
P35	313611	6395196	Interburden, Blakefiled Seam & Arrowfield Seam	EX	SWL	United Wambo	N/A	N/A

Notes to Table F:

1. A = bore currently monitored under existing GWMP, with individual trigger level for SWL, pH and EC,
 B = bore currently monitored under existing GWMP, individual trigger to be established once sufficient data has been collected
 EX = existing monitoring bore with baseline data available
 Proposed = bore proposed to be installed and included in the monitoring network
 SWL = Static water level - VWP sensors record daily pressure (converted to SWL) – download results every six months, 2m = monitoring frequency every two months, measuring water level, field pH and EC, full suite = conduct water quality testing annually for revised full water quality suite as follows:
 - physio-chemical indicators – pH, EC, total dissolved solids (TDS);
2.
 - major ions – calcium, fluoride, magnesium, potassium, sodium, chloride, sulphate;
 - total alkalinity as CaCO₃, HCO₃, CO₃; and
 - dissolved and total metals – aluminium, arsenic, barium, boron, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, strontium, silver, vanadium, and zinc.
3. Units: Depth to Water (metres below top of casing (MBOC) – 10th and 90th percentile triggers, pH in pH units, EC in µS/cm – 10th and 90th percentile triggers
4. GW14 has been dry since December 2011
5. Water level also recorded with datalogger at this site.

Groundwater Monitoring Program Figure



- Legend**
- Wambo DA 305-7-2003
 - Rail DA 177-8-2004
 - Approved Wambo Surface Development Area
 - DA 305-7-2003 Operational Area - Surface Development (Phase 2)
 - SSD 7142 Operational Area (Phase 2)
 - National Park
 - Approved Underground Development (Current)
 - Drainage Line
 - Railway
 - Road
 - Town
- Monitoring Locations**
- UW OC Bores**
- GW Monitoring
 - VWP
- Wambo Bores**
- GW Monitoring
 - VWP
- Shared Monitoring Bores**
- Wambo GW Monitoring
 - Wambo/UW OC GW Monitoring
 - Wambo VWP
 - Wambo/UW OC VWP

Peabody
WAMBO COAL MINE
 Groundwater Monitoring Locations

Image Source: HereMap (May 2020), ESRI BaseMap. Data source: DFSI (2020)