WATER MANAGEMENT PLAN

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1 INTRODUCTION

1.1 Background

Maxwell Ventures (Management) Pty Ltd, a wholly owned subsidiary of Malabar Resources Limited (Malabar) owns and operates the Maxwell Underground (UG) Project (the site). The site is in the Upper Hunter Valley of New South Wales (NSW), east-southeast of Denman and south-southwest of Muswellbrook. The site is approved to extract a maximum of 8 million tonnes of run-of-mine coal per year over a period of 26 years. The site boundary is shown in **Figure 1**.

The site consists of the following areas:

- Underground area comprising the proposed area of underground mining operations and the mine entry area (MEA) to support underground mining and coal handling activities and provide for personnel and materials access;
- Maxwell Infrastructure (formerly Drayton mine) comprising previous open cut mining areas, existing coal handling and preparation plant (CHPP), train load-out facilities and rail loop, Antiene rail spur and other infrastructure and services; and
- Proposed transport and services corridor between the underground area and Maxwell Infrastructure comprising the proposed site access road, covered overland conveyor, power supply and other ancillary infrastructure and services.

The area within and surrounding the site, which has previously been known as Mt Arthur South, Saddlers Creek and Drayton South, has long been identified as having a significant in-situ coal resource. Prospecting for coal commenced in the late 1940s, with exploration intensifying during the 1960s and 1970s. Open cut coal extraction and mining activities commenced at Maxwell Infrastructure in 1983 and ceased in October 2016. The previous open cut mining area is currently in the rehabilitation phase of the mine operations.

The development consent for State Significant Development 9526 (Development Consent SSD 9526) was granted on 22 December 2020 under clause 8A of the *State Environmental Planning Policy (State and Regional Development) 2011* and section 4.5(a) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The development consent was modified on 19 November 2021 to allow for the repositioning of infrastructure primarily at the MEA and realignment of a section of the site access road.

The site also incorporates the development formerly authorised under the Maxwell Infrastructure Project Approval (PA) 06_0202. Development Consent DA 106-04-00 for the existing rail loop and Antiene Rail Spur was granted on 2 November 2000 under Section 76(A)9 and 80 of the EP&A Act and is still current.

1.2 Purpose and Scope

The purpose of this Water Management Plan (WMP) is to detail the statutory requirements, and to outline the water management controls, for the site. This WMP is one of a series of Environmental Management Plans that together form the Environmental Management System for the site. This WMP includes the following sub-plans as Appendices:

- **Appendix 1** – Site Water Balance and Salt Balance
- **Appendix 2** – Erosion and Sediment Control Plan
- **Appendix 3** – Surface Water Management Plan
- **Appendix 4** – Groundwater Management Plan

This WMP applies to all activities within the Development Consent SSD 9526 development application area and the Antiene Rail Spur Development Consent (DA 106-04-00) boundary.

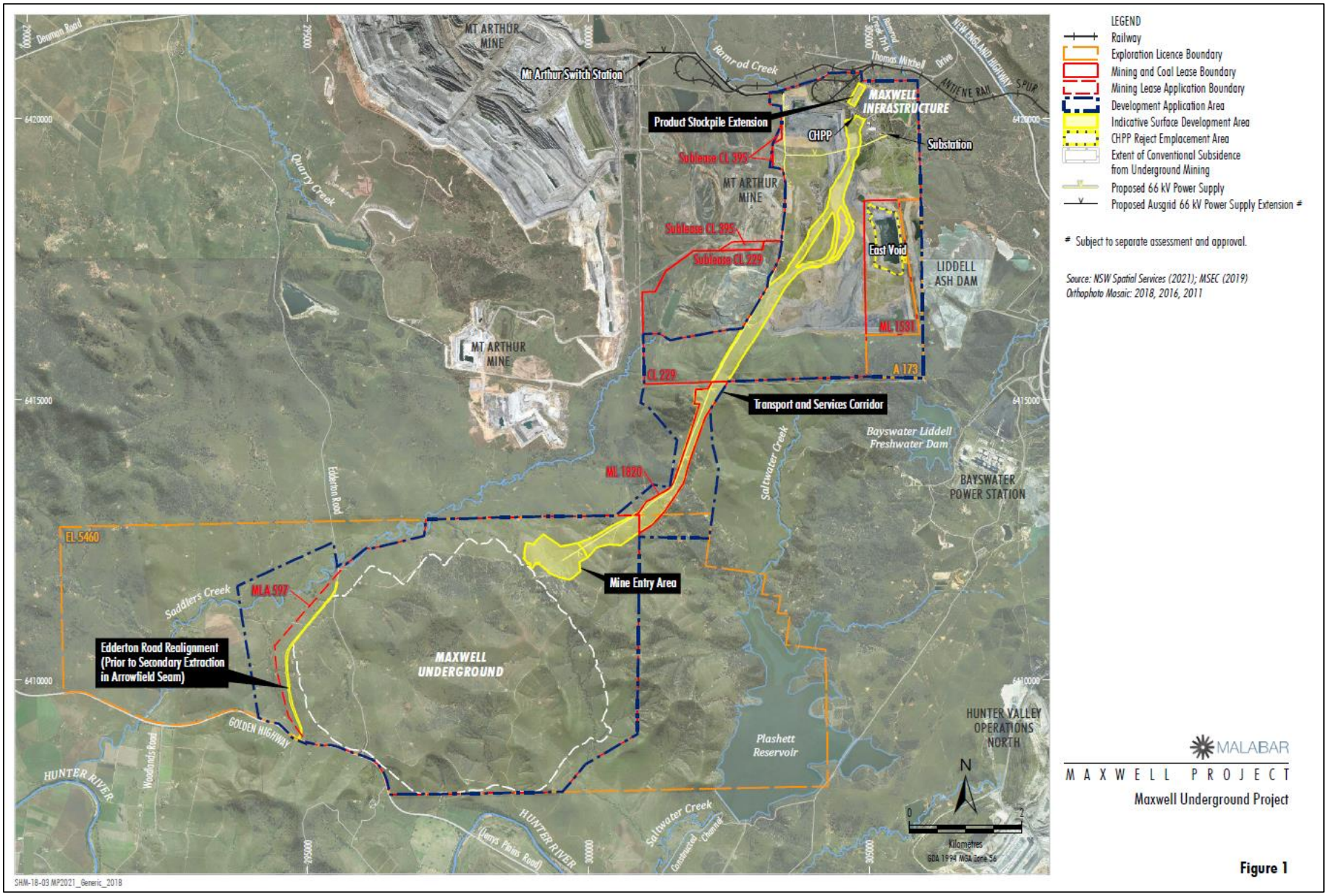


Figure 1. Maxwell Underground Project

In accordance with Schedule 2, Condition A24(a) of SSD 9526, this WMP has been prepared for stage 1 activities only. Stage 1 activities include early preparatory works, construction and first workings. Early preparatory works are defined in Section 3.4.2 of the Maxwell UG Project Environmental Impact Statement (Project EIS) and construction and first workings are defined in Development Consent SSD 9526. A copy of the approval from the Planning Secretary to stage this plan is provided in **Appendix 5**. This plan will be updated prior to the commencement of second workings.

Maxwell will not commence construction until this WMP is approved by the Planning Secretary. Maxwell will notify the Department of Planning, Industry and Environment (DPIE) in writing of the date of commencement of construction at least two weeks before the commencement date in accordance with Condition A13(b), Schedule 2 of Development Consent SSD 9526. Maxwell will implement this WMP, following approval by the Planning Secretary.

1.3 Objectives

The objectives of this WMP are to:

- identify potential water impacts;
- detail all relevant statutory requirements;
- detail the controls that are implemented to minimise water impacts;
- detail the water monitoring system to assess water impacts;
- provide a protocol to evaluate compliance;
- manage water related complaints in a timely and effective manner; and
- detail the procedure for reporting water criteria exceedances to relevant stakeholders.

2 PLANNING

2.1 Regulatory Requirements

This WMP describes the management of water to meet relevant statutory requirements within Development Consent SSD 9526 and DA 106-04-00 and Environment Protection Licence (EPL) 1323. The various conditions that relate to water management and where they are addressed in this document are detailed in **Appendix 6**.

In addition, requirements of Development Consent SSD 9526 that specifically relate to **Appendices 1 to 4**, and where they are addressed in that appendix, are detailed in **Section 2.4** of each appendix**.**

This WMP also addresses the water resources conditions in EPBC Approval 2018/8287. Particular requirements of EPBC Approval 2018/8287 are addressed as follows:

- Conditions 1 and 2: Appendix 6 summarises how each of the relevant conditions in Development Consent SSD 9526, including those referenced in EPBC Approval 2018/8287, are addressed in this WMP.
- Conditions 3 and 4: Section 5.1 addresses the notification requirements under EPBC Approval 2018/8287.
- Condition 5: Section 5.2 of the Groundwater Management Plan (Appendix 4) addresses the groundwater monitoring requirements outlined in EPBC Approval 2018/8287.
- Conditions 6 – 9: Section 5.9 of the Surface Water Management Plan (Appendix 3) and Section 5.6 of the Groundwater Management Plan (Appendix 4) outline the how the surface water and groundwater trigger action response plans will be applied to the notification and reporting requirements outlined in EPBC Approval 2018/8287.

2.2 Maxwell Project EIS and Supporting Document Commitments

Surface water and groundwater assessments were undertaken for the Project EIS (published on 14 August 2019). Commitments in the Project EIS and supporting documents that relate to surface water and groundwater management for the scope of this WMP, and where they are addressed in this document, are detailed in **Appendix 7**.

In addition, commitments in the Project EIS that specifically relate to **Appendices 1** to **4**, and where they are addressed in that appendix, are detailed in **Section 2.4** of each appendix**.**

2.3 Preparation and Consultation

Schedule 2, Condition B42(a) of Development Consent SSD 9526, requires that this plan be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary. Maxwell has engaged Matt Briody (Principal Engineer, WRM Water & Environment Pty Ltd) to assist with the preparation of the surface water components of the plan. Maxwell has also engaged Dr Noel Merrick (Senior Principal Hydrogeologist at HydroAlgorithmics) to assist with the preparation of the groundwater components of the plan. A copy of the endorsement by the Planning Secretary is included in **Appendix 8**.

In accordance with Schedule 2, Condition B42(b) of Development Consent SSD 9526, this plan has been prepared in consultation with DPIE Water. Outcomes of consultation with DPIE Water are presented in **Appendix 9**.

3 IMPLEMENTATION

3.1 General Water Management Performance Measures

The water management system at the site is designed and operated to achieve the following general water management performance measures:

- Maintain separation between clean, dirty and mine water.
- Minimise the use of clean and potable water.
- Maximise water recycling, reuse and sharing opportunities.
- Minimise the use of make-up water from external sources.
- Design, install, operate and maintain water management infrastructure in a proper and efficient manner.
- Minimise risks to the receiving environment and downstream water users.

3.2 Water Management System Overview

The general water management performance measures will be achieved through operation of the following water management systems:

- A mine water management system to collect and use water that may contain high total dissolved solids (i.e. salt) concentrations. Mine voids and dams will be used on site to store mine water for reuse.
- A clean water management system to divert clean water around disturbed areas.
- A dirty water management system to separate potentially sediment-laden runoff from disturbed areas, from clean area runoff, and collect it in sediment dams for treatment.
- A hydrocarbon water management system for water potentially contaminated with oils, greases and chemicals.
- Management and monitoring systems to ensure water management infrastructure is designed, installed, operated and maintained in a proper and efficient manner.

Maxwell will operate a closed water management system that does not actively draw water from external surface water sources such as the Hunter River or ‘highly productive’ groundwater sources, and will not discharge mine water to the environment under the Hunter River Salinity Trading Scheme.

3.3 Site Water Balance and Salt Balance Overview

The main water sources for the site during the ongoing Maxwell Infrastructure and stage 1 activities are:

- groundwater inflows to existing mine voids;
- minimal groundwater inflows encountered during establishment of the drift;

- catchment runoff from surface disturbance areas; and
- small volumes of potable water imported to site.

No surface water is proposed to be directly or indirectly extracted from the Hunter River for the site. Accordingly, no water access licences for Management Zone 1A (Hunter River from Glenbawn Dam to Goulburn River Junction) of the Hunter Regulated River Water Source under the *Water Sharing Plan of the Hunter Regulated River Water Source 2016* will be required. Malabar currently holds sufficient licences to cover the predicted indirect water take associated with the Management Zone 1B (Hunter River from Goulburn River Junction to Glennies Creek Junction) of the Hunter Regulated River Water Source under the *Water Sharing Plan of the Hunter Regulated River Water Source 2016*.

During the stage 1 activities, water will be used for dust suppression along the temporary site access road, prior to it being sealed, dust suppression at the MEA and for construction activities. A detailed description of the site water balance and salt balance management, monitoring and reporting is provided in **Appendix 1**.

3.4 Erosion and Sediment Control Overview

The main principles of erosion and sediment controls at the site are as follows:

- Minimising surface disturbance to prevent erosion.
- Stabilisation or rehabilitation of areas disturbed for infrastructure construction as soon as practicable.
- Separation of runoff from disturbed and undisturbed areas where practicable.
- Construction of surface drains to control and manage surface runoff.
- Construction of sediment dams or use of existing/modified water storages to contain runoff up to a specified design criterion.

Erosion could be caused by surface disturbance from the following construction and development activities:

- Upgrades of existing access tracks for early preparatory works at the MEA.
- Construction of the temporary site access road to the MEA.
- Excavation of the MEA (access floor and wall above the portal), portals and mine access drift.
- Construction of MEA water management infrastructure, including sumps, pumps, drains, pipelines and water storages.
- Construction of administration buildings, meeting rooms, bathhouse, workshop, fuel storage, laydown and parking facilities and other ancillary infrastructure.
- Potential sources of erosion at Maxwell Infrastructure are mine waste dumps undergoing rehabilitation.

Erosion and sediment control structures will be designed and operated in accordance with *Managing Urban Stormwater Soils and Construction* (Landcom, 2004) and *Volume 2E: Mines and Quarries* (DECC, 2008). A detailed description of erosion and sediment controls is provided in **Appendix 2**.

3.5 Surface Water Management Overview

First workings are not predicted to cause subsidence or impacts on channel stability and riparian health. However, baseline channel stability and riparian health monitoring has commenced. Impacts of second workings and mitigation measures will be described in the subsequent Water Management Plan that will be developed prior to secondary extraction.

The performance measure for aquatic ecosystems relevant to surface water flows is to maximise, as far as reasonable, the diversion of clean water around disturbed areas on the site. The water management system incorporates up-catchment diversions around the northern and southern boundaries of the MEA to minimise the runoff from undisturbed areas captured by on-site water storages and impacts on downstream water flows. Diversion banks will be designed to ensure effective segregation of sediment-laden runoff and allow clean surface water to return to a natural watercourse.

The water storage and transfer system is summarised in **Appendix 1**. Potential pathways for the uncontrolled overflows of mine-affected water from the water storage and transfer system include:

- overtopping of dams, particularly during heavy and prolonged rainfall events;
- rupture of raw water pipelines; and
- seepage of water from storage dams.

Runoff from emplacement areas is captured and stored on site and within mine voids. No more overburden emplacement activities are required for Maxwell Infrastructure. Some existing overburden emplacements may be shaped using a dozer (or similar) to manage spontaneous combustion outbreaks and improve water management on the site.

Rehabilitation occurred progressively at the Maxwell Infrastructure as ancillary disturbance areas and final landforms became available for revegetation since 1983. Maxwell will continue rehabilitation of the former mining areas at the Maxwell Infrastructure as part of the Project. Earthworks at the Maxwell Infrastructure have been undertaken to establish final landforms in accordance with the approved Mining Operations Plan. Where possible, landform designs have been modified to create more natural landscapes, incorporating dams and natural drainage lines on rehabilitation.

Any potentially contaminated rainfall runoff from the Industrial Area is diverted to the Oil Pollution Control (OPC) Dam located immediately upstream of the Industrial Dam. The OPC Dam has two oil/water separators in place which remove oil residue from the water prior to it being fed into the Industrial Dam and into the mine's raw water management system.

Following the completion of mining, surface infrastructure areas (including the MEA) will be decommissioned and rehabilitated to pasture or woodland. The objective for water management of rehabilitated surface infrastructure areas post-mining is that the land surface is safe, stable and reshaped to meet post mining land use requirements.

A detailed description of surface water management is provided in **Appendix 3**.

3.6 Groundwater Management Overview

The final voids within the Maxwell Infrastructure area are predicted to act as groundwater sinks and are therefore unlikely to impact on water quality within the surrounding stratigraphy (HydroSimulations 2019).

A groundwater assessment for the Project EIS was undertaken by HydroSimulations (2019). A numerical regional groundwater model was used to simulate potential effects of changes in hydraulic properties on local and regional aquifer systems and groundwater users as a result of sub-surface fracturing of overburden above mining panels. The first workings comprise a network of access roadways (i.e. drifts and main headings) that will be designed to remain stable for the life of the mine and not result in material fracturing or land subsidence.

The second workings associated with the partial pillar extraction and longwalls will however result in subsidence that would develop above the area of secondary extraction. Site specific alluvial investigations, including drilling transects, indicate there is no alluvium within the footprint of the MEA (Gippel 2019). In addition, no excavation of the alluvial sediments associated with Saddlers Creek is proposed. First workings and construction activities are therefore predicted to not impact groundwater levels, other groundwater users, groundwater quality, baseflows in Saddlers Creek or Saltwater Creek or Groundwater Dependent Ecosystems (GDEs). Impacts of second workings and mitigation measures will be described in the subsequent Water Management Plan that will be developed prior to secondary extraction.

A detailed description of groundwater management is provided in **Appendix 4**.

4 MEASUREMENT AND EVALUATION

4.1 Incident and Non-Compliance Notification

An incident is defined in Development Consent SSD 9526 as an occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance.

In accordance with Schedule 2, Condition E9 of Development Consent SSD 9526, Maxwell shall immediately notify DPIE and any other relevant agencies, immediately after it becomes aware of an incident. The notification shall be in writing via the Department's Major Projects Website and identify the development (including the development application number and name) and set out the location and nature of the incident.

A *Pollution and Incident Response Management Plan* (PIRMP) is maintained in accordance with the requirements of the Part 5.7A of the *Protection of the Environment Operations Act 1997* and Chapter 7, Part 3A of the *Protection of the Environment Operations* (General) Regulation 2009. Any pollution incident that causes actual or potential material harm will be reported to the relevant agencies immediately after it is identified, as described in the PIRMP. A copy of the PIRMP is located on Malabar's website at https://malabarresources.com.au/sustainability/documentation.

In accordance with Schedule 2, Condition E10 of Development Consent SSD 9526, Maxwell shall notify DPIE within seven days of becoming aware of a non-compliance. The notification shall be in writing via the Department's Major Projects Website and identify the development (including the development application number and name), set out the condition of Development Consent SSD 9526 that the Project is non-compliant with, why it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.

4.2 Adaptive Management and Contingency Plan

In accordance with Schedule 2, Condition E4 of Development Consent SSD 9526, where any exceedance of performance measures has occurred, Maxwell shall, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur. Steps may include (where appropriate)
    - Isolating a water source.
    - Installation of bunding to control an uncontrolled release of water.
    - Installation of additional surface infrastructure such as pipes and pumping.
    - A review of operational activities in the surrounding area.
    - Undertaking additional water sampling analysis.
    - Undertaking a review of surface and or ground water models.
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to DPIE describing those options and any preferred remediation measures or other course of action; and
- Implement reasonable remediation measures as directed by the Planning Secretary.

In accordance with Schedule 2, Condition E5(f) of Development Consent SSD 9526, the following contingency plan is used to manage any unpredicted impacts and their consequences, and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible:

- Review the unpredicted impact with consideration of any relevant activities and monitoring data;
- Identify the most likely source of the unpredicted impact;
- Review the existing process and current dust controls; and
- Implement appropriate mitigation measures.

Adaptive management and contingency planning is addressed in more detail in the attached sub-plans.

4.3 Complaints Handling

The Maxwell UG Project maintains a 24-hour community hotline (1800 653 960) for any issues or enquiries. In addition to the community hotline, the site can also be contacted by emailing info@malabarresources.com.au.

If a complaint or enquiry is received regarding water management, it is investigated as soon as reasonably practicable and managed in accordance with Maxwell's *Community Complaints and Enquiries Procedure*. Details such as complainant name, contact details, nature of concern, date, time and method of receival are recorded. While details of the enquiry vary depending on the nature and source of the enquiry, the following actions may result:

- Confirmation of whether the complainant would like the matter raised as a complaint or an enquiry.
- Identify further details which may assist in determining the cause of the complaint.
- Carry out an inspection of the site or conduct an assessment of monitoring results to identify the source.
- Identify if there is an exceedance or non-compliance with any consent or licence condition.
- Identify, where necessary and practical, methods to manage the source of the complaint and minimise the chance of a recurrence or the potential to generate further complaints.

All enquiries and/or complaints are recorded in an enquiries database. A summary of complaints is presented to the Community Consultative Committee (CCC) and included in the Annual Review and EPL Annual Return.

5 AUDIT, REVIEW AND IMPROVEMENT

5.1 Review Schedule

The suitability of this WMP will be reviewed in accordance with Schedule 2, Condition E7 of Development Consent SSD 9526, that is within three months of:

- the submission of an incident notification under Condition E9;
- the submission of an Annual Review under Condition E11;
- the submission of an Independent Environmental Audit under Condition E13;
- the approval of any modification of the conditions of Development Consent SSD 9526; or
- notification of a change in development phase under Condition A13.

In accordance with Condition E8, if necessary, to improve the environmental performance of the site, cater for a modification or comply with a direction, this plan will be revised. The revised plan will be submitted to DPIE for approval within six weeks of the review.

In accordance with Conditions 3 and 4 of EPBC Approval 2018/8287, Maxwell will provide the approved version of this WMP, as well as any future updated versions, to the Commonwealth Department of Agriculture, Water and Environment within two business days of its approval by DPIE.

5.2 Reporting

In accordance with Schedule 2, Condition E11 of Development Consent SSD 9526, by the end of March in each year after the commencement of the development, or other timeframe agreed by the Planning Secretary, an Annual Review report will be submitted to DPIE. The Annual Review will include the following:

- A description of the development that was carried out in the previous calendar year and the development proposed to be carried out over the current calendar year.
- A comprehensive review of the water monitoring results and complaints over the previous calendar year.
- A description of non-compliances which occurred in the previous calendar year and actions that were (or are being) taken to rectify the non-compliance and avoid reoccurrence.
- Evaluation of the effectiveness of the water management measures.

- Trends in water monitoring data and any discrepancies between predicted and actual impacts.
- Measures to be implemented over the next calendar year to improve the environmental performance of the development.

In accordance with Schedule 2, Condition E12 of Development Consent SSD 9526 copies of the Annual Review shall be submitted to Muswellbrook Shire Council and made available to the CCC and any interested person upon request.

In accordance with Schedule 2, Condition E17(a) of Development Consent SSD 9526, the Annual Review will also be publicly available on Malabar's website at https://malabarresources.com.au/sustainability/documentation. Further detail on reporting to be included in the Annual Review is provided in the following sub-sections.

In accordance with Condition 5c of EPBC Approval 2018/8287, groundwater monitoring data collected in accordance with Section 5.2 of the Groundwater Management Plan (Appendix 4) will be published on the Malabar website quarterly.

In accordance with Condition R3.11 of Environment Protection Licence (EPL) 1323 Maxwell will provide a Sewage Treatment System Maintenance Report to the Environment Protection Authority (EPA) each year.

In accordance with Condition R1.1 of EPL 1323 Maxwell will complete and supply to the EPA an Annual Return in the approved form comprising:

- a Statement of Compliance,
- a Monitoring and Complaints Summary,
- a Statement of Compliance – Licence Conditions,
- a Statement of Compliance – Load based Fee,
- a Statement of Compliance – Requirement to Prepare Pollution Incident Response Management Plan,
- a Statement of Compliance – Requirement to Publish Pollution Monitoring Data; and
- a Statement of Compliance – Environmental Management Systems and Practices

In accordance with Condition R3.9 and R3.10 of EPL 1323 Maxwell will complete and supply to the EPA a Surface Water Monitoring Report and a Groundwater Monitoring Report each year. These reports will include the following information from the respective monitoring period:

- the date and time of the monitoring;
- the location of the monitoring;
- analysis and trends for monitoring parameters;
- an explanation for changes in parameter concentrations with a summary of any investigations or mitigation actions undertaken.

This information may be incorporated into the Annual Review.

5.3 Auditing

In accordance with Schedule 2, Condition E13 of Development Consent SSD 9526 within one year of commencement of development under this consent, and every three years after, unless the Planning Secretary directs otherwise, Maxwell will commission and pay the full cost of an Independent Environmental Audit of the development. The audit shall:

a) be led by a suitably qualified, experienced and independent auditor whose appointment has been endorsed by the Planning Secretary;

b) be conducted by a suitably qualified, experienced and independent team of experts (including any expert in field/s specified by the Planning Secretary) whose appointment has been endorsed by the Planning Secretary;

c) be carried out in consultation with the relevant agencies and the CCC;

d) assess the environmental performance of the development and whether it is complying with the relevant requirements in this consent, water licences and mining leases for the development (including any assessment, strategy, plan or program required under these approvals);

e) review the adequacy of any approved strategy, plan or program required under the abovementioned approvals and this consent;

f) recommend appropriate measures or actions to improve the environmental performance of the development and any assessment, strategy, plan or program required under the abovementioned approvals and this consent; and

g) be conducted and reported to the satisfaction of the Planning Secretary.

In accordance with Schedule 2, Condition E14 of Development Consent SSD 9526, within three months of commencing an Independent Environmental Audit, or other timeframe agreed by the Planning Secretary. Maxwell shall submit a copy of the audit report to the Planning Secretary, and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of the recommendations. The recommendations shall be implemented to the satisfaction of the Planning Secretary.

5.4 Access to Information

In accordance with Schedule 2, Condition E17 of Development Consent SSD 9526 before the commencement of construction until the completion of all rehabilitation required under SSD 9526, Maxwell will make the following information and documents (as they are obtained, approved or as otherwise stipulated within the conditions of Development Consent SSD 9526) that are relevant to this plan publicly available on Malabar's website:

- this WMP;
- all current statutory approvals for the development;
- the proposed staging plans for the development if the construction, operation or decommissioning of the development is to be staged;
- minutes of CCC meetings;
- regular reporting on the environmental performance of the development in accordance with the reporting requirements in any plans or programs approved under the conditions of this consent;
- a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs;
- a summary of the current phase and progress of the development;
- contact details to enquire about the development or to make a complaint;
- a complaints register, updated monthly;
- the Annual Reviews of the development; and
- audit reports prepared as part of any Independent Environmental Audit of the development and the Applicant's response to the recommendations in any audit report.

This information shall be kept up to date, to the satisfaction of the Planning Secretary.

5.5 Records Management

All surface water and groundwater monitoring data will be maintained in accordance with the Environmental Management Strategy and maintained on the premises for a period of at least five years.

5.6 Continuous Improvement

Feedback from the monitoring results and any complaints will be used to assess impacts and determine where improvements or mitigation measures are required. These measures will be reported on in the Annual Review.

5.7 Document Review History

A summary of the document history is outlined in **Table 1.**

Table 1: Document Revision Status

Issue	Issue Date	Review Team	Details of Change / Communication
1	July 2021	Matt Briody Noel Merrick Robyn Skinner Donna McLaughlin	Document prepared following approval of Development Consent SSD 9526 for the Maxwell UG Project.
1.1	November 2021	Matt Briody Noel Merrick Robyn Skinner Donna McLaughlin	Document updated following feedback from DPIE Water.
1.2	November 2021	Matt Briody Noel Merrick Robyn Skinner Donna McLaughlin	Document updated following feedback from DPIE.

6 INFORMATION, TRAINING AND INSTRUCTION

6.1 Competent Persons

Suitably qualified, competent and experienced persons shall be involved in the design, planning and implementation of this plan and related procedures. Suitably qualified and experienced person/s involved in preparation of this plan are discussed in **Section 2.3**.

6.2 Training

Water management training is provided to all employees and contractors through the Site Familiarisation process. From time to time, workforce communication and toolbox talks allow for discussion of the objectives and requirements of this and any other relevant management plans.

To ensure the effective implementation of water management controls, all site personnel involved in supervisory roles will undertake a more detailed awareness training package.

7 RESPONSIBILITIES

Responsibilities associated with this management plan are outlined in **Table 2**.

Table 2: Responsibilities

Position	Responsibilities
Operations Manager	• Provide adequate resources for the implementation of this Plan.
Health, Safety, Environment and Community Manager	• Oversee the implementation of the WMP. • Coordinate monitoring in accordance with this Plan. • Notify regulatory authorities and affected landholders of any water related exceedance and undertake the associated reporting. • Coordinate periodic reviews of this Plan.

Position	Responsibilities
	• Ensure all personnel are trained in accordance with this Management Plan.
Environmental Coordinator	• Assist the Manager Environment and Community as required in implementation of this Plan. • Assist the Manager Environment and Community with investigations of water related incidents or complaints. • Liaise with the Manager Environment and Community to maintain the environmental hotline. • Coordinate the implementation of the water monitoring program in accordance with this Plan. • Coordinate the management of records and reporting of water monitoring results. • Manage water related complaints in accordance with the complaints management procedure. • Provide training to all relevant personnel.
Task Coordinators	• Provide that the requirements of this Plan are met through compliance with water management procedures. • Report all incidents involving the failure or damage to water management structures.
All Personnel	• Undertake works in accordance with the objectives and principles of this Plan. • Report all incidents involving the failure or damage to Water Management Structures.

8 DOCUMENT INFORMATION

8.1 References

Gippel, C.J (2019) *Maxwell Project, Environmental Impact Statement, Technical Study Report, Geomorphology Assessment*, Fluvial Systems Pty Ltd, Stockton, Malabar Coal Limited, Sydney, June.

HydroSimulations (2019) *Maxwell Project: Groundwater Assessment – In support of an EIS*.

WRM Water & Environment Pty Ltd (2019) *Surface Water Assessment – Maxwell Project.*

8.2 Definitions and Abbreviations

Refer to **Appendix 10**.

APPENDIX 1 – SITE WATER BALANCE AND SALT BALANCE

Appendix 1 - Site Water Balance and Salt Balance

1 INTRODUCTION

1.1 Purpose and Scope

The purpose of this sub-plan is to satisfy the requirements of the Development Consent for State Significant Development (SSD) 9526 Schedule 2, Condition B42(e)(i) and B42(e)(ii), to prepare a site water balance and salt balance. This sub-plan applies to all activities within the Development Consent SSD 9526 consent boundary and the Antiene Rail Spur Development Consent (DA 106-04-00) boundary.

In accordance with Schedule 2, Condition A24(a) of Development Consent SSD 9526, this sub-plan has been prepared for stage 1 activities only. Stage 1 activities include early preparation works, construction and first workings. Early preparatory works are defined in Section 3.4.2 of the Maxwell Underground (UG) Project Environmental Impact Statement (Project EIS) and construction and first workings are defined in Development Consent SSD 9526). A copy of the approval from the Planning Secretary to stage this plan is provided in **Appendix 5** of the Water Management Plan (WMP). This sub-plan will be updated prior to the commencement of second workings.

1.2 Objectives

The objectives of this sub-plan are to:

- identify potential water impacts;
- detail all relevant statutory requirements;
- detail the controls that are implemented to minimise water impacts;
- detail the water monitoring system to assess water impacts;
- provide a protocol to evaluate compliance; and
- detail the procedure for reporting water criteria exceedances to relevant stakeholders.

2 PLANNING

2.1 Regulatory Requirements

This sub-plan describes the site water balance and salt balance to meet relevant statutory requirements within Development Consent SSD 9526. Requirements of Development Consent SSD 9526 that relate to site water balance and salt balance, and where they are addressed in this document, are detailed in **Section 2.4**.

2.2 Maxwell Project EIS and Supporting Document Commitments

A surface water and groundwater assessment were undertaken for the Project EIS (published on 14 August 2019). Commitments in the Project EIS that relate to site water balance and salt balance, and where they are addressed in this sub-plan, are detailed in **Section 2.4**.

2.3 Preparation and Consultation

Schedule 2, Condition B42(a) of Development Consent SSD 9526, requires that the WMP be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary. Maxwell has engaged Matt Briody (Principal Engineer, WRM Water & Environment Pty Ltd) to assist with the preparation of the surface water components of the sub- plan. Maxwell has also engaged Dr Noel Merrick (Senior Principal Hydrogeologist at HydroAlgorithmics) to assist with the preparation of the groundwater components of the sub-plan. A copy of the endorsement by the Planning Secretary is included in **Appendix 8** of the WMP.

In accordance with Schedule 2, Condition B42(b) of Development Consent SSD 9526, this plan has been prepared in consultation with the Department of Planning, Industry and Environment (DPIE) Water. Outcomes of consultation with the DPIE Water are presented in **Appendix 9** of the WMP.

2.4 Site Water Balance and Salt Balance Requirements

Requirements of Development Consent SSD 9526, relevant to the salt balance and water balance, and where they are addressed in this sub-plan are presented in **Table 1**.

Table 1: Requirements of Development Consent SSD 9526

Clause	Requirement	Section of Sub-plan
B27	The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of the development to match its available water supply	4.1.5
B28	The Applicant must report on water captured, intercepted or extracted from the site each year (direct and indirect) in the Annual Review, including water taken under each water licence. ***Note:*** *Under the Water Act 1912 and/or the Water Management Act 2000, the Applicant is required to obtain all necessary water licences for the development, including during rehabilitation and following mine closure.*	5.2, 5.3
B35	The Applicant must ensure that all water discharges from the site comply with: a) discharge limits (both volume and quality) set for the development in any EPL; and b) the relevant provisions of the POEO Act.	4.4
B36	The Applicant must implement all reasonable and feasible measures to avoid off-site discharges from the Access Road Dam or the Rail Loop Dam. However, should discharges from these dams be required, any such discharge may only be undertaken in accordance with the *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002*.	4.3, 4.4
B37	The Applicant may receive water from and/or transfer water to, the Mt Arthur Coal Complex.	4.5
B38	The Applicant may, with the written approval of the Planning Secretary, receive water from and/or transfer water to, other mining and/or industrial operations in the vicinity of the development. *Note:* *• Prior to the granting of written approval by the Planning Secretary, the Applicant must demonstrate that all necessary approvals and licences have been obtained for the sharing of water*.	4.5
B39	The Applicant may, with the written approval of the Planning Secretary, integrate components of the site water management system with the water management system for the Mt Arthur Coal Complex.	4.5

Clause	Requirement	Section of Sub-plan
B40	The Applicant must ensure that the development complies with the performance measures in Table 4.	
	Table 4: *Water management performance measures*	
	Feature / ***Performance Measure***	
	Water management – General	
	(a) Maintain separation between clean, dirty (i.e. sediment-laden) and mine water management systems.	Appendix 3 of WMP
	(b) Minimise the use of clean and potable water on the site.	4.3
	(c) Maximise water recycling, reuse and sharing opportunities.	4.3
	(d) Maximise the capture and reuse of mine water and dirty water to meet operational demands for water	4.3
	(e) Minimise the use of make-up water from external sources.	4.3
	(f) Design, install, operate and maintain water management systems in a proper and efficient manner.	4.3
	(g) Minimise risks to the receiving environment and downstream water users.	4.3
B42	Prior to the commencement of construction activities, the Applicant must prepare a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:	
	(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;	2.3
	(b) be prepared in consultation with DPIE Water;	2.3
	(c) describe the measures to be implemented to ensure that the Applicant complies with the water management performance measures (see Table 4)	4
	(d) utilise existing data from nearby mines and build on existing monitoring programs, where practicable;	Appendix 3 of WMP
	(e) include a:	
	(i) **Site Water Balance** that includes details of:	
	• predicted annual inflows to and outflows from the site;	4.6
	• sources and security of water supply for the life of the development (including authorised entitlements and licences);	4.1
	• water storage capacity;	4.3
	• water use and management on the site, including any water sharing arrangements permitted under condition B37 and B38 of this Schedule;	4.2, 4.3, 4.4, 4.5
	• licenced discharge points and limits; and	4.4
	• reporting procedures, including the annual preparation of a site water balance;	5
	(ii) Salt Balance that includes details of:	
	• sources of saline material on the site;	4.7
		4.7

Clause	Requirement	Section of Sub-plan
	• saline material and saline water management on the site; • measures to minimise discharge of saline water from the site; and • reporting procedures, including the annual preparation of an updated salt balance;	4.3, 4.4 5
E5	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include: **(a)** a summary of relevant background or baseline data; (b) details of: (i) the relevant statutory requirements (including any relevant approval, licence or lease conditions); (ii) any relevant limits or performance measures and criteria; and (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures; (c) any relevant commitments or recommendations identified in the document/s listed in condition A2(c); (d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria; (e) a program to monitor and report on the: (i) impacts and environmental performance of the development; and (ii) effectiveness of the management measures set out pursuant to condition E5(d); (f) A contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible; (g) a program to investigate and implement ways to improve the environmental performance of the development over time; (h) a protocol for managing and reporting any: (i) incident, non-compliance or exceedance of any impact assessment criterion or performance criterion); (ii) complaint; or (iii) failure to comply with other statutory requirements; (i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and (j) a protocol for periodic review of the plan. *Note: The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*	3 2.1 4 4 2.4 4 5 5 6 7 4.1 of WMP 4.3 of WMP 4.2 of WMP 5.4 of WMP 5.1 of WMP

Commitments in the Project EIS and supporting documents, relevant to the salt balance and water balance, and where they are addressed in this sub-plan are presented in **Table 2**.

Table 2: Maxwell Project EIS and supporting document commitments

Source	Details	Reference
EIS Section 6.5.4	**Surface Water Licensing** • No surface water is proposed to be directly extracted from the Hunter River for the Project. Accordingly, water access licences under the *Water Sharing Plan for the Hunter Regulated River Water Source 2016* would not be required for Project water supply.	4.1.1
EIS Section 6.5.4	**Surface Water Monitoring** • Storage volume and water quality data would be collected from the various water storages to assist in the verification/calibration of the site water balance and salt balance for the Project and to mitigate the risk of an uncontrolled spill from the dams • The site water balance would be periodically reviewed and updated as additional and/or newer information becomes available with the progression of the underground operations. The following parameters would be recorded to validate the assumptions of the water balance model: o site rainfall; o dam and void water levels and volumes; o pump rates between storages, particularly major pipelines between the MEA and Maxwell Infrastructure; o actual demand rates for CHPP makeup water (and losses), dust suppression and vehicle washdown during operation of the mine; o groundwater inflows; and o general mine site water management practices. • The site water balance would be reviewed following review of the numerical groundwater model, which would be periodically evaluated during the life of the Project. • Regular monitoring of infrastructure such as pumps, pipelines and dams would be undertaken to monitor whether they are working effectively. • In accordance with DSC requirements, an annual surveillance report would continue to be undertaken and submitted for the Access Road Dam and any other Project dams that are determined to be a 'prescribed dam' and/or 'declared dam'. • The outcomes of the surveillance reports would be included in the Annual Reviews for the Project.	5.1 4.6, 5.1 5.1 4.3 4.3 4.3

3 BASELINE DATA

3.1 Climate

Long-term meteorological data for the region is available from nearby Bureau of Meteorology (BoM) meteorological stations and on-site Automatic Weather Stations AWS-1 and AWS-2. A summary of this data is provided in **Table 3**.

3.1.1 Rainfall Data and Statistics

The long-term mean annual rainfall ranges from 592 millimetres (mm) to 645 mm at the nearby BoM meteorological stations, with the driest month generally being August and the wettest month being January. The mean annual rainfall recorded at the AWS-1 (located at Maxwell Infrastructure) is 674 mm, with the driest month August and the wettest month December.

3.1.2 Temperature

The data from the Jerrys Plains Post Office (Station 061086) presented in **Table 3** indicates that temperatures in the vicinity of the Project are warmest from December to February and coolest from June to August. Average daily temperatures are highest in January (average daily maximum of 31.8°C) and lowest in July (average daily minimum of 3.8°C).

3.1.3 Humidity Data and Statistics

Relative humidity records from the Jerrys Plains Post Office (Station 061086) generally exhibit a uniform seasonal pattern for the period of record (1940 - 2010). The lowest morning (9.00 am) monthly average relative humidity was recorded in October (59 per cent) and the highest recorded in June (80 per cent). The lowest afternoon (3.00 pm) monthly average relative humidity was recorded in October, November and December (42 per cent) and the highest recorded in June (54 per cent).

3.1.4 Evaporation

Evaporation records indicate a distinct seasonality, with higher evaporation rates from November to February and lower evaporation from May to August. When compared to long-term mean rainfall, the rate of evaporation exceeds rainfall on an average annual basis, as well as generally for all mean monthly rainfalls, with the exception of June, where the factored SILO Data Drill evaporation is less than the mean monthly rainfall.

4 IMPLEMENTATION

4.1 Water Sources

4.1.1 Water Sources

The main water sources for stage 1 activities are:

- groundwater inflows to existing mine voids;
- catchment runoff and infiltration; and
- small volumes of potable water imported to site.

4.1.2 Groundwater Inflows

Groundwater inflows will continue to accumulate in the North, South and East Voids until an equilibrium water level is reached. Analysis by HydroSimulations (2019) as part of the Project EIS indicated that inflows to these voids would be negligible over the life of the Project. No significant groundwater inflows to the first workings are predicted during the stage 1 activities.

Table 3: Relevant Meteorological Data

Period of Record	Long-term Mean Monthly Rainfall (mm)			On-site Mean Monthly Rainfall (mm)	Mean Monthly Evaporation (mm)		Average Daily Temperature (Degrees Celsius [°C])				Average Relative Humidity (%)	
	Jerrys Plains Post Office (061086)	Muswellbrook (Lower Hill St) (061053)	Denman (Palace Street) (061016)	Maxwell Infrastructure AWS-1	Jerrys Plains Post Office (061086)	Factored SILO Data Drill	Jerrys Plains Post Office (061086)		Maxwell Infrastructure AWS		Jerrys Plains Post Office (061086)	
							1907 - 2014		2013 - 2019		1940 - 2010	1957 - 2010
	1884 - 2014	1870 - 2013	1883 – 2014[1]	1981 - 2017	1957 - 1972		Min	Max	Min	Max	9.00 am	3.00 pm
January	77.1	69.8	72.2	71.9	220	185	17.2	31.8	19.0	32.9	67	47
February	73.1	66.6	66.5	77.1	170	148	17.1	30.9	18.1	31.7	72	50
March	59.7	52.8	54.2	67.0	155	132	15.0	28.9	16.8	28.8	72	49
April	44.0	43.2	40.1	51.5	120	89	11.0	25.3	13.4	25.0	72	49
May	40.7	41.5	36.3	40.6	90	57	7.4	21.3	9.1	20.9	77	52
June	48.1	51.3	42.4	50.4	60	39	5.3	18.0	7.4	16.9	80	54
July	43.4	44.2	38.8	37.9	71	47	3.8	17.4	6.3	17.2	78	51
August	36.1	38.6	34.7	37.2	81	72	4.4	19.4	6.3	18.9	71	45
September	41.7	40.5	38.9	40.9	111	103	7.0	22.9	9.2	22.8	65	43
October	51.9	48.6	48.0	52.2	164	141	10.3	26.3	12.1	26.8	59	42
November	61.9	56.1	55.5	68.0	195	163	13.2	29.1	14.6	28.9	60	42
December	67.5	67.0	64.6	78.9	205	186	15.7	31.2	17.2	31.4	61	42
Annual Average	645	620	592	674	1,641	1,363	10.6	25.2	12.5	25.2	70	47

Notes:

[1] The BoM reports that Denman (Palace Street) (061016) is "open"; however, the last reading was in September 2014.

4.1.3 Off-site Water Transfers

In accordance with Schedule 2, Condition B37 of Development Consent SSD 9526, Maxwell has approval to receive water from, and/or transfer water to Mt Arthur Coal (MAC). In accordance with Schedule 2, Condition B38 of Development Consent SSD 9526 Maxwell may, with the written approval of the Planning Secretary, receive water from and/or transfer water to, other mining and/or industrial operations in the vicinity of the site. At the time of writing this plan, there is no written approval from the Planning Secretary to receive water from and/or transfer water to, other mining and/or industrial operations. This would be established prior to any water transfers occurring. In accordance with Schedule 2, Condition B39 of Development Consent SSD 9526, Maxwell may, with the written approval of the Planning Secretary, integrate the site water management system with the water management system for MAC. Receiving water from, or transferring water to, MAC is not included in the current water balance model or water management system and is not anticipated to be required as part of stage 1 activities.

4.1.4 Potable Water

Potable water at Maxwell Infrastructure is supplied via a pipeline from Muswellbrook Shire Council and is used for drinking, ablutions and toilets within the administration building and bathhouse. Potable water requirements at the Mine Entry Area (MEA) and underground will be sourced from the existing potable water supply and or transported by truck to the Project.

4.1.5 Security of Supply

A simulated site water balance based on 129 years of climatic data has been prepared by WRM (2019) to simulate the performance of the water management system over the life of the Project. The site water balance modelling estimated that the average inflows exceed the average annual outflows for each phase of the Project. The site water balance modelling demonstrated the water management system has sufficient capacity and flexibility to accommodate a wide range of groundwater inflows and climate scenarios while providing security of supply for mine operations.

4.1.6 Water Licences

Figure 1 shows the water sharing plans relevant to the site and associated boundaries. Water sharing plans relevant to the site are:

- *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*.
- *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*.
- *Water Sharing Plan for the Hunter Regulated River Water Source 2016*.

No surface water is proposed to be directly or indirectly extracted from the Hunter River for the site. Accordingly, no water access licences for Management Zone 1A (Hunter River from Glenbawn Dam to Goulburn River Junction) of the Hunter Regulated River Water Source under the *Water Sharing Plan of the Hunter Regulated River Water Source 2016* will be required.

Maxwell currently holds sufficient licences to cover the predicted indirect water take associated with the Management Zone 1B (Hunter River from Goulburn River Junction to Glennies Creek Junction) of the Hunter Regulated River Water Source under the *Water Sharing Plan of the Hunter Regulated River Water Source 2016*. Maxwell holds current licences under the *Water Management Act 2000* for passive extraction from the Permian coal seam aquifers and for monitoring purposes. Details of these licences are summarised in **Table 4.**

4.2 Water Use

During the stage 1 activities, water will be used for dust suppression along the temporary site access road (prior to it being sealed), dust suppression at the MEA, and for construction activities. The water consumption requirements and water balance of the system will fluctuate over the life of the mining operations with climatic conditions and production rate.

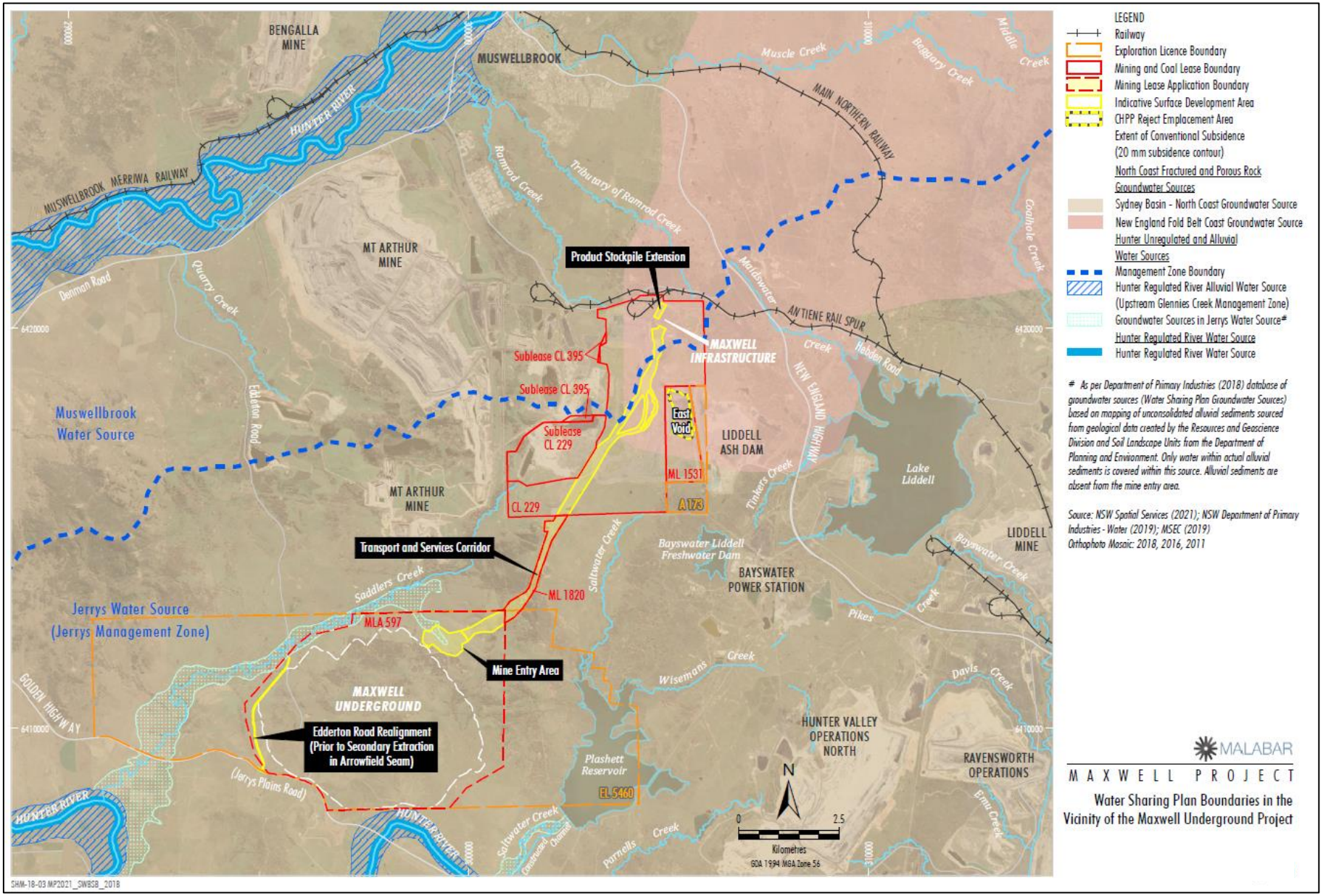


Figure 1: Water Sharing Plan Boundaries in the Vicinity of the Maxwell Underground Project

Table 4: Existing water licensing summary

Reference	Description	Issue Date	Expiry Date
WAL 41559 [1]	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.	23/02/2015	Perpetuity
WAL 41491 [1]	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.	24/04/2020	Perpetuity
WAL 41234	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.	01/09/2020	Perpetuity
WAL 43166	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.	07/04/2020	Perpetuity
WAL 39739	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.	12/05/2020	Perpetuity
WAL 43160	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.	23/03/2020	Perpetuity
WAL 39792	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.	01/07/2020	Leased for a period of five years
20BL171953	Bore licence issued under the *Water Act 1912* for a test bore.	27/08/2008	Perpetuity
20BL171954	Bore licence issued under the *Water Act 1912* for a test bore.	27/08/2008	Perpetuity
20BL171955	Bore licence issued under the *Water Act 1912* for a test bore.	27/08/2008	Perpetuity
20BL171956	Bore licence issued under the *Water Act 1912* for a test bore.	27/08/2008	Perpetuity
20BL171957	Bore licence issued under the *Water Act 1912* for a test bore.	27/08/2008	Perpetuity
20BL174016	Bore licence issued under the *Water Act 1912* for a monitoring bore.	02/04/2019	01/04/2024
20BL174017	Bore licence issued under the *Water Act 1912* for a monitoring bore.	02/04/2019	01/04/2024
20BL174018	Bore licence issued under the *Water Act 1912* for a monitoring bore.	02/04/2019	01/04/2024

Notes:

1. *WAL 41491 and WAL 41559 were converted from 20BL111869/20BL122620. Anglo American plc wrote to DPI Water on 13 September 2017 indicating that 527 units were incorrectly assigned to the New England Fold Belt Coast Groundwater Source instead of the Sydney Basin-North Coast Groundwater Source. Malabar is consulting with relevant NSW Government agencies to resolve this administrative issue.*

4.3 Water Storages and Transfers

Existing and proposed mine water storages are shown in **Figure 2**. A summary of the water storages and the proposed water management system operating rules (as modelled) is presented in **Table 5**. The aims of the operating rules are to:

- Minimise the use of clean and potable water on the site.
- Maximise water recycling, reuse and sharing opportunities.
- Maximise the capture and reuse of mine water and dirty water to meet operational demands for water.
- Minimise the use of make-up water from external sources.
- Operate the water management systems in a proper and efficient manner.
- Minimise risks to the receiving environment and downstream water users.

The major water demands during stage 1 activities includes dust suppression and water to be used during the construction of the MEA. These demands are met by the reuse of mine affected water from the Access Road Dam and mine voids rather than using clean or potable water. The water storage and transfer system detailed in **Table 5** describes how mine affected water is transferred to enable it to be reused. Future water management plans will describe recycling of water used in coal processing. The water storage and transfer system detailed in **Table 5** notes the mine affected water dams that have potential to overflow to clean water catchments. **Table 5** also details the transfer system for such dams that enables them to be kept in a drawn dawn condition and prevent unplanned discharges of saline water.

Water management training is provided to all employees and contractors through the Site Familiarisation process and will include relevant information on the site water management objectives. All site personnel involved in water storage and transfers will undertake a more detailed awareness training package of the water management system operating rules.

The Access Road Dam is prescribed by the Dams Safety Committee (DSC) under the provisions of the *Dams Safety Act 1978*. Management of this dam, in relation to dam stability, is undertaken in accordance with DSC requirements. In accordance with DSC requirements, an annual surveillance report will continue to be undertaken and submitted for the Access Road Dam. The outcomes of the surveillance reports will be included in the Annual Reviews for the site.

4.4 Discharge

The Project will not involve controlled release of mine-affected water to the Hunter River or Saddlers Creek. Maxwell does not have approval to discharge mine-affected water from the site under Environment Protection Licence 1323. The water management system will operate in compliance with the relevant provisions of the *Protection of the Environment Operations Act 1997*, which prohibit pollution of waters. In accordance with Schedule 2, Condition B36 of Development Consent SSD 9526, Maxwell will implement all reasonable and feasible measures to avoid off-site discharges from the Access Road Dam and the Rail Loop Dam. Maxwell will operate the Access Road and Rail Loop Dams as low as practically possible to reduce the risk of overflowing. Should controlled discharges from these dams be required, any such discharge will only be undertaken in accordance with the *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002*.

4.5 Water Sharing

Under some climatic conditions, the Project has the potential to receive groundwater and surface water inflows in excess of its consumption requirements. In the event that excess water accumulates at the site, Maxwell will manage this excess water according to the following hierarchy:

1. Sharing mine water with MAC (e.g. for use in dust suppression).
2. Sharing mine water or treated water with other industrial users (e.g. AGL).
3. Sharing treated water with nearby agribusiness (e.g. viticulture or equine industries).
4. Irrigation or evaporation of water within the site (i.e. on land catchments that report to the site water management system, such as rehabilitation areas). Evaporation cannons may also be used in these areas to remove excess water from the site water management system.

5. Beneficial use on Maxwell-owned pastoral property (e.g. irrigation with treated water).
6. Storage in East Void, South Void or North Void.

Any water sharing arrangements will be implemented in compliance with regulatory requirements and in consultation with DPIE and the Environment Protection Authority. A water transfer procedure will also be documented and implemented to manage any potential environmental impacts and will include a requirement to record and report the volume of water transferred in the Annual Review. If Maxwell proposes to integrate components of the site water management system with the water management system for MAC the written approval of the Planning Secretary will be obtained.

Figure 2: Existing and proposed mine water storages

Table 5: Water storages and transfers

Water Management System Element	Approximate Storage Capacity (ML)	Operating Rules
Supply to Demands		
Dust suppression	N/A	• Demand supplied from Access Road Dam.
Mine affected water storages		
North Void (existing)	17,390 [1] (open void to 175 mAHD)	• Existing void that functions as a surplus water storage. • Receives groundwater inflows. • Receives transfers from Rail Loop Dam. • Transfer to Access Road Dam, or Southern Void
East Void (existing)[2]	23,730 [1] (open void to 175 mAHD)	• Receives the following transfers: ○ Supplies Access Road Dam as required (at a higher preference than South Void). • Receives groundwater inflows. • Transfer to Pringles Dam and Industrial Dam and will supply water to the MEA for construction activities.
South Void (existing)	17,700 [1] (open void to 175 mAHD)	• Receives dewatering from Mine Water Dam. • Supplies Access Road Dam as required (at a lower preference than East Void). • Receives groundwater inflows.
Industrial Dam (existing)	750	• Receives runoff from disturbed areas and mine rehabilitation. • Receives transfers from Rail Loop Dam, Oil Pollution Control Dam and East Void. • Supplies Access Road Dam as required. • Supplies water cart fill point. • Overflows to East Void.
Oil Pollution Control Dam (existing)	~2	• Receives runoff from the Industrial Area. • The Oil Pollution Control Dam has two oil/water separators in place which remove oil residue from the water prior to it being fed into the Industrial Dam.

Access Road Dam (existing)	750	• Some runoff from upstream clean catchment is diverted to downstream of V-Notch weir dam.
		• Demands water from the following storages, up to a volume of 502 ML:
		  ○ Rail Loop Dam
		  ○ Industrial Dam
		  ○ East Void
		  ○ South Void
		  ○ North Void
		• Overflows to V-Notch Weir Dam.

V-Notch Weir Dam (existing)	<1	• Seepage from Access Road Dam and runoff from natural ground. • Transfer to Access Road Dam.
Rail Loop Dam (existing)	18	• Dam water levels managed to prevent uncontrolled overflow through transfers to Access Road Dam and North Void. • Overflows to Ramrod Creek catchment.

Water Management System Element	Approximate Storage Capacity (ML)	Operating Rules
DC2 Dam (existing)	~2	• Receives runoff from natural ground and coal stockpile area. • Dam water levels managed to prevent uncontrolled overflow through transfers to Rail Loop Dam and or Access Road Dam. • Overflows to Ramrod Creek catchment.
Pringles Dam (existing)	20	• Water transferred from East Void for livestock. Also receives runoff from natural ground and mine rehabilitation. • Overflows to Saltwater Creek.
Mine Water Dam (MWD) (proposed)	17	• Receives pumped transfer from MEA Dam. • Receives overflow from MEA Sedimentation Dam. • Supplies water to dust suppression demand. • Transfers water to/from South Void or East Void as required. • Overflows to MEA Dam. • Receives pumped transfer of groundwater inflows (dewatered) from the underground operations, once dewatering commences.
Mine Entry Area Dam (MEA Dam) (proposed)	110	• Receives overflow from Water Storage Dam in wet weather event. • During MEA construction may receive water from East Void. • Transfers water back to Water Storage Dam and is maintained empty. • Overflows to Saddlers Creek catchment.
Treated Water Dam (TWD) (proposed)	15	• Will store treated water from the Water Treatment Plan (once constructed) for use within the underground. • Overflows to MEA Sedimentation Dam.
Dirty water management system infrastructure		
Savoy Dam (existing)	140	• Receives runoff from upstream catchment that is non-mine affected and mine affected. • Staging point for water pumped from MEA Dam and Transport and Services Corridor sedimentation dams to South Void. • Supplies water to water cart fill point. • Overflows to Saddlers Creek catchment.
Sedimentation dam (proposed)	4.35	• Captures surface runoff from MEA area. • Transfers water to MWD and is maintained in accordance with the Blue Book. • Overflows to MWD.

Notes:

1. *Approximate storage volume of open void. Additional storage would be available within the in-pit spoil adjacent to the open void.*
2. *The volume of the East Void available for water storage would reduce over the life of the Project as CHPP reject material is progressively placed in the void.*

4.6 Water Balance Model

A computer-based operational simulation model (OPSIM) was used to assess the dynamics of the mine water balance under conditions of varying rainfall and catchment conditions throughout the different stages of the Project. The OPSIM model dynamically simulates the operation of the water management system and keeps a complete account of all site water volumes and representative water quality on a daily time step. The model has been configured to simulate the operations of all major components of the water management system (WRM 2019). The simulated inflows and outflows included in the model are given in **Table 6**.

Table 6: Simulated inflows and outflows to the water management system – Stage 1

Inflows	Outflows
Direct rainfall on water surface of storages Catchment runoff Groundwater inflows to existing voids Minor groundwater inflows to drift	Evaporation from water surface of storages Dust suppression demand Construction activities usage

Potable water used on site is monitored, however, it is not included in the water balance due to the low volume.

The model was run over multiple climate sequences based on a 27-year sequence extracted from the historical rainfall data. This approach provides the widest possible range of climate scenarios covering the full range of climatic conditions represented in the historical rainfall record (WRM 2019). Water balance modelling results for the model runs, averaged over each modelled Project stage, are presented in the Project EIS**.** The water balance model, summarising annual inflow and outflow volumes, will be updated and included in the updated WMP to be developed prior to secondary extraction.

4.7 Saline Material Management

Performance measures for overburden emplacements are:

- Design, install and maintain emplacements to encapsulate and prevent migration of acid forming and potentially acid forming materials, and saline and sodic material.
- Design, install and maintain emplacements to prevent and/or manage long term saline groundwater seepage.

In accordance with Schedule 2, Condition B41 of Development Consent SSD 9526, the above performance measures apply to overburden emplacements that were constructed under previous development consents but does not require any additional earthmoving works be undertaken, except as required for the establishment of a stable, non-polluting and free-draining landform.

No more overburden emplacement activities are required for Maxwell Infrastructure. Some existing overburden emplacements may be shaped using a dozer (or similar) to manage spontaneous combustion outbreaks and improve water management on the site. Existing emplacement areas at Maxwell Infrastructure are a potential source of saline runoff. Runoff from emplacement areas is captured and stored on site and within mine voids. Existing emplacement areas are designed to be free-draining and support vegetation, and hence minimise potential seepage to groundwater. Existing emplacement areas will continue to be monitored and maintained to be free-draining, support vegetation and minimise seepage.

The establishment rock from construction of the drift is also a potential source of saline runoff. Establishment rock removed during construction of the MEA pad will be preferentially used at the MEA as construction fill (e.g. for hardstand areas, dam embankments and road construction). Infrastructure constructed from establishment rock will be free-draining to minimise potential seepage to groundwater. The mine establishment rock will be treated with gypsum to improve the sodicity of the material. Any excess mine establishment rock that cannot be utilised at the MEA will be emplaced in the existing South Void.

Four new dams are proposed to be constructed at the MEA (within MLA 598). The dams include the Mine Water Dam, MEA dam, Sedimentation Dam and Treated Water Dam. All sediment controls will be designed, installed and maintained in accordance with the Blue Book requirements.

4.8 Salt Balance Model

Salt inputs to the site include salts in the groundwater inflows, catchment runoff and direct rainfall. Salt outputs from the site include salts lost through site demands (including dust suppression) and dam overflows. Salt inflows from direct rainfall on water surface of storages are assumed to be zero. There is anticipated to be limited salts accumulated on-site during stage 1 activities.

A salt balance was presented in the *Maxwell Project Surface Water Assessment (WRM, 2019*) for the life of the Maxwell Underground Mine. The salt balance will be reviewed and updated as part of the development of the operational Water Management Plan (stage 2).

5 MONITORING AND REPORTING

5.1 Water and Salt Balance Monitoring

The site water balance model allows Maxwell to account for water inputs and outputs, inform operational decisions and activities to minimise water use and the risk of uncontrolled mine water overflows off-site. The following data will be collected to assist in the verification/calibration of the site water balance model and salt balance.

- Site rainfall.
- Dam and void water levels (to be converted to volumes using stage-storage characteristics).
- Pump rates between storages, including major pipelines between the MEA and Maxwell Infrastructure.
- Water quality of storages;
- Actual demand rates for dust suppression, vehicle washdown and construction activities.
- Volume estimates for volume of any off-site uncontrolled overflows.
- General mine site water management practices.

The site water balance and salt balance will be reviewed and reported annually as additional and/or updated information becomes available with the progression of the underground operations. Review of the numerical groundwater model will also be undertaken periodically and evaluated during the life of the Project, including an independent review of the groundwater model every 3 years (including comparison of monitoring results with modelled predictions). The review of the site water balance and salt balance will be used to judge the performance of, and guide the implementation of, any management measures.

A summary of the site water balance and salt balance, as well as the outcome of periodic groundwater model reviews, will be included in the Annual Review.

5.2 Passive Aquifer Intake

Due to a “cone of depression” in the potentiometric surface of the coal seam aquifer created by previous mining at the Maxwell Infrastructure, there is a passive intake of aquifer water into the final voids. The quantity of aquifer water intake is estimated, at least annually, using the site water balance model. This quantity will be reviewed against the water licence entitlements and will be compared to the inflow predicted in the Project EIS and reported in the Annual Review.

5.3 Water Take

The Annual Review will report on the water captured, intercepted or extracted from the site (direct and indirect) in the previous water year (1 July – 30 June), including water taken under each water licence. The report will include:

- water licence number;
- water sharing plan, source and management zone (as applicable);
- entitlement;
- passive take/inflows;
- active pumping (if applicable); and
- total water take.

Details of any changes or upgrades to the water management system will be included in the Annual Review.

5.4 Meteorological Data

Both on-site meteorological stations will continue to monitor a number of meteorological parameters, including temperature, humidity, rainfall, wind speed, and wind direction, over the life of the Project. Meteorological data will form inputs to water balance and salt balance modelling.

6 CONTINGENCY PLAN

Potential unpredicted impacts related to the site water balance and salt balance and contingency plans to address these are summarised in **Table 7**.

Table 7: Unpredicted impacts and contingency plans

Unpredicted impacts	Contingency plan
Insufficient data to support water balance and/or salt balance update.	Review site water metering and monitoring and amend update as required.
Use of clean and potable water on the site higher than predicted.	Review clean water use and determine if recycled water can be used instead.
Site water balance review indicates capture and reuse of mine water and dirty water to meet operational demands for water is not being maximised.	Review site operating rules (Table 2) and amend rules or infrastructure as required.

7 CONTINUOUS IMPROVEMENT

Results of water quality monitoring of site water storages will be reviewed and used to determine if any changes to upstream mine waste or land management are required, or if site operating rules require changing. Results of the annual water balance review will be used to ensure continual improvement in minimisation of clean water usage and maximisation of recycled water usage.

8 DOCUMENT INFORMATION

8.1 References

WRM Water & Environment Pty Ltd (2019) *Surface Water Assessment – Maxwell Project.*

8.2 Definitions and Abbreviations

Refer to **Appendix 10** of the WMP.

APPENDIX 2 – EROSION AND SEDIMENT CONTROL PLAN

Appendix 2 - Erosion and Sediment Control Plan

1 INTRODUCTION

1.1 Purpose and Scope

The purpose of this sub-plan is to satisfy the requirements of the Development Consent for State Significant Development (SSD) 9526 Schedule 2, Condition B42(e)(iii), to prepare an Erosion and Sediment Control Plan (ESCP). This sub-plan applies to all activities within the Development Consent SSD 9526 consent boundary and the Antiene Rail Spur Development Consent (DA 106-04-00) boundary.

In accordance with Schedule 2, Condition A24(a) of Development Consent SSD 9526, this sub-plan has been prepared for stage 1 activities only. Stage 1 activities include early preparation works, construction and first workings. Early preparatory works are defined in Section 3.4.2 of the Maxwell Underground (UG) Project Environmental Impact Statement (Project EIS) and construction and first workings are defined in Development Consent SSD 9526). A copy of the approval from the Planning Secretary to stage this plan is provided in **Appendix 5** of the Water Management Plan (WMP). This plan will be updated prior to the commencement of second workings.

The objectives of this plan are to:

- Identify potential water impacts;
- Detail all relevant statutory requirements;
- Detail the controls that are implemented to minimise water impacts;
- Detail the water monitoring system to assess water impacts;
- Provide a protocol to evaluate compliance; and
- Detail the procedure for reporting water criteria exceedances to relevant stakeholders.

2 PLANNING

2.1 Regulatory Requirements

This sub-plan describes the erosion and sediment controls to meet relevant statutory requirements within Development Consent SSD 9526. Requirements of Development Consent SSD 9526 that relate to erosion and sediment control, and where they are addressed in this document, are detailed in **Section 2.4**.

2.2 Maxwell Project EIS and Supporting Document Commitments

A surface water and groundwater assessment were undertaken for the Project EIS (published on 14 August 2019). Commitments in the Project EIS that relate to the erosion and sediment controls and where they are addressed in this sub-plan, are detailed in **Section 2.4**.

2.3 Preparation and Consultation

Schedule 2, Condition B42(a) of Development Consent SSD 9526, requires that the WMP be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning

Secretary. Maxwell has engaged Matt Briody (Principal Engineer, WRM Water & Environment Pty Ltd) to assist with the preparation of the surface water components of the sub- plan. Maxwell has also engaged Dr Noel Merrick (Senior Principal Hydrogeologist at Hydro Algorithmics) to assist with the preparation of the groundwater components of the sub-plan. A copy of the endorsement by the Planning Secretary is included in **Appendix 8** of the WMP.

In accordance with Schedule 2, Condition B42(b) of Development Consent SSD 9526, this plan has been prepared in consultation with Department of Planning, Industry and Environment (DPIE) Water. Outcomes of consultation with DPIE Water are presented in **Appendix 9** of the WMP.

2.4 Erosion and Sediment Control Plan Requirements

Requirements of Development Consent SSD 9526 and where they are addressed in this plan are presented in **Table 1**.

Table 1: Requirements of Development Consent SSD 9526

<table>
<tr><th>Clause</th><th>Requirement</th><th>Section of Plan</th></tr>
<tr><td>B40</td><td>The Applicant must ensure that the development complies with the performance measures in Table 4.
Table 4: Water management performance measures
<table>
<tr><th>Feature</th><th>Performance Measure</th></tr>
<tr><td>Sediment dams</td><td>• Design, install and/or maintain sediment dams to avoid off-site discharges to surface waters, except as may be permitted under conditions B35 and B36.
• Design, install and maintain sediment dams in accordance with the guidance series Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004) and 2E Mines and Quarries (DECC, 2008) and the requirements under the POEO Act or Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002.
• Design, install and/or maintain sediment dams to ensure no discharges to surface waters (including Saddlers Creek and Ramrod Creek), except in accordance with an EPL or in accordance with Section 120 of the POEO Act.</td></tr>
</table></td><td>4.1

Appendix 1</td></tr>
<tr><td>B42</td><td>Prior to the commencement of construction activities, the Applicant must prepare a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;
(b) be prepared in consultation with DPIE Water;
(c) describe the measures to be implemented to ensure that the Applicant complies with the water management performance measures (see Table 4)
(d) utilise existing data from nearby mines and build on existing monitoring programs, where practicable;
(e) include a:</td><td>2.3

2.3
4

Appendix 3 of WMP</td></tr>
</table>

Clause	Requirement	Section of Plan
	(iii) Erosion and Sediment Control Plan that**:**	
	• is consistent with the requirements of *Managing Urban Stormwater: Soils and Construction - Volume 1: Blue Book* (Landcom, 2004) and *Volume 2E: Mines and Quarries* (DECC, 2008);	4.1
	• identifies activities that could cause soil erosion or generate sediment;	4.2
	• describes measures to minimise soil erosion and the potential for the transport of sediment to downstream waters;	4.3
	• describes the location, function and capacity of erosion and sediment control structures; and	4.4
	• describes what measures would be implemented to maintain (and if necessary, decommission) the structures over time;	5.1
E5	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	
	(a) a summary of relevant background or baseline data;	3
	(b) details of:	
	(i) the relevant statutory requirements (including any relevant approval, licence or lease conditions);	2.1
	(ii) any relevant limits or performance measures and criteria; and	4
	(iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	4
	(c) any relevant commitments or recommendations identified in the document/s listed in condition A2(c);	2.4
	(d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	4
	(e) a program to monitor and report on the:	
	(i) impacts and environmental performance of the development; and	5 5
	(ii) effectiveness of the management measures set out pursuant to condition E5(d);	
	(f) A contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	6
	(g) a program to investigate and implement ways to improve the environmental performance of the development over time;	7
	(h) a protocol for managing and reporting any:	
	(iv) incident, non-compliance or exceedance of any impact assessment criterion or performance criterion);	4.1 of WMP
	(v) complaint; or	4.3 of WMP
	(vi) failure to comply with other statutory requirements;	4.2 of WMP
	(i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and	5.4 of WMP
	(j) a protocol for periodic review of the plan.	5.1 of WMP

Clause	Requirement	Section of Plan
	Note: *The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*	

Commitments in the Project EIS and supporting documents, relevant erosion and sediment control, and where they are addressed in this sub-plan are presented in **Table 2**.

Table 2: Maxwell Project EIS and supporting document commitments

Clause	Requirement	Section of Plan
EIS Section 6.5.4	**Erosion and Sediment Control Plan** • An erosion and sediment control plan would be developed to manage runoff during the construction phase and to manage runoff from the disturbed areas peripheral to the MEA (i.e. transport and services corridor and ventilation shaft site). • Erosion and sediment control structures would be maintained in accordance with *Managing Urban Stormwater Soils and Construction* (Landcom, 2004). Proper drainage of the site would be maintained by: • removing accumulated sediment from basins/drains (if required); • checking that drains are operating as intended and any damaged works are repaired where necessary; • confirming recent works have not resulted in the diversion of sediment-laden water away from their intended destination; and • checking that rehabilitated lands have established sufficient groundcover.	This sub-plan 4.1 5.1
EIS Section 6.5.4	**Surface Water Monitoring** • Site drainage and sediment control structures would be inspected regularly (monthly or following rainfall greater than 25 mm in 24 hours) to check for scouring of diversion drains (and their outlets) and accumulation of sediment in sediment traps (including sediment fences, sediment basins, etc.).	5.1

3 BASELINE DATA

Detailed soil mapping and assessment was undertaken by SLR (2019) for the Project EIS. SLR (2019) mapped the Australian Soil Classification (ASC) soil type Mesonatric Brown Sodosol at the MEA and much of the transport and services corridor. The A1 and A2 horizon of the Mesonatric Brown Sodosol is non sodic to marginally sodic and non-saline. However, the B horizon was identified as strongly sodic and moderately saline, and therefore has a higher erosion potential.

The key performance measure for erosion and sediment control is to minimise soil erosion and the potential for the transport of sediment to downstream waters. Baseline information on downstream waters is presented in the following sections.

3.1 Regional Drainage Network

The site is located within the Hunter River catchment. The Hunter River is a large, regulated river with extensive alluvial aquifers. Flow in the Hunter River is regulated by releases from Glenbawn Dam, approximately 90 kilometres (km) upstream of the site. The Hunter River has a catchment area of approximately 13,400 square kilometres (km^2) to Jerry's Plains, which is immediately downstream of the site.

3.2 Local Drainage Network

The main waterways in the vicinity of the site are shown on **Figure 1.** The north-western part of the Maxwell Infrastructure area historically drained to upper parts of the Ramrod Creek catchment, however, that area is now a rehabilitated mining area and runoff from that area drains internally rather than to Ramrod Creek. The rail loop, product stockpile and Access Road dam and surrounding undisturbed areas in the north-eastern part of the infrastructure area are in the catchment of an upper tributary of Ramrod Creek. Ramrod Creek drains into the Hunter River 10 km to the north-west of the site, immediately downstream of Muswellbrook.

The eastern part of the Maxwell Infrastructure area drained to Bayswater Creek prior to mining operations, but now drains internally to the site. The lower reaches of Bayswater Creek drain into Lake Liddell and the headwater dams, located upstream of the ash dam on land owned by AGL Macquarie.

The southern part of the Maxwell Infrastructure area drained to Saltwater Creek and Saddlers Creek catchments prior to mining operations but now drains internally to the site. Saltwater Creek downstream of the Maxwell Infrastructure area drains into Plashett Reservoir on land owned by AGL Macquarie. Saddlers Creek downstream of Maxwell Infrastructure drains to the Hunter River.

The main drainage feature in the vicinity of the MEA is Saddlers Creek, located to the north and west of the MEA. The MEA and most of the temporary access road drains to Saddlers Creek. A small part of the temporary access road drains via first order (minor), second order (minor) and third order (non-minor) gullies to Saltwater Creek downstream of Plashett Reservoir. Plashett Reservoir is a 65,000 megalitre (ML) storage that receives pumped inflows from the Hunter River and serves as an off-river water storage for Bayswater Power Station, along with supplying water to the Jerrys Plains township.

3.3 Flooding

Flood modelling of Saddlers Creek has been undertaken by WRM (2019) to define the location of the surface development areas for the underground. The extent of subsidence of the underground and the infrastructure in the MEA and Transport and Services Corridor are located outside of the Saddlers Creek and Hunter River Probable Maximum Flood (PMF) extent. Therefore, the site would have no impact on the existing flood behaviour up to the PMF event, or any lesser events.

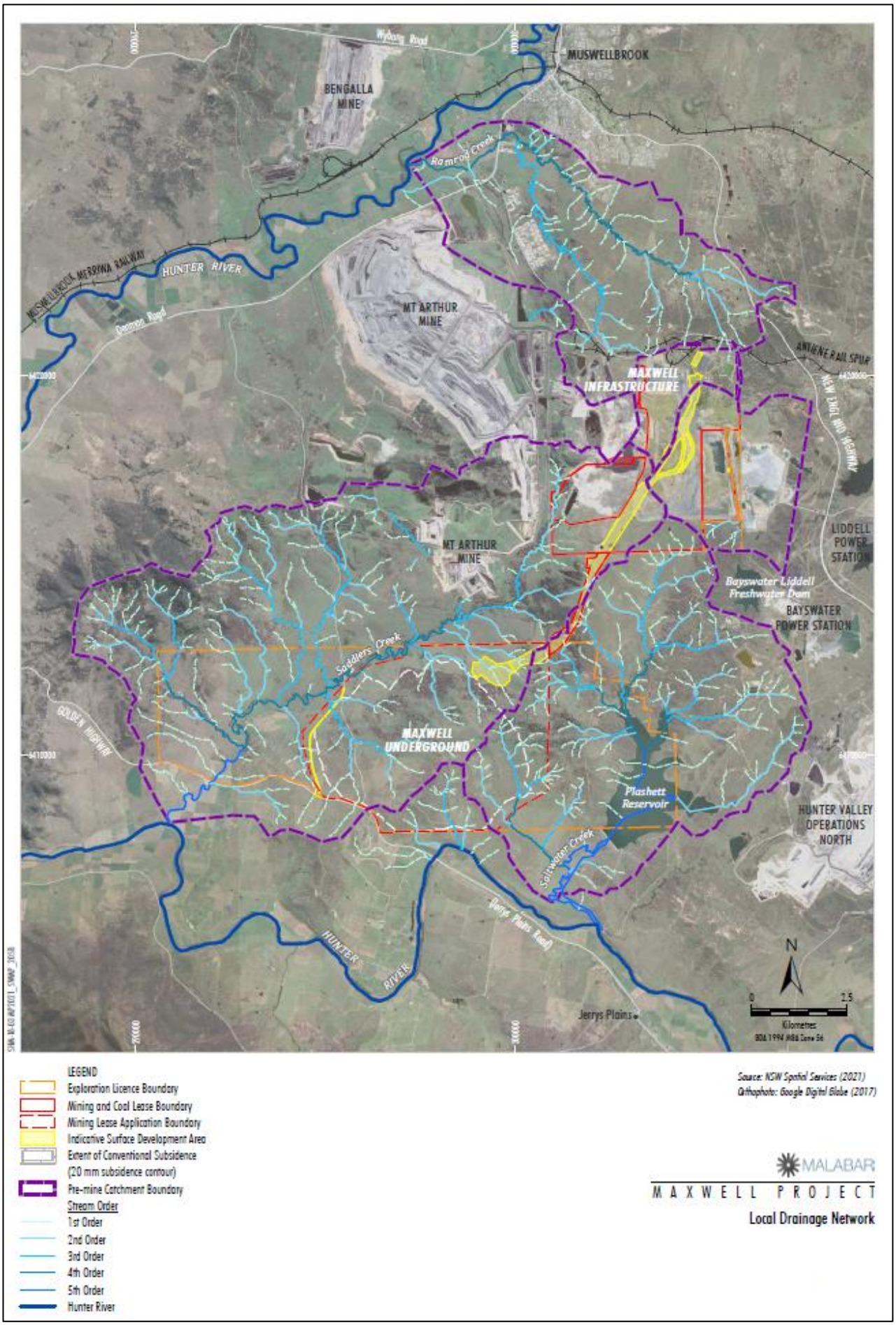


Figure 1: Local Drainage Network

4 IMPLEMENTATION

4.1 General Principles and Performance Measures

The general principles and performance measures for erosion and sediment controls at the site include:

- Minimising surface disturbance to prevent erosion.
- Stabilisation or rehabilitation of areas disturbed for infrastructure construction as soon as practicable.
- Separation of runoff from disturbed and undisturbed areas where practicable.
- Construction of surface drains to control and manage surface runoff.
- Design, installation and maintenance of new sediment dams in accordance with the guidance series *Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004) and 2E Mines and Quarries (DECC, 2008)* and the requirements under the *Protection of the Environment Operations Act 1997* or *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002.*

4.2 Potential Sources of Erosion and Sedimentation

4.2.1 Construction Disturbance

Erosion could be caused by surface disturbance associated with the following stage 1 activities:

- Upgrades of existing access tracks for early preparatory works at the MEA.
- Construction of the temporary site access road to the MEA.
- Excavation of the MEA (access floor and wall above the portal), portals and mine access drift.
- Construction of MEA water management infrastructure, including sumps, pumps, drains, pipelines and water storages.
- Construction of administration buildings, meeting rooms, bathhouse, workshop, fuel storage, laydown and parking facilities and other ancillary infrastructure.

4.2.2 Areas Undergoing Rehabilitation

A potential source of erosion is mine overburden emplacement areas undergoing rehabilitation at the Maxwell Infrastructure area. As at July 2021, approximately 853 hectares (ha) of previously mined land at the Maxwell Infrastructure area has been rehabilitated. Since taking ownership of Mining Lease (ML) 1531, Coal Lease (CL) 229 and CL 395 in 2018, Maxwell have completed a total of 212 ha of rehabilitation and planted 76,000 trees within the woodland rehabilitation domain. All areas of rehabilitation are currently within the ecosystem and land use establishment phase (i.e. phase 4 of 6).

4.2.3 Topsoil Stockpiles

The topsoil stripped during construction of the MEA and associated infrastructure will be stockpiled for use in rehabilitating areas disturbed during the construction phase. The volume of topsoil stockpiled will be modest given the modest extent of the MEA land disturbance.

4.3 Erosion and Sediment Control

4.3.1 Disturbance Minimisation

Construction disturbance will be minimised by limiting disturbance to only that required to achieve the works. Disturbance minimisation will be managed through implementation of the Ground Disturbance Permit (GDP) Procedure.

The GDP Procedure applies to any activity that will result in:

- vegetation removal;
- disturbance to natural surface;
- disturbance to rehabilitated areas; or
- changes to existing landforms and drainage patterns.

The GDP process requires activities to be planned and designed to minimise disturbance impacts and ensure disturbance is compliant with all legal and other obligations and commitments. Any required erosion and sediment control measures are documented in the GDP which is reviewed and approved by an environmental specialist. Approval of the proposed disturbance will be conditional on the installation of any required erosion and sediment control measures being verified prior to or commencement of the disturbance and/or at specified stages during works. A post-disturbance inspection is also required.

Erosion and sediment control strategies for new access tracks include:

- limiting track construction works to slashing vegetation where possible;
- limiting construction across drainage lines; and
- ensuring tracks are free-draining.

Third-parties who lease land from Maxwell will also be required to obtain consent prior to undertaking disturbance, in accordance with their formal lease agreements. No infrastructure will be constructed within 40 metres (m) of watercourses and no creek crossings are required.

4.3.2 Temporary Erosion and Sediment Controls

Temporary erosion and sediment controls will be installed at the MEA prior to the commencement of construction as part of the early preparatory works. Potential temporary erosion and sediment controls include, but are not limited to, water diversion banks, sandbags, sediment fences, hay bales, or geotextiles. The installation of appropriate temporary erosion and sediment controls will be achieved through implementation of through the GDP process. Appropriate temporary erosion and sediment controls are those designed and constructed in accordance with the Blue Book and prioritise erosion prevention with supplementary sediment capture.

4.3.3 Stabilisation

Areas disturbed during construction will be rehabilitated as soon as practical following completion of construction activities. Rehabilitation of areas disturbed during construction will include seeding with a pasture seed mix. A sterile cover crop is typically included in the seed mix to assist with initial soil stabilisation.

4.3.4 Topsoil Stockpile Management

Long-term soil stockpiles will be managed to prevent erosion and sedimentation through the implementation of the following management practices:

- Soil stockpiles will be located outside of active operational areas and away from drainage lines, operational water areas and steeply sloped areas.
- Surface drainage in the vicinity of stockpiles will be diverted to minimise run-on and managed to minimise sediment-laden run-off.
- Silt fences will be installed around soil stockpiles to control potential loss of soil where necessary.

4.3.5 Rehabilitated Areas

Rehabilitation activities will continue to be undertaken during stage 1, with a focus on enhancing existing areas of rehabilitation through infill planting in the woodland rehabilitation corridor to increase species diversity and targeted weed management.

Performance criteria for water management of rehabilitated overburden emplacements at Maxwell Infrastructure are based on the objectives and completion criteria for overburden emplacements in the current approved Mining Operations Plan. The objective for water management of overburden emplacements post-mining is that overburden areas are free draining and non-polluting. Drainage and erosion completion criteria for overburden emplacements to meet that objective are:

- Water management contour drains are designed, surveyed and constructed.
- Engineer designed waterways with groundcover vegetation and or rock armouring will be constructed to convey run-off down slope in a controlled manner.

- Except for deliberate detention basins or sediment ponds, ponding will not occur on emplacement surfaces, in contour drains or drop structures.
- Emplacement drainage reports to existing natural drainage features, via sediment control ponds.
- Only infrequent minor rilling observed with maximum depth of less than 30 centimetres (cm).
- No active gullies greater than 30 cm depth.
- No major failures observed in drainage structures.

Maintenance requirements for revegetation areas and contour drains for rehabilitated overburden emplacements will be determined through regular ecological monitoring and walkover inspections. Revegetation and maintenance of existing contours on rehabilitation areas will be undertaken as required. As vegetation establishes on rehabilitation areas at Maxwell Infrastructure, and surface runoff quality is considered suitable for the final land use, Maxwell will progressively develop drainage works to reduce clean runoff to mine voids as far as practicable.

Following the completion of mining, surface infrastructure areas (including the MEA) will be decommissioned and rehabilitated to pasture or woodland. The objective for water management of rehabilitated surface infrastructure areas post-mining is that the land surface is safe, stable and reshaped to meet post mining land use requirements. Drainage and erosion completion criteria for surface infrastructure areas to meet that objective are:

- Decommissioned infrastructure surface areas reshaped to gradients less than 16 degrees and integrate with adjacent landforms.
- Excavations and trenches remaining from infrastructure removal backfilled and compacted.
- Unless deliberately designed as detention basins or sediment ponds, reshaped surfaces will shed water.
- Controlled drainage will report to surrounding natural drainage features, via sediment ponds. Operational sediment and erosion control works will be maintained during the establishment of revegetation. However, once self-sustaining stable final landforms have been achieved within an area, key elements of the operational sediment control structures will be either left as passive water control storages or removed to allow the area to become free-draining.
- Minor rilling only observed, less than 30 cm in depth.
- No active gully formation.

4.4 Location, Function and Capacity of Erosion and Sediment Control Structures

Surface runoff from disturbance areas that drain off-site will be managed by the dirty water management system to reduce sediment loads. The majority of the catchments at Maxwell Infrastructure and MEA drain internally to site storages. However, the temporary access road within the transport and services corridor will require erosion and sediment controls to be installed.

Diversion banks will be installed upslope of areas to direct clean surface water runoff away from disturbed areas where practical. The diversion banks will be designed to ensure effective segregation of sediment-laden runoff and allow clean surface water to return to a natural watercourse. Diversions will be designed in accordance with the Blue Book to cater for a minimum 100-year average recurrence interval (ARI) storm event.

Catch drains will be constructed, where appropriate, to capture runoff from disturbed areas and direct runoff into sediment dams. Catch drains will be designed to have a non-erosive hydraulic capacity to convey flow from a minimum 20-year ARI storm event. Energy dissipators (rock check dams, geotextiles and vegetation) will be installed if required to slow water velocity.

Sediment dams and basins will be installed to retain rainfall runoff such that suspended solids can settle to the base of the dam. Water will be released when the total suspended sediment level meets the recommended criterion of 50 milligrams per litre.

5 MONITORING AND REPORTING

5.1 Monitoring and Maintenance of Erosion and Sediment Control Structures

Maintenance and inspections of diversion banks, sediment dams and voids are integral to water management on site. Maxwell personnel will conduct regular inspections of erosion and sediment control structures and rehabilitated areas for potential erosion and sediment control issues. This will include at least weekly inspections during construction, and post-rainfall inspections after 25 mm of rain in a 24-hour period (25 mm within 24 hours, midnight to midnight, with a new rainfall event considered to have commenced if there has not been a rainfall event in the previous 48 hours). If damage, such as washouts of drainage lines, is discovered, actions will be implemented to repair the damage as soon as practical. The completion and effectiveness of the implemented actions will be assessed during subsequent inspections.

Erosion and sediment control structures will be maintained in accordance with *Managing Urban Stormwater Soils and Construction* (Landcom, 2004) and *Volume 2E: Mines and Quarries* (DECC, 2008). Proper drainage of the site will be maintained by:

- removing accumulated sediment from basins/drains, if required (e.g. de-silting);
- checking that drains are operating as intended and any damaged works are repaired where necessary;
- confirming recent works have not resulted in the diversion of sediment-laden water away from their intended destination; and
- checking that rehabilitated lands have established sufficient groundcover.

5.2 Surface Water Quality Monitoring and Reporting

The surface water monitoring program is detailed in the Surface Water Management Plan (**Appendix 3** of the WMP) will be used to assess the performance of erosion and sediment controls through monitoring of total suspended solids.

5.3 Meteorological Monitoring

Meteorological monitoring is undertaken at on-site Automatic Weather Stations AWS-1 and AWS-2 to provide data to support environmental monitoring and design work. The following parameters will continue to be monitored at the meteorological monitoring stations:

- Rainfall
- Sigma theta
- Temperature at 2 m
- Temperature at 10 m
- Total solar radiation
- Wind direction at 10 m
- Wind speed at 10 m

6 CONTINGENCY PLAN

Potential unpredicted impacts related to the erosion and sediment control and contingency plans to address these are summarised in **Table 3**.

Table 3: Unpredicted impacts and contingency plans

Unpredicted impacts	Contingency plan
Total suspended solids exceed surface water quality trigger level (refer to Surface Water Management sub-plan).	Investigate potential sources of contamination by reviewing upstream water quality. If trigger exceedance is not due to Project-related activities then review monitoring frequency.

Unpredicted impacts	Contingency plan
	If observed changes are due to Project-related erosion and sedimentation then investigate potential sources and undertake remediation as required. Remediation may include repair of erosion and sediment control infrastructure, installation of additional infrastructure, or undertaking revegetation and stabilisation works. Continue to monitor water quality at location(s) of exceedance.
Inspections after 25 mm of rain in a 24-hour period (25 mm within 24 hours, midnight to midnight, with a new rainfall event considered to have commenced if there has not been a rainfall event in the previous 48 hours) to identify damage to erosion and sediment control infrastructure, such as washouts of drainage lines.	Repair the damage as soon as practical. The completion and effectiveness of the implemented actions will be assessed during subsequent inspections.

7 CONTINUOUS IMPROVEMENT

Results of surface water quality monitoring will be reviewed regularly and used to determine if erosion and sediment control infrastructure stabilisation works require improvements.

8 DOCUMENT INFORMATION

8.1 References

SLR Consulting Australia Pty Ltd (2019) *Maxwell Project Refined Biophysical Strategic Agricultural Land Verification Assessment*.

WRM Water & Environment Pty Ltd (2019) *Surface Water Assessment – Maxwell Project.*

8.2 Definitions and Abbreviations

Refer to **Appendix 10** of the WMP.

APPENDIX 3 – SURFACE WATER MANAGEMENT PLAN

Appendix 3 - Surface Water Management Plan

1 INTRODUCTION

1.1 Purpose and Scope

The purpose of this sub-plan is to satisfy the requirements of the Development Consent for State Significant Development (SSD) 9526 Schedule 2, Condition B42(e)(iv), to prepare a Surface Water Management Plan (SWMP). This sub-plan applies to all activities within the Development Consent SSD 9526 consent boundary and the Antiene Rail Spur Development Consent (DA 106-04-00) boundary.

In accordance with Schedule 2, Condition A24(a) of Development Consent SSD 9526, this sub-plan has been prepared for stage 1 activities only. Stage 1 activities include early preparation works, construction and first workings. Early preparatory works are defined in Section 3.4.2 of the Maxwell UG Project Environmental Impact Statement (Project EIS) and construction and first workings are defined in Development Consent SSD 9526). A copy of the approval from the Planning Secretary to stage this plan is provided in **Appendix 5** of the Water Management Plan (WMP). This plan will be updated prior to the commencement of second workings.

1.2 Objectives

The objectives of this plan are to:

- Identify potential water impacts;
- Detail all relevant statutory requirements;
- Detail the controls that are implemented to minimise water impacts;
- Detail the water monitoring system to assess water impacts;
- Provide a protocol to evaluate compliance; and
- Detail the procedure for reporting water criteria exceedances to relevant stakeholders.

2 PLANNING

2.1 Regulatory Requirements

This sub-plan describes surface water management to meet relevant statutory requirements within Development Consent SSD 9526. Requirements of Development Consent SSD 9526 that relate to surface water management, and where they are addressed in this document, are detailed in **Section 2.4**.

2.2 Maxwell Project EIS and Supporting Document Commitments

A surface water and groundwater assessment were undertaken for the Project EIS (published on 14 August 2019). Commitments in the Project EIS that surface water management, and where they are addressed in this sub-plan, are detailed in **Section 2.4**.

2.3 Preparation and Consultation

Schedule 2, Condition B42(a) of Development Consent SSD 9526, requires that this plan be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary. Maxwell has engaged Matt Briody (Principal Engineer, WRM Water & Environment Pty Ltd) to assist with the preparation of the surface water components of the sub- plan. Maxwell has also engaged Dr Noel Merrick (Senior Principal Hydrogeologist at Hydro Algorithmics) to assist with the preparation of the groundwater components of the sub-plan. A copy of the endorsement by the Planning Secretary is included in **Appendix 8** of the WMP.

In accordance with Schedule 2, Condition B42(b) of Development Consent SSD 9526, this plan has been prepared in consultation with DPIE Water. Outcomes of consultation with DPIE Water are presented in **Appendix 9** of the WMP.

2.4 Surface Water Management Plan Requirements

Requirements of Development Consent SSD 9526 and where they are addressed in this plan are presented in **Table 1**.

Table 1: Requirements of Development Consent SSD 9526

<table>
<tr><th>Clause</th><th>Requirement</th><th>Section of Plan</th></tr>
<tr><td>B40</td><td>The Applicant must ensure that the development complies with the performance measures in Table 4.
Table 4: Water management performance measures
<table>
<tr><th>Feature</th><th>Performance Measure</th></tr>
<tr><td>Saddlers Creek, Saltwater Creek and Hunter River aquatic and riparian ecosystems</td><td>• Negligible environmental consequences beyond those predicted in the document/s listed in condition A2(c).
• Negligible decline in baseline channel stability.
• Develop site-specific in-stream water quality objectives in accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000) and Using the ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006).</td></tr>
<tr><td>Feature</td><td>Performance Measure</td></tr>
<tr><td>Clean water diversions and storage infrastructure</td><td>• Design, install and maintain the clean water system to capture and convey the 100 year ARI flood.
• Maximise as far as reasonable the diversion of clean water around disturbed areas on the site, except where clean water is captured for use on the site.</td></tr>
</table></td><td>3.3, 4.1

4.2

4.2</td></tr>
<tr><td></td><td>
<table>
<tr><td>Feature</td><td>Performance Measure</td></tr>
<tr><td>Mine water storages</td><td>• Design, install and maintain mine water storage infrastructure to avoid unlicensed or uncontrolled discharge of mine water.
• Ensure adequate freeboards within all mine water storage dams and voids at all times to minimise the risk of discharge to surface waters.
• New on-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and maintained, including being lined to comply with a permeability standard of < 1 x 10^{-9} m/s.</td></tr>
</table></td><td>4.3

4.3, Appendix 1 of WMP

4.3</td></tr>
</table>

Clause	Requirement		Section of Plan
	Feature	***Performance Measure***	
	Overburden emplacements	• Design, install and maintain emplacements to encapsulate and prevent migration of acid forming and potentially acid forming materials, and saline and sodic material. • Design, install and maintain emplacements to prevent and/or manage long term saline groundwater seepage.	4.4 4.4
	Feature	***Performance Measure***	
	Chemical and hydrocarbon storage	• Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standard	4.6
B42	Prior to the commencement of construction activities, the Applicant must prepare a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:		
	(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;		2.3
	(b) be prepared in consultation with DPIE Water;		2.3
	(c) describe the measures to be implemented to ensure that the Applicant complies with the water management performance measures (see Table 4)		4
	(d) utilise existing data from nearby mines and build on existing monitoring programs, where practicable;		5.3
	(e) include a:		
	(iv) Surface Water Management Plan that includes**:**		
	• detailed baseline data on channel stability, water flows and water quality in the sections or parts of watercourses and/or water bodies potentially impacted by the development (including Saddlers Creek, Saltwater Creek, Ramrod Creek and the Hunter River);		3.1, 3.2, 3.3
	• a detailed description of the surface water management system, including a Brine Management Plan as described in the Submissions Report in the EIS;		4, Brine management not yet triggered
	• details of any water sharing arrangements permitted under condition B37 and B38 of this Schedule;		4.1.3 in Appendix 1
	• detailed plans, design objectives and performance criteria for water management infrastructure including:		
	– any approved creek diversions or restoration works associated with the development;		NA
	– water run-off diversions and catch drains;		4.4 in Appendix 2
	– erosion and sediment controls;		4.4 in Appendix 2
	– any water storages, including mine water management systems;		4.3 in Appendix 1
	– tailings and brine transfer and storage infrastructure; and		Not triggered
	– reinstated drainage networks on rehabilitated areas of the site;		4.5
	• surface water performance criteria, including trigger levels for identifying and investigating any potentially adverse impacts (or		5.5

Clause	Requirement	Section of Plan
	trends) associated with the development for; – water supply for other water users; – downstream surface water flows and quality, including site-specific trigger levels for molybdenum, selenium, antimony and arsenic; – stream and riparian vegetation health; and – post-mining water pollution from rehabilitated areas of the site; • a program to monitor and evaluate: – compliance with the relevant performance measures listed in Table 4 and the performance criteria in this plan; – controlled and uncontrolled discharges and seepage/leachate from the site; – impacts on water supply for other water users; – surface water inflows, outflows and storage volumes, to inform the Site Water Balance; and – the effectiveness of the surface water management system, and the measures in the Erosion and Sediment Control Plan; – reporting procedures for the results of the monitoring program, including notifying other water users of any elevated results; and – a trigger action response plan to respond to any exceedances of the performance measures in Table 4, and to repair, mitigate and/or offset any adverse surface water impacts of the development, including measures to provide compensatory water supply to affected water users under condition B30 of this Schedule;	5.1, 5.3, 5.4 5.1, 5.2, 5.3 and 4.7 in Appendix 1 Appendix 4 of WMP Appendix 1 of WMP 5.1, 5.2, 5.3, 5.5, Appendix 2 of WMP 5.8, Table 12 5.2, 5.5
E5	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include: (a) a summary of relevant background or baseline data; (b) details of: (i) the relevant statutory requirements (including any relevant approval, licence or lease conditions); (ii) any relevant limits or performance measures and criteria; and (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	 3 2.1 5.4 5.4
	(c) any relevant commitments or recommendations identified in the document/s listed in condition A2(c); (d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria; (e) a program to monitor and report on the: (i) impacts and environmental performance of the development; and (ii) effectiveness of the management measures set out pursuant to condition E5(d);	2.4 4 5 5

Clause	Requirement	Section of Plan
	(f) A contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	5.2, 5.3, 5.5
	(g) a program to investigate and implement ways to improve the environmental performance of the development over time;	6
	(h) a protocol for managing and reporting any:	
	(i) incident, non-compliance or exceedance of any impact assessment criterion or performance criterion);	4.1 of WMP
	(ii) complaint; or	4.3 of WMP
	(iii) failure to comply with other statutory requirements;	4.2 of WMP
	(i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and	5.4 of WMP
	(j) a protocol for periodic review of the plan.	5.1 of WMP
	Note: *The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*	

Commitments in the Project EIS and supporting documents, relevant to surface water management, and where they are addressed in this sub-plan are presented in **Table 2**.

Table 2: Maxwell Project EIS and supporting document commitments

Source	Details	Reference
EIS Section 6.5.4	**Surface Water Monitoring**	
	• Surface water monitoring for the Project would be undertaken to demonstrate compliance with regulatory requirements, as well as improve the understanding and efficiency of the site water management system. The proposed monitoring program for the Project addresses the following issues: ○ water quality; ○ water balance; ○ site water management system integrity; ○ erosion and sediment control; ○ stream health; and ○ geomorphic response to subsidence.	5.1, 5.3
	• The existing surface water monitoring network would form the basis for the monitoring network for the Project, augmented with additional monitoring sites proposed in Appendix C (or other suitable, similar locations).	5.1, 5.3
	• Malabar would seek to integrate the monitoring program with monitoring undertaken for the Mt Arthur Mine.	3
	• Sampling standards, parameters and frequency are summarised in Appendix C. The results of surface water	5.1, 5.3, 5.6

Source	Details	Reference
	monitoring would be reported in the Annual Reviews for the Project.	
	• Storage volume and water quality data would be collected from the various water storages to assist in the verification/calibration of the site water balance and salt balance for the Project and to mitigate the risk of an uncontrolled spill from the dams.	Appendix 1 of WMP
	• The site water balance would be periodically reviewed and updated as additional and/or newer information becomes available with the progression of the underground operations. The following parameters would be recorded to validate the assumptions of the water balance model: o site rainfall; o dam and void water levels and volumes; o pump rates between storages, particularly major pipelines between the MEA and Maxwell Infrastructure; o actual demand rates for CHPP makeup water (and losses), dust suppression and vehicle washdown during operation of the mine; o groundwater inflows; and o general mine site water management practices.	Appendix 1 of WMP
	• The site water balance would be reviewed following review of the numerical groundwater model, which would be periodically evaluated during the life of the Project.	Appendix 1 of WMP
	• Regular monitoring of infrastructure such as pumps, pipelines and dams would be undertaken to monitor whether they are working effectively.	Appendix 1 of WMP
	• In accordance with DSC requirements, an annual surveillance report would continue to be undertaken and submitted for the Access Road Dam and any other Project dams that are determined to be a 'prescribed dam' and/or 'declared dam'.	Appendix 1 of WMP Appendix 1 of WMP
	• The outcomes of the surveillance reports would be included in the Annual Reviews for the Project.	Appendix 2 of WMP
	• Site drainage and sediment control structures would be inspected regularly (monthly or following rainfall greater than 25 mm in 24 hours) to check for scouring of diversion drains (and their outlets) and accumulation of sediment in sediment traps (including sediment fences, sediment basins, etc.).	5.6
	• The extent of riparian vegetation and extent of erosion and sedimentation deposits would be used as an indicator of stream health. Monitoring would be undertaken quarterly by taking photographs at each of the Saddlers Creek surface water monitoring sites. The photographs would be taken at the same location (identified by GPS or permanent photographic ID post) and taken of the relevant bed and bank features looking upstream and downstream. These	

Source	Details	Reference
	photographs would be documented with the location, direction and date as well as a log of erosional and depositional features at each location.	5.6
	• Monitoring of potential geomorphic impacts to drainage lines overlying the Maxwell Underground area would primarily utilise LiDAR survey. The total coverage achieved by LiDAR survey is considered superior to the traditional method of establishing sampling locations where cross-sections and long profiles are re-surveyed from time to time. The geomorphic response to subsidence is likely to be slow, so a frequency of five years for catchment-wide re-survey (including LiDAR survey) and reporting of stream geomorphological condition is suggested in addition to annual visual inspection.	5.2, 5.5
	• A surface water response plan would be developed as part of the Water Management Plan for the Project. The surface water response plan would determine trigger levels based on historical monitoring data and identify proposed actions to be taken if the monitoring program identifies the exceedance of a trigger level.	

3 BASELINE DATA

The local and regional drainage network is discussed in **Appendix 2** of the WMP.

3.1 Geomorphology, Channel Stability and Riparian Vegetation Health

Gippel (2019) characterised the geomorphic forms and processes in the underground area for the Maxwell UG Project EIS. The streams comprised six natural geomorphic types, with the majority being Headwater type. Headwater streams are geomorphologically resilient, so mining would not be expected to present a significant risk to changing their character. If they are impacted, the streams would be expected to recover their character quickly. Most of the drainage lines overlying the underground mine are currently in poor geomorphic condition due to knickpoints (sharp drops in the bed of the drainage line) and poor riparian vegetation as a result of historic land management practices, resulting in either incision or excess sediment on the bed. Knickpoints were very common, with 300 of them mapped and measured in the underground area. Most of the knickpoints were less than one metre high, but some were more than two metres high. Further detail on baseline geomorphology, channel stability and riparian vegetation health is provided in Appendix D of the Project EIS.

Riparian tree cover is very low to moderate at most sites and the riparian vegetation cover index is uniformly in the low to moderate range over the surveyed sites, mainly because of low to moderate grass cover on the hillslopes due to the prevailing dry climatic conditions. Gullying was mapped as widespread throughout the catchments of Saddlers and Saltwater creeks. In the area above the underground mine 69 per cent of the total hydroline length was affected by erosion. Of this erosion about 50 per cent was in the Moderate gully erosion category, and about 18 per cent was in the severe gully erosion category.

3.2 Surface Water Flows

WRM (2019) described the existing surface water environment in the Project EIS. The streams in the underground area primarily have ephemeral flow regimes. The recorded flows in Saddlers Creek at the Bowfield Gauge (210043) shown on **Figure 1**, from 1956 to 1981 indicates Saddlers Creek flowed intermittently, with flow recorded some 55 per cent of the time and is dry 45 per cent of the time during this period of record. Extended periods of baseflow are evident indicating that the system is fed by groundwater flows. The median (non-zero) flow is 0.22 ML/d and the highest recorded daily flow over the period of record was 1,137 ML/d.

Maxwell installed a new stream gauging station (SC1) on Saddlers Creek in September 2018 at the location shown on **Figure 1**. In the period from September 2018 to April 2019 there was one recorded flow event. The single recorded flow occurred after 66 mm of rainfall fell in a single day and lasted for around 48 hours. During the recording period, daily rainfall totals of less around 25 mm were insufficient to cause a measurable surface flow in Saddlers Creek at the gauging station.

The gauging station on the Hunter River that is closest to the underground area is the Liddell Gauging Station (210083) shown on **Figure 1** and located approximately 9.0 kilometres (km) downstream. Data has been collected at the Liddell Gauging Station (210083) since 1969. The median flow is about 240 ML/d and flows exceed 1,000 ML/d some 16 per cent of the time.

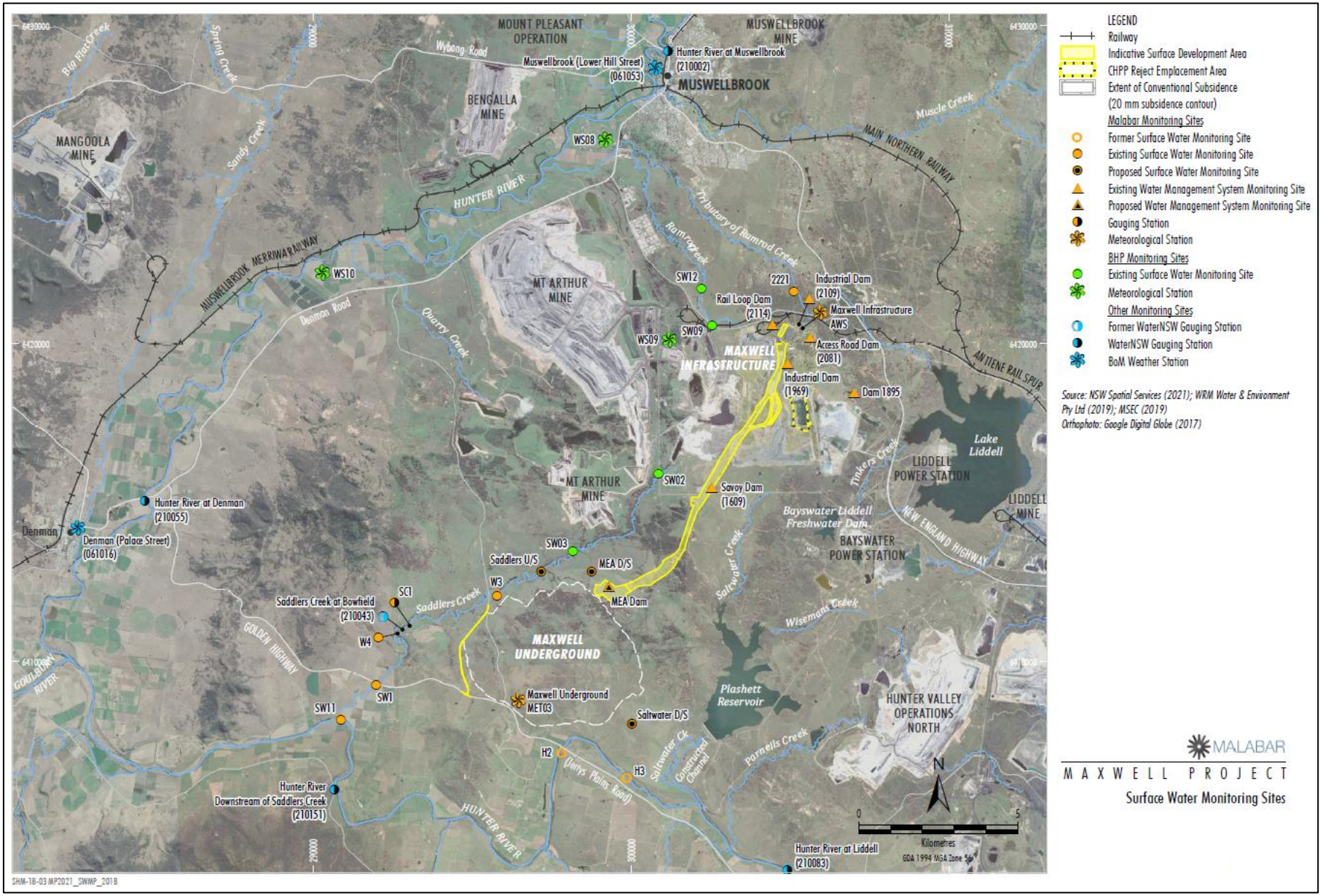


Figure 1: Local surface water monitoring sites surrounding the Project

3.3 Surface Water Quality

For comparative purposes, water quality guideline values (ANZG 2018) are shown in **Table 3**.

Table 3: Water quality guideline values

Parameter	Guideline Values				
	Irrigation	Liv-stock Drinking	Ecosystem	Recreational	Drinking
pH	-	-	6.5 – 8.5	5.0 – 9.0	6.5 – 8.5
EC (µS/cm)	1,000[1]	-	25 - 2,200	-	<1,500
Total Dissolved Solids (mg/L)	-	2,000[1]	-	1,000	1,000
Calcium (mg/L)	-	1,000	-	-	-
Magnesium (mg/L)	-	2,000[2]	-	-	-
Chloride (mg/L)	175[3]	-	-	400	-
Iron (mg/L)	0.2[4]	-	-	0.3	-
SO_4 (mg/L)	-	1,000	-	400	-

Notes:
- No guideline value recommended.
mg/L – milligrams per litre.
µS/cm – microSiemens per centimetre.
[1] Lowest recommended value.
[2] Cattle (insufficient information on other livestock).
[3] Sensitive crops.
[4] Long term guideline value

Water quality at sites H2, H3 and SW11 on the Hunter River (shown on **Figure 1**), from results of surface water monitoring undertaken by Anglo American and Maxwell, are summarised in **Table 4**. The sampling results indicate:

- Hunter River water is slightly alkaline with median pH ranging from 8.1 to 8.4.
- Hunter River median Electrical Conductivity (EC) ranges from 727 µS/cm to 817 µS/cm which is within the range of low salinity irrigation water and within the range of default trigger values for protection of aquatic ecosystems for slightly disturbed ecosystems.
- Median Total Dissolved Solids (TDS) is within the range of recommended concentrations of TDS in drinking water for livestock.
- Recorded Total Suspended Solid (TSS) concentrations for the Hunter River are low.

Table 4: Hunter River Water Quality

Parameter		Hunter River (2008 to 2015)		Hunter River (2012 to 2020)
		H2	H3	SW11
pH	20%ile	8.1	8.1	8.0
	Median	8.3	8.4	8.1
	80%ile	8.4	8.5	8.2
	n	31	31	74
EC (µS/cm)	20%ile	629	624	490
	Median	817	812	727
	80%ile	1,024	982	910
	n	31	31	75
Total Dissolved Solids (mg/L)	20%ile	420	420	287
	Median	550	540	403
	80%ile	690	660	493
	n	31	31	74
TSS (mg/L)	20%ile	10	11	8
	Median	20	19	16
	80%ile	40	39	34
	n	31	31	74
Calcium (mg/L)	20%ile	34	33	32
	Median	47	45	42
	80%ile	52	54	49
	n	11	11	70
Magnesium (mg/L)	20%ile	25	25	21
	Median	32	34	30
	80%ile	42	44	40
	n	11	11	70
Chloride (mg/L)	20%ile	79	73	49
	Median	108	103	101
	80%ile	167	166	147
	n	11	11	70
Iron (filterable) (mg/L)	20%ile	0.05	0.05	0.05
	Median	0.05	0.05	0.05
	80%ile	0.05	0.05	0.07
	n	11	11	70

Parameter		Hunter River (2008 to 2015)		Hunter River (2012 to 2020)
		H2	H3	SW11
Iron (total) (mg/L)	20%ile	0.38	0.39	0.26
	Median	1.17	0.64	0.53
	80%ile	1.89	2.07	1.48
	n	11	11	70
Sulphur as SO_4 (mg/L)	20%ile	27	28	20
	Median	33	33	31
	80%ile	39	39	40
	n	11	11	70

Water quality at sites W3, W4, SW1, SW02, SW03 in Saddlers Creek (shown on **Figure 1**), from results of surface water monitoring undertaken by Anglo American, Malabar and Mt Arthur Coal (MAC) since 1998, are summarised in **Table 5**. The sampling results indicate:

- Saddlers Creek is slightly alkaline with median pH ranging from 7.4 to 8.3.
- Saddlers Creek EC is very high with median EC values ranging from 5,280 µS/cm to 7,510 µS/cm. The median EC values exceed the EC range of low salinity irrigation water and the range of default trigger EC values for protection of aquatic ecosystems for slightly disturbed ecosystems.
- Median TDS generally exceeds the maximum recommended concentrations of TDS in drinking water for livestock.
- Recorded TSS concentrations for Saddlers Creek are low.

Table 5: Saddlers Creek Water Quality

Parameter		W3	W4	SW1	SW02	SW03
pH	20%ile	7.9	8.1	7.8	7.1	7.7
	Median	8.0	8.2	8.3	7.4	7.9
	80%ile	8.2	8.4	8.4	7.9	8.1
	n	178	59	39	78	137
EC (µS/cm)	20%ile	6,144	3,968	1,458	4,622	3,378
	Median	7,295	6,880	5,365	7,510	5,280
	80%ile	8,470	8,614	7,206	8,600	7,530
	n	178	59	40	78	137
TDS (mg/L)	20%ile	3,960	2,640	838	4,402	2,104
	Median	4,764	4,530	3,130	6,280	3,300
	80%ile	5,515	5,584	3,942	7,212	4,694
	n	176	57	39	78	137
TSS (mg/L)	20%ile	5	4	5	5	5
	Median	14	6	7	10	5
	80%ile	38	10	18	24	11
	n	178	59	39	77	137

Parameter		W3	W4	SW1	SW02	SW03
Calcium (mg/L)	20%ile	76	43	21	-	-
	Median	100	58	46	-	-
	80%ile	110	73	65	-	-
	n	59	19	40	-	
Magnesium (mg/L)	20%ile	236	93	42	-	-
	Median	319	195	147	-	-
	80%ile	354	252	208	-	-
	n	59	19	40	-	-
Chloride (mg/L)	20%ile	1,374	743	316	-	-
	Median	1,880	1,730	1,305	-	-
	80%ile	2,318	2,298	1,810	-	-
	n	59	19	40	-	-
Iron (filterable) (mg/L)	20%ile	0.05	0.05	0.05	0.05	0.05
	Median	0.05	0.05	0.08	0.05	0.05
	80%ile	0.12	0.14	0.22	0.50	0.06
	n	59	19	40	78	137
Sulphur as SO_4 (mg/L)	20%ile	348	150	84		-
	Median	520	237	168	-	-
	80%ile	614	333	311	-	-
	n	59	19	40	-	-

Water quality at sites in the Ramrod Creek catchment (shown on **Figure 1**), from results of surface water monitoring undertaken by MAC from January 2007 to August 2020, are summarised in **Table 6**. Historically there has been no direct discharges of mine affected runoff to Ramrod Creek. The sampling results indicate:

- Runoff is generally saline with median EC.
- Median pH is slightly alkaline.
- Recorded TSS concentrations are generally low.

Table 6: Ramrod Creek Water Quality

Parameter		Ramrod Creek SW09	Ramrod Creek SW12
pH	20%ile	7.7	7.6
	Median	8.0	7.9
	80%ile	8.3	8.1
	n	38	159

Parameter		Ramrod Creek SW09	Ramrod Creek SW12
EC	20%ile	3,742	4,126
	Median	6,010	5,070
	80%ile	7,076	5,822
	n	38	159
TSS	20%ile	5	4
	Median	8	12
	80%ile	22	40
	n	36	159

4 IMPLEMENTATION

This section describes the potential impacts of the project on channel stability, riparian ecosystem health, surface water flows and downstream water quality, and mitigation measures to meet the required performance measures for each of those aspects. Impacts of second workings and mitigation measures will be described in the subsequent Water Management Plan that would form part of the Extraction Plan.

4.1 Channel Stability and Riparian Ecosystem Health

First workings are not predicted to cause subsidence or impacts on channel stability and riparian health. Good land management practices will be used to manage vegetation on drainage lines and maximise the erosional stability of the land to mitigate any future subsidence impacts. Land owned by Maxwell and leased to third parties for grazing will be managed via a grazing licence agreement or similar. Such agreements will include requirements to manage the land according to best agricultural practice and best environmental practice and not exceed a set carrying capacity. Stage 1 activities are not predicted to impact channel stability and riparian health; however, baseline channel stability and riparian health monitoring will be undertaken during stage 1.

4.2 Clean Water Diversions

The key performance measure for clean water diversions is to maximise, as far as reasonable, the diversion of clean water around disturbed areas on the site.

The catchment reporting to Saltwater Creek, Bayswater Creek and Ramrod Creek will be unchanged during the Project. As vegetation establishes on rehabilitation areas at Maxwell Infrastructure, Maxwell will progressively develop drainage works, with the aim of minimising the long-term catchment areas of the mine voids in previous mining areas far as practicable. Prior to completion of rehabilitation of Maxwell Infrastructure, a diversion will be constructed to channel flows from the western rehabilitation area past North Void and into a tributary of Ramrod Creek. Clean water diversions at Maxwell Infrastructure will not be undertaken during stage 1.

Construction of the MEA will result in some excision of catchment (approximately 38 ha) that would otherwise report to Saddlers Creek. The water management system incorporates up-catchment diversions around the northern and southern boundaries of the MEA to minimise the runoff from undisturbed areas captured by on-site water storages and impacts on downstream water flows. Up-catchment diversion structures will be constructed to divert runoff from undisturbed areas around the transport and services corridor. Stabilisation of up-catchment diversions will be achieved by the design of appropriate channel cross-sections and gradients and the use of channel lining materials, such as grass or rock fill.

Clean water diversions will be designed to ensure effective segregation of sediment-laden runoff and allow clean surface water to return to a natural watercourse. Clean water diversions will be designed in accordance with the Blue Book to cater for the peak discharge from a 1 per cent Annual Exceedance Probability (AEP) (or 1 in 100 year ARI) design event. If a clean water diversion has potential to spill into a dirty water or mine-affected water storage the diversion will be designed to 1 per cent AEP.

4.3 Mine Water Management

Performance measures for above ground mine water storages are:

- Design, install and maintain mine water storage infrastructure to avoid unlicensed or uncontrolled overflows of mine water.
- Ensure adequate freeboards within all mine water storage dams and voids at all times to minimise the risk of uncontrolled overflows to surface waters.
- New on-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and maintained, including being lined to comply with a permeability standard of $< 1 \times 10^{-9}$ m/s.

In accordance with Schedule 2, Condition B41 of Development Consent SSD 9526, the above performance measures apply to the entire site, including mine-affected water storages constructed under previous development consents. However, these performance measures do not require any additional earthmoving works be undertaken for mine-affected water storages that have been approved and constructed under previous consents, except where those earthworks are required for the establishment of a stable, non-polluting and free-draining landform.

The water storage and transfer system is summarised in **Appendix 1** of the WMP**.** Potential pathways for the uncontrolled overflows of mine-affected water from the water storage and transfer system include:

- overtopping of dams, particularly during heavy and prolonged rainfall events;
- rupture of raw water pipelines; and
- seepage of water from storage dams.

The following controls for the water storage and transfer system will be implemented to manage potential pathways for the uncontrolled overflows of mine water and meet the above performance criteria:

- Rail Loop Dam water levels are managed to prevent uncontrolled overflow through transfers to Access Road Dam and North Void.
- DC2 Dam water levels are managed to prevent uncontrolled overflow through transfers to Rail Loop Dam.
- Automatic pumping stations to transfer water from high-risk dams into other storages.
- Pipelines, where possible, are located within water storage catchments to contain any uncontrolled release of mine water in the event of a rupture or leak.
- Where possible, pumps and infrastructure, that are used to transfer water around the site, are in areas where leaks and uncontrolled releases can be captured by the site water management system.
- A permit system for the East void pumps (pumping to Pringles or Access Road dams), automatic shut-off timers on pumps, and requirements to monitor pumping to dams in the site water system that have a risk of an offsite uncontrolled overflows.
- Regular inspections of dams in the site water system that have a risk of an offsite uncontrolled overflows to ensure issues are identified and managed accordingly.
- Regular monitoring of infrastructure such as pumps, pipelines and dams will be undertaken to monitor whether they are working effectively.
- New on-site storages (including mine infrastructure dams, groundwater storage and treatment dams) will be suitably designed, installed and maintained, including being lined to comply with a permeability standard of $< 1 \times 10^{-9}$ m/s.

During heavy or prolonged rainfall events, a pumping strategy is implemented that removes excess water from dams such as the Rail Loop Dam and Access Road Dam, which have the potential for off-site uncontrolled overflows, and transfers the water into the voids.

4.4 Overburden Emplacements

Performance measures for overburden emplacements are:

- Design, install and maintain emplacements to encapsulate and prevent migration of tailings, acid forming and potentially acid forming materials, and saline and sodic material.
- Design, install and maintain out-of-pit emplacements to prevent and/or manage long term saline seepage.

The above performance measures apply to overburden emplacements that were constructed under previous development consents but does not require any additional earthmoving works be undertaken, except as required for the establishment of a stable, non-polluting and free-draining landform.

The bulk of the overburden in waste emplacements at Maxwell Infrastructure is expected to be non-acid forming and relatively barren in terms of acid generation and neutralisation. Although the carbonaceous mudstone and siltstone overburden may have a risk of acid generation, the volumes are relatively minor and with the blending that occurred during disposal it is expected that the overall overburden will have a low risk of acid generation. Carbonaceous materials, such as carbonaceous mudstone/siltstone and uneconomic coal were placed within the lower levels of the emplacements and encapsulated with truck and dozer compacted inert overburden to isolate these materials from oxygen and reduce the risk of spontaneous combustion. Coal seam partings which contained significant carbonaceous materials, were also encapsulated within the lower levels of the overburden emplacements, on the pit floors, or in between the pre-stripped dragline spoil piles. If any materials prone to spontaneous combustion were identified within the surface of the overburden emplacements, they were capped with inert overburden as soon as practical and prior to rehabilitation. For areas with a low risk of heating through spontaneous combustion, a minimum of 2 m of capping was required and for areas with a high risk, a minimum of 5 m was required. Management of overburden to reduce the risk of spontaneous combustion also reduced the risk of oxidation of reactive sulfides and generation of acid rock drainage (ARD).

Runoff from emplacement areas is captured and stored on site and within mine voids. Monitoring of the water within the mine voids and tailings emplacement demonstrates that the pH generally ranges from 7 to 8, indicating that ARD has not occurred within the overburden emplacements at Maxwell Infrastructure.

No more overburden emplacement activities are required for Maxwell Infrastructure. Some existing overburden emplacements may be shaped using a dozer (or similar) to manage spontaneous combustion outbreaks and improve water management on the site.

4.5 Rehabilitated Areas

As of July 2021, approximately 853 ha of previously mined land at the Maxwell Infrastructure area has been rehabilitated. Since taking ownership of ML 1531, CL 229 and CL 395 in 2018, Maxwell have completed a total of 212 ha of rehabilitation and planted 76,000 trees within the woodland rehabilitation domain. All areas of rehabilitation are currently within the ecosystem and land use establishment phase (i.e. phase 4 of 6).

Rehabilitation activities will continue to be undertaken during stage 1, with a focus on enhancing existing areas of rehabilitation through infill planting in the woodland rehabilitation corridor to increase species diversity and targeted weed management.

Performance criteria for water management of rehabilitated overburden emplacements at Maxwell Infrastructure are based on the objectives and completion criteria for overburden emplacements in the current approved MOP. The objective for water management of overburden emplacements post-mining is that overburden areas are free draining and non-polluting. Drainage and erosion completion criteria for overburden emplacements to meet that objective are:

- Water management contour drains are designed, surveyed and constructed.
- Engineer designed waterways with groundcover vegetation and or rock armouring will be constructed to convey run-off down slope in a controlled manner.

- Except for deliberate detention basins or sediment ponds, ponding will not occur on emplacement surfaces, in contour drains or drop structures.
- Emplacement drainage reports to existing natural drainage features, via sediment control ponds.
- Only infrequent minor rilling observed with maximum depth of less than 30cm.
- No active gullies greater than 30 cm depth.
- No major failures observed in drainage structures.

Maintenance requirements for revegetation areas and contour drains for rehabilitated overburden emplacements will be determined through regular ecological monitoring and walkover inspections. Revegetation and maintenance of existing contours on rehabilitation areas will be undertaken as required. As vegetation establishes on rehabilitation areas at Maxwell Infrastructure, and surface runoff quality is considered suitable for the final land use, Maxwell will progressively develop drainage works to reduce clean runoff to mine voids as far as practicable.

Following the completion of mining, surface infrastructure areas (including the MEA) will be decommissioned and rehabilitated to pasture or woodland. The objective for water management of rehabilitated surface infrastructure areas post-mining is that the land surface is safe, stable and reshaped to meet post mining land use requirements. Drainage and erosion completion criteria for surface infrastructure areas to meet that objective are:

- Decommissioned infrastructure surface areas reshaped to gradients generally less than 16 degrees and integrate with adjacent landforms.
- Excavations and trenches remaining from infrastructure removal backfilled and compacted.
- Unless deliberately designed as detention basins or sediment ponds, reshaped surfaces will shed water.
- Controlled drainage will report to surrounding natural drainage features, via sediment ponds. Operational sediment and erosion control works will be maintained during the establishment of revegetation. However, once self-sustaining stable final landforms have been achieved within an area, key elements of the operational sediment control structures will be either left as passive water control storages or removed to allow the area to become free-draining.
- Minor rilling only observed, less than 30 cm in depth.
- No active gully formation.

4.6 Chemical and Hydrocarbon Storage

Performance measures for chemical and hydrocarbon storage are:

- Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standard.
- Any potentially contaminated rainfall runoff from the Industrial Area is diverted to the Oil Pollution Control (OPC) Dam located immediately upstream of the Industrial Dam. The OPC Dam has two oil/water separators in place which remove oil residue from the water prior to it being fed into the Industrial Dam and into the mine's raw water management system.

Controls to prevent contamination of soil and water from hydrocarbons are summarised below:

- Storage tank areas will have an impermeable surface and bunding in accordance with *Australian Standard 1940:2017: The storage and handling of flammable and combustible liquids*.
- All oil, grease, fuel and hydrocarbon products will be securely stored.
- Refuelling, oiling and greasing will take place in designated areas only.
- Soil contaminated by spills will be collected and transported to a licensed waste disposal facility or remediated safely on-site.

4.7 Flooding

Flood modelling of Saddlers Creek has been undertaken by WRM (2019) to define the location of the surface development areas for the underground. The extent of subsidence of the underground and the infrastructure in the MEA and Transport and Services Corridor are located outside of the Saddlers Creek and Hunter River probable maximum flood (PMF) extent. Therefore, the site would have no impact on the flood behaviour up to the PMF event, or any lesser events.

4.8 Sewage Treatment and Effluent Management

The existing onsite wastewater treatment plant at Maxwell Infrastructure will continue to be used. When volumes are sufficient, treated effluent is disposed in a small area of rehabilitation on the East Tip. When volumes are not sufficient, the water evaporates from the effluent ponds. The disposal of this effluent is approved under Environment Protection Licence (EPL) 1323. The volume of effluent disposed is monitored in accordance with EPL 1323 and must not exceed 140 kilolitres (kL) per day. The application of the effluent is also managed to avoid surface runoff, spray drift beyond the premises, and an exceedance of the capacity of the area to effectively utilise the effluent applied.

Sewage and wastewater from the MEA ablution facilities will be collected and treated in a biocycle sewage treatment system and serviced by a licensed waste disposal contractor on an as-needed basis. Treated effluent will be irrigated in accordance with the *Environmental Guidelines: Use of Effluent by Irrigation* (NSW Department of Environment and Conservation 2004).

4.9 Wastewater Management Systems Inspection

The wastewater management systems shall be inspected and assessed by a suitably qualified and experienced wastewater technician at least once in each quarterly period and a minimum of four times per year and serviced as required. Maxwell shall record details of each inspection undertaken (date and time), the actions required or recommended following each inspection, the date those actions were completed or detail the reasons if they were not completed and the results of any tests performed on the wastewater management system by the technician. Maxwell shall provide a Sewage Treatment System Maintenance Report each year that provides details of implementation of the wastewater management system, wastewater management system inspections, actions required or recommended following each inspection, actions undertaken, and tests performed.

5 MONITORING AND REPORTING

5.1 Mine Water Storages

Water quality will continue to be monitored at the key mine water storages (existing and proposed) listed in **Table 7** and shown in **Figure 2**. In addition, hydrocarbon analysis (BTEX, PAHs and TPHs) is conducted quarterly at the Oil Pollution Control Dam. Hydrocarbon analysis is undertaken on other dams as required or where an inspection has indicated the potential presence of hydrocarbon materials. Water quality data of the mine water storages is used for operational purposes and is reported internally as required.

All mine-affected water is contained within the site water management system and there are no off-site uncontrolled overflows. Inspections of high-risk water storages are undertaken following storm events of more than 25 mm in a 24-hour period (25 mm within 24 hours, midnight to midnight, with a new rainfall event considered to have commenced if there has not been a rainfall event in the previous 48 hours) to confirm that no uncontrolled overflows of mine-affected water off-site have occurred. These inspections continue until the effects of the rainfall event have subsided.

Table 7: Mine water storage monitoring locations

Water Storage	Monitoring ID	Coordinates (GDA 94 / MGA 56)		Sampling Program
		Easting	Northing	
Industrial Dam	1969	304736	6419291	The following parameters to be analysed on a quarterly basis: • pH; • EC • TSS • TDS • Sodium; • Magnesium; • Calcium; • Chloride; • Sulfate; • Bicarbonates; and • Potassium
Oil Pollution Control Dam	OPC	304874	6419580	
Access Road Dam	2081	305495	6420323	
DC2 Dam	2109	305260	5420582	
Rail Loop Dam	2114	304402	3420612	
V-Notch	V-Notch	305635	6420479	
East Void	ES Void	305387	6417563	
MEA dam [1]	MEA	299202	6412440	
Mine Water Dam [1]	MWD	299346	6412407	
Treated Water Dam [1]	TWD	299630	6412131	
MEA Sedimentation Dam [1]	SED	299301	6412359	

Notes:
[1] Mine water storage to be constructed.

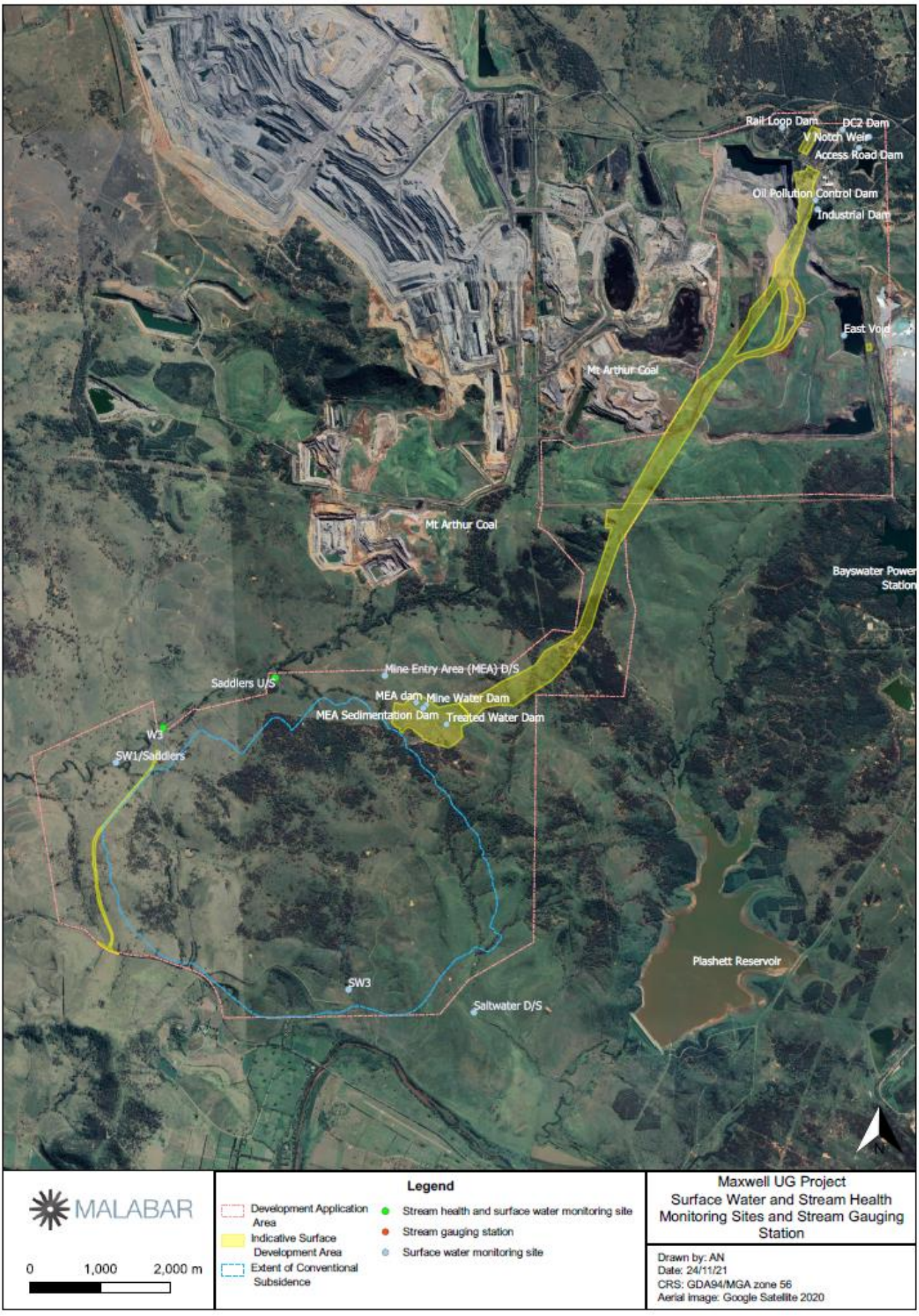


Figure 2: Surface water and stream health monitoring sites

5.2 Trigger Action Response Plan – Mine Water Storages

A Trigger Action Response Plan (TARP) detailing performance criterion for mine water storages, based on response actions in the surface water assessment, is presented in **Table 8.**

Table 8: Trigger Action Response Plan – Mine Water Storages

Status	Trigger	Action	Response
Normal	Performance measures met. Design, install and maintain mine water storage infrastructure to avoid unlicensed or uncontrolled overflow of mine water. Ensure adequate freeboards within all mine water storage dams and voids at all times to minimise the risk of discharge to surface waters.	Operate water management system in accordance with operating rules. Continue normal measurement and evaluation in accordance with this sub-plan.	None.
Level 1	Forecast heavy rainfall. Rainfall greater than 25 mm of rain in a 24-hour period (25 mm within 24 hours, midnight to midnight, with a new rainfall event considered to have commenced if there has not been a rainfall event in the previous 48 hours). Any out-of-pit mine water storage inventory exceeds maximum operating volume.	Review status of site water storage inventory and transfer water as required to minimise risk of unlicensed discharge. Pump water from any storage at risk of unlicensed discharge. Undertake event water monitoring in accordance with this sub-plan. Cease pumped inflows to the storage until the inventory reduces to below the maximum operating volume. Continue to monitor inventory to assess risk of unlicensed discharge. If inventory continues to increase due to surface runoff/direct rainfall, transfer water to available storage.	Reassess water balance and operating rules.

Status	Trigger	Action	Response
Level 2	Uncontrolled overflow from mine water storage off-site.	Water quality monitoring at discharge point and downstream, in accordance with this sub-plan. Notification to downstream users.	Report non-compliance in accordance with this sub-plan**.** Undertake investigation to determine cause of uncontrolled overflow. Undertake adaptive management strategies in accordance with this sub-plan. If relevant, review water management system including pump cut-off switches and alarms, and integrity of water management infrastructure (dam walls, pumps and pipelines). Review water management system integrity monitoring program.

5.3 Surface Water Monitoring

Surface water sampling will be undertaken at sites listed in **Table 9** and shown in **Figure 2** to monitor potential impacts from mining activities. The sites in **Table 9** comprise sites listed in Table 9.1 of the surface water assessment for the Project EIS and additional sites (SW1/Saddlers, SW2 and SW3) to meet commitments in the *Maxwell Project Submissions Report*. Site SW1 is an un-named tributary upstream of Saddlers Creek and monitors runoff from the majority of the subsidence area before it enters Saddlers Creek. Site SW3 would monitor the potential runoff from the potential subsidence area that drains to the Hunter River.

Table 9: Downstream Surface Water Monitoring Locations

Monitoring Site Name	Coordinates (GDA 94 / MGA 56)	
	Easting	Northing
Saddlers Creek Station (automatic water monitoring station)	293035	6411121
W3	295605	6412079
Saddlers D/S (W4- Bowfield)	292659	6410869
MEA (Mine Entry Area) D/S	298756	6412822
Saddlers U/S	297195	6412789
Saltwater D/S	300021	6408036
SW1/Saddlers	294933	6411588
SW3	298239	6408359

Monitoring Site Name	Coordinates (GDA 94 / MGA 56)	
	Easting	Northing
Transport and Services Corridor sediment dams	Location to be confirmed following confirmation of sediment dam locations downstream of the transport corridor.	

Results of previous surface water monitoring undertaken by MAC are summarised in **Table 6.** In accordance with Condition B42(d) Schedule 2 of Development Consent SSD 9526 Maxwell will continue to request data from nearby mines and utilise such data (where available) and continue to build on existing monitoring programs where practicable.

Surface water quality parameters and monitoring frequency are detailed in **Table 10** and are based on the surface water monitoring program proposed in the surface water assessment for the Project EIS and commitments in the *Maxwell Project Submissions Report*. Surface water quality monitoring will be undertaken quarterly (if the waterway is flowing) and/or following a significant rainfall event (25 mm within 24 hours, midnight to midnight), with a new rainfall event considered to have commenced if there has not been a rainfall event in the previous 48 hours. Monitoring shall also be undertaken within 24 hours of commencement of overflow from a sedimentation dam or mine water dam.

Table 10: Surface Water Monitoring Parameters and Frequency

Monitoring Site	Analysis	Parameter	Units	Frequency
Saddlers Creek Station	Field	Depth	m	Continuous
		Flow rate	m^3/s	
		Temperature	^oC	
		Total flow	ML	
All other water sampling locations	Field	Depth	m	Quarterly and following 25 mm of rain over a 24-hr period.
		pH	-	
		Electrical conductivity	mS/cm	
		Turbidity	-	
	Laboratory	Total suspended solids	mg/L	
		Total dissolved solids	mg/L	
		Electrical conductivity	mS/cm	
		Turbidity	-	
		Sodium	mg/L	
		Magnesium	mg/L	
		Calcium	mg/L	
		Chloride	mg/L	
		Sulfate	mg/L	
		Bicarbonates	mg/L	
		Potassium	Mg/L	
		Molybdenum	mg/L	
		Selenium	mg/L	
		Antimony	mg/L	
		Arsenic	mg/L	

Monitoring Site	Analysis	Parameter	Units	Frequency
Sediment dams and mine water dams	Field	Depth	m	Within 24 hours of commencement of an overflow from a sedimentation dam or mine water dam.
		pH	-	
		Electrical conductivity	mS/cm	
		Turbidity	-	
	Laboratory	Total suspended solids	mg/L	
		Total dissolved solids	mg/L	
		Electrical conductivity	mS/cm	
		Turbidity	-	
		Sodium	mg/L	
		Magnesium	mg/L	
		Calcium	mg/L	
		Chloride	mg/L	
		Sulfate	mg/L	
		Bicarbonates	mg/L	
		Potassium	mg/L	
		Molybdenum	mg/L	
		Selenium	mg/L	
		Antimony	mg/L	
		Arsenic	mg/L	

Given the waste emplacement areas are rehabilitated, there are currently no identified seepage sites. If any seepage sites around waste emplacement areas are identified they will be included in the surface water monitoring program.

5.4 Surface Water Quality Criteria

Results from Saddlers Creek downstream monitoring location(s) (median over three consecutive samples) will be compared to the relevant trigger values described in **Table 11**. Trigger values are values that trigger further investigation or management action.

Table 11: Downstream Water Quality Trigger Values for Saddlers Creek

Parameter		Units	Trigger	Comment
Field	pH	-	6.5 – 8.5	Preliminary guideline value in WRM (2019)[1]
	Electrical conductivity	µS/cm	7,600	Preliminary guideline value in WRM (2019)[1]
	Turbidity	-		To be derived based on TSS/turbidity relationship (WRM 2019)
Laboratory	Total suspended solids	mg/L	50	Preliminary guideline value in WRM (2019)[1]
	Total dissolved solids	mg/L	4,900	Preliminary guideline value in WRM (2019)[1]

Parameter		Units	Trigger	Comment
	Sodium	mg/L	For interpretation purposes only[2]	
	Magnesium	mg/L	For interpretation purposes only[2]	
	Calcium	mg/L	For interpretation purposes only[2]	
	Chloride	mg/L	For interpretation purposes only[2]	
	Sulfate	mg/L	For interpretation purposes only[2]	
	Bicarbonates	mg/L	For interpretation purposes only[2]	
	Potassium	mg/L	For interpretation purposes only[2]	
	Molybdenum	µg/L	34 (low reliability)	Default guideline values from ANZG (2018). Site-specific triggers will be calculated from reference site data based on ANZG (2018) method for guideline value derivation.
	Selenium	µg/L	11 (95% protection)	
	Antimony	µg/L	9 (low reliability)	
	Arsenic (V)	µg/L	13 (95% protection)	
	Arsenic (III)	µg/L	24 (95% protection)	

Notes:
[1] The preliminary guideline value will be updated with a site-specific trigger value calculated based on ANZECC Section 7.4.4.1 – 80th percentile at the reference site based on the most recent 24 monthly observations.
[2] Sodium, magnesium, calcium, chloride, sulfate, bicarbonates and potassium are not prescribed as toxicants or physical and chemical stressors in aquatic environments as per the ANZECC/ARMCANZ (2000) guidelines. Therefore, these parameters will be monitored for interpretation purposes only.

5.5 Trigger Action Response Plan – Surface Water Quality

A TARP for surface water quality performance criteria, based on response actions in the surface water assessment is presented in **Table 12**. TARPs for water supply for other water users and post-mining water pollution from rehabilitated areas of the site will be developed as part of the updated WMP that will be developed prior to secondary extraction.

Table 12: Trigger Action Response Plan – Surface Water Quality

Status	Trigger	Action	Response
Normal	Performance Measures met. Saddlers Creek, Saltwater Creek and Hunter River aquatic and riparian ecosystems have site-specific in-stream water quality objectives in accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000). Erosion and sediment control works are designed, installed and maintained in accordance with Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004) and 2E Mines and Quarries (DECC, 2008) and the requirements under the POEO Act or Protection of the	Implement surface water management measures in accordance with this sub-plan. Continue normal surface water measurement and evaluation in accordance with this sub-plan. Implement erosion and sediment control inspections and maintenance in accordance with **Appendix 2** of the WMP. Continue monitoring to develop site-specific in-stream water quality objectives in accordance with this sub-plan. Sediment dams designed, installed and maintained in accordance with *Managing Urban Stormwater: Soils and Construction – Volume 1*	None

Status	Trigger	Action	Response
	Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002.	*(Landcom, 2004) and 2E Mines and Quarries (DECC, 2008).*	
Level 1	Results from Saddlers Creek downstream monitoring locations (median over three consecutive samples) are greater than the relevant trigger values described in **Table 10**.	Investigate potential sources of contamination by reviewing upstream water quality.	If trigger exceedance is not due to Project-related activities, then review monitoring frequency. If observed changes are due to Project-related activities, then undertake Level 2 Actions.
Level 2	Investigation following Level 1 trigger review indicates changes are due to Project-related activities.	Investigate potential sources of contamination and undertake any remediation as required. Continue to monitor water quality at location(s) of exceedance. Notify downstream users.	Report non-compliance in accordance with WMP. Undertake adaptive management strategies in accordance with this sub-plan. If relevant, review water management system including pump cut-off switches and alarms, and integrity of water management infrastructure (dam walls, pumps and pipelines). Review water management system integrity monitoring program.

5.6 Geomorphology and Riparian Vegetation Health Baseline Monitoring

5.6.1 Geomorphological Monitoring

Monitoring of potential geomorphic impacts to drainage lines overlying the underground area will primarily be determined from the results of LiDAR survey. A model of surface elevation change over the entire mining area on a 0.5 m grid will enable characterisation of all areas of potential concern for stream stability. Objective comparison of LiDAR-derived digital elevation models (DEMs) over the entire subsidence area will be the primary basis on which impact of second workings on stream morphology will be measured. The geomorphic response to subsidence is likely to be slow, so a catchment-wide re-survey (including LiDAR survey) and reporting of stream geomorphological condition will be undertaken at least every five years in addition to regular visual inspections. Baseline LiDAR surveys of the underground area have already been undertaken.

Further information on subsidence monitoring will be included in the subsequent Water Management Plan that will be developed prior to the commencement of second extraction.

5.6.2 Stream Health Monitoring

The extent of riparian vegetation, the extent of erosion and sedimentation deposits and Swamp Oak health will be used as an indicator of stream health and to provide supplementary information on potential geomorphic impacts to drainage lines. Monitoring will be undertaken quarterly by taking photographs at each of the Saddlers Creek surface water monitoring sites (as shown in **Figure 2**):

- Saddlers Creek Upstream (U/S)
- W3
- Saddlers Creek Downstream (D/S) (W4- Bowfield)

These monitoring sites will be identified by GPS or permanent photographic ID post. Photographs will be taken of the relevant bed and bank features looking upstream and downstream. These photographs will be documented with the location, direction and date as well as a log of erosional and depositional features at each location. Data on the baseline geomorphic conditions of streams in the underground area is included in the geomorphology assessment for the Project EIS. Stream health monitoring has commenced, and will continue, in order to provide information on baseline geomorphology prior to the commencement of second workings. Further information on stream health monitoring to monitor subsidence impacts, including trigger values and a TARP, will be included in the subsequent Water Management Plan that will be developed prior to secondary extraction.

Monitoring of the shallow, alluvial bores in the Saddlers Creek alluvium (MW1, MW2, MB2-Alluvial and MB3-Alluvial) will be undertaken in accordance with the Groundwater Management Plan. Maxwell has an existing data-sharing agreement with MAC and will periodically request monitoring data collected from the shallow, alluvial bores in Saddlers Creek (GW45 and GW47).

The outcomes of the riparian vegetation monitoring program will be reported in the Annual Review. The Annual Review will also identify if any additional monitoring sites are required, or if optimisation of the existing monitoring sites should be undertaken.

5.7 Meteorological Monitoring

Meteorological monitoring is undertaken at on-site Automatic Weather Stations AWS-1 and AWS-2 to provide data to support environmental monitoring and design work. The following parameters will continue to be monitored at the meteorological monitoring stations:

- Rainfall
- Sigma theta
- Temperature at 2 m
- Temperature at 10 m
- Total solar radiation
- Wind direction at 10 m
- Wind speed at 10 m

5.8 Annual Review and Surface Water Monitoring Report

A summary of analyses of surface water monitoring data shall be reported in the Annual Review in accordance with **Section 5.2** of the WMP. These summaries will:

- compare the data to predictions made in the Project EIS;
- identify trends in the data; and
- identify any management implications.

The Annual Review will report on modifications to monitoring sites and identify if any additional monitoring sites are required, or if optimisation of the existing monitoring sites should be undertaken. If monitoring indicates performance of the water management system is not consistent with the relevant performance criteria then the issue will be investigated as an incident, as described in the WMP.

Maxwell shall provide a Surface Water Monitoring Report the NSW Environment Protection Authority (EPA) each year, which shall include the following information from the respective monitoring period:

- the date and time of the monitoring;
- the location of the monitoring;
- analysis and trends for monitoring parameters;
- an explanation for changes in parameter concentrations with a summary of any investigations or mitigation actions undertaken.

This information may be incorporated into the Annual Review.

5.9 EPBC Impact Response Plan

In accordance with Conditions 6 and 7 of EPBC Approval 2018/8287, Maxwell would prepare an EPBC Impact Response Plan in the event monitoring detects an exceedance of the 'Level 2' triggers outlined in Section 5.5. The EPBC Impact Response Plan would be prepared by a suitably qualified water resources expert and describe all potential and actual impacts to water resources arising from the exceedance.

The EPBC Impact Response Plan would be published within three months of the exceedance being detected, unless an alternative timeframe is agreed with the Commonwealth Minister for the Environment. An EPBC Impact Response Plan would not be prepared for exceedances of 'Normal' or 'Level 1' triggers, as these have been established to provide an early warning of any potential performance measure exceedances and therefore may be exceeded during the normal course of operations. An EPBC Impact Response Plan would not be prepared following an uncontrolled mine water discharge (as outlined in Section 5.2) unless it is accompanied by an exceedance of a Level 2 water quality trigger as outlined in Section 5.5.

6 CONTINUOUS IMPROVEMENT

Results of surface water quality monitoring will be reviewed regularly and used to determine if the surface water management system or operating rules require any improvements.

7 DOCUMENT INFORMATION

7.1 References

ANZECC and ARMCANZ (2000). *National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

ANZG (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines.

Gippel, C.J (2019) Maxwell Project, Environmental Impact Statement, Technical Study Report, Geomorphology Assessment, Fluvial Systems Pty Ltd, Stockton, Malabar Coal Limited, Sydney, June.

HydroSimulations (2019) Maxwell Project: Groundwater Assessment – In support of an EIS.

WRM Water & Environment Pty Ltd (2019) Surface Water Assessment – Maxwell Project.

7.2 Definitions and Abbreviations

Refer to **Appendix 10** of the WMP.

APPENDIX 4 – GROUNDWATER MANAGEMENT PLAN

Appendix 4 - Groundwater Management Plan

1 INTRODUCTION

1.1 Purpose and Scope

The purpose of this sub-plan is to satisfy the requirements of the Development Consent for State Significant Development (SSD) 9526 Schedule 2, Condition B42(e)(v), to prepare a Groundwater Management Plan (GMP). This sub-plan applies to all activities within the Development Consent SSD 9526 consent boundary and the Antiene Rail Spur Development Consent (DA 106-04-00) boundary.

In accordance with Schedule 2, Condition A24(a) of Development Consent SSD 9526, this sub-plan has been prepared for stage 1 activities only. Stage 1 activities include early preparation works, construction and first workings. Early preparatory works are defined in Section 3.4.2 of the Maxwell Underground (UG) Project Environmental Impact Statement (Project EIS) and construction and first workings are defined in Development Consent SSD 9526). A copy of the approval from the Planning Secretary to stage this plan is provided in **Appendix 5** of the Water Management Plan (WMP). This plan will be updated prior to the commencement of second workings.

1.2 Objectives

The objectives of this plan are to:

- Identify potential water impacts;
- Detail all relevant statutory requirements;
- Detail the controls that are implemented to minimise water impacts;
- Detail the water monitoring system to assess water impacts;
- Provide a protocol to evaluate compliance; and
- Detail the procedure for reporting water criteria exceedances to relevant stakeholders.

2 PLANNING

2.1 Regulatory Requirements

This sub-plan describes groundwater management to meet relevant statutory requirements within Development Consent SSD 9526. Requirements of Development Consent SSD 9526 that relate to groundwater management, and where they are addressed in this document, are detailed in **Section 2.4**.

2.2 Maxwell Project EIS and Supporting Document Commitments

A surface water and groundwater assessment were undertaken for the Project EIS (published on 14 August 2019). Commitments in the Project EIS that relate to groundwater management, and where they are addressed in this sub-plan, are detailed in **Section 2.4**.

2.3 Preparation and Consultation

Schedule 2, Condition B42(a) of Development Consent SSD 9526, requires that this plan be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning

Secretary. Maxwell has engaged Matt Briody (Principal Engineer, WRM Water & Environment Pty Ltd) to assist with the preparation of the surface water components of the sub- plan. Maxwell has also engaged Dr Noel Merrick (Senior Principal Hydrogeologist at HydroAlgorithmics) to assist with the preparation of the groundwater components of the sub-plan. A copy of the endorsement by the Planning Secretary is included in **Appendix 8** of the WMP.

In accordance with Schedule 2, Condition B42(b) of Development Consent SSD 9526, this plan has been prepared in consultation with DPIE Water. Outcomes of consultation with DPIE Water are presented in **Appendix 9** of the WMP.

2.4 Groundwater Management Plan Requirements

Requirements of Development Consent SSD 9526 and where they are addressed in this plan are presented in **Table 1**.

Table 1: Requirements of Development Consent SSD 9526

Clause	Requirement	Section of Plan
B29	Prior to commencing extraction of ROM coal under this consent, the Applicant must notify owners of licensed privately-owned groundwater bores that are predicted to have a drawdown of greater than 2 metres as a result of the development.	4.3.1
B30	The Applicant must provide a compensatory water supply to any landowner of privately-owned land whose rightful water supply is adversely and directly impacted (other than an impact that is minor or negligible) as a result of the development, in consultation with DPIE Water, and to the satisfaction of the Planning Secretary.	4.3.2
B31	The compensatory water supply measures must provide an alternative long-term supply of water that is equivalent, in quality and volume, to the loss attributable to the development. Equivalent water supply should be provided (at least on an interim basis) as soon as practicable after the loss is identified, unless otherwise agreed with the landowner.	4.3.2
B32	If the Applicant and the landowner cannot agree on whether the loss of water is to be attributed to the development or the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.	4.3.2
B33	If the Applicant is unable to provide an alternative long-term supply of water, then the Applicant must provide compensation, to the satisfaction of the Planning Secretary. ***Note:*** *The Water Management Plan (see condition B42) is required to include trigger levels for investigating potentially adverse impacts on water supplies.*	4.3.2
B34	In the event of any complaint relating to a privately-owned licensed groundwater bore which may, in the opinion of the Planning Secretary, have been adversely and directly impacted as a result of the development (other than an impact that is minor or negligible), the Applicant must, as soon as practicable, facilitate the provision of a temporary water supply, pending the outcome of any groundwater investigation and/or the provision of an alternative long-term supply of water as required under conditions B30 and B31, to the satisfaction of the Planning Secretary.	4.3.2

<table>
<tr><th>Clause</th><th>Requirement</th><th>Section of Plan</th></tr>
<tr><td>B40</td><td>The Applicant must ensure that the development complies with the performance measures in Table 4.
Table 4: Water management performance measures
<table>
<tr><th>Feature</th><th>Performance Measure</th></tr>
<tr><td>Saddlers Creek, Saltwater Creek and Hunter River alluvial aquifers</td><td>• Negligible impacts to any alluvial aquifer as a result of the development, beyond those predicted in the document/s listed in condition A2(c), including:
• negligible change in groundwater levels;
• negligible change in groundwater quality; and
• negligible impact to other groundwater users</td></tr>
</table></td><td>4.2, 4.3</td></tr>
<tr><td>B42</td><td>Prior to the commencement of construction activities, the Applicant must prepare a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;
(b) be prepared in consultation with DPIE Water;
(c) describe the measures to be implemented to ensure that the Applicant complies with the water management performance measures (see Table 4)
(d) utilise existing data from nearby mines and build on existing monitoring programs, where practicable;
(e) include a:</td><td>2.3
2.3
4
Appendix 3 of WMP</td></tr>
<tr><td></td><td>(v) Groundwater Management Plan that includes:
• detailed baseline data regarding groundwater levels, yield and quality for privately-owned groundwater bores and the condition of GDEs potentially impacted by the development;
• a program to periodically review and update data regarding groundwater levels, yield and quality at privately-owned groundwater bores in the vicinity of the development
• a detailed description of the groundwater management system, including a commitment to install additional shallow monitoring bores within the Saddlers Creek alluvium, in consultation with DPIE Water;
• groundwater performance criteria, including trigger levels for identifying and investigating any potentially adverse groundwater impacts (or trends) associated with the development, on:
– regional and local aquifers (alluvial and hard rock); and
– licensed privately-owned groundwater bores;</td><td>3, 4.3
5.2.2
5.2.3
5.3, 5.4
5.5</td></tr>
</table>

Clause	Requirement	Section of Plan
	• a program to monitor and evaluate:	
	– compliance with the relevant performance measures listed in Table 4 and the performance criteria of this plan;	5.2
	– water loss/seepage from water storages into the groundwater system, including seepage from the final voids;	5.2, Section 5 of Appendix 1
	– groundwater inflows, outflows and storage volumes, to inform the Site Water Balance;	Section 5 of Appendix 1
	– impacts on water supply for other water users;	5.5
	– impacts on GDEs (including Swamp Oak Forest and stygofauna);	4.2
	– the hydrogeological setting of any nearby alluvial aquifers and the likelihood of any indirect impacts from the development; and	4.2
	– the effectiveness of the groundwater management system;	5.2, 5.3, 5.5
	• reporting procedures for the results of the monitoring program, including notifying other water users of any elevated results;	5.5, 5.6, 5.7
	• a trigger action response plan to respond to any exceedances of the relevant performance measures and groundwater performance criteria, and repair, mitigate and/or offset any adverse groundwater impacts of the development;	5.3, 5.4, 5.5
	• a program to periodically validate the groundwater model for the development, including an independent review of the model every 3 years, and comparison of monitoring results with modelled predictions;	5.1, 5.6
	• a program to undertake further hydraulic testing of the fault in the vicinity of Saddlers Creek within the first three years of mining operations and incorporate the results into subsequent reviews of the groundwater model; and	5.1
	• a plan to respond to any exceedances of the performance measures.	5.3, 5.4, 5.5
E5	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	
	(a) a summary of relevant background or baseline data;	3
	(b) details of:	
	(i) the relevant statutory requirements (including any relevant approval, licence or lease conditions);	2.1
	(ii) any relevant limits or performance measures and criteria; and	5.3, 5.4, 5.5
	(iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	5.3, 5.4, 5.5
	(c) any relevant commitments or recommendations identified in the document/s listed in condition A2(c);	2.4
	(d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	4
	(e) a program to monitor and report on the:	
	(i) impacts and environmental performance of the development; and	5
	(ii) effectiveness of the management measures set out	5

Clause	Requirement	Section of Plan
	pursuant to condition E5(d);	
	(f) A contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	6
	(g) a program to investigate and implement ways to improve the environmental performance of the development over time;	7
	(h) a protocol for managing and reporting any: (i) incident, non-compliance or exceedance of any impact assessment criterion or performance criterion); (ii) complaint; or (iii) failure to comply with other statutory requirements;	4.1 of WMP 4.3 of WMP 4.2 of WMP
	(i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and (j) a protocol for periodic review of the plan. ***Note:*** *The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*	5.2 and 5.4 of WMP 5.1 of WMP

Maxwell Project EIS and supporting document commitments related to groundwater management, and where they are addressed in this sub-plan are presented in **Table 2**.

Table 2: Maxwell Project EIS and supporting document commitments

Source	Details	Reference
EIS Section 6.4.4	**Groundwater monitoring** • Groundwater monitoring for the Project would be undertaken to demonstrate compliance with regulatory requirements. • In addition, consistent with the recommendation made by Dr Frans Kalf, Malabar would establish additional alluvial monitoring bores in the Saddlers Creek alluvium. • Manual groundwater level monitoring would be conducted for all monitoring bores, with dataloggers installed within selected bores to gather temporal variations in water levels. Data would also be downloaded from the existing VWPs, pressure readings recorded and converted to groundwater elevations within a central database. • Ongoing monitoring would enable natural groundwater level fluctuations (such as responses to rainfall) to be distinguished from potential groundwater level impacts due to depressurisation resulting from Project. Ongoing monitoring of groundwater levels would also be used to assess the extent and rate of depressurisation against model predictions. • Yearly reporting of the water level results from the monitoring network would be included in the Annual Review. The reporting would include comparison to climate trends and surface water monitoring results to identify changes in the	5 5.2.3 5.2 5.2, 5.6 5.6

Source	Details	Reference
	surface water and groundwater interactions. The Annual Review would also identify if any additional monitoring sites are required, or if optimisation of the existing monitoring sites should be undertaken	
EIS Section 6.4.4	**Groundwater Quality** • Groundwater quality sampling would be conducted to monitor groundwater quality during and post-mining. Additional data would be collected prior to commencement of mining, particularly for bores recently installed as part of the Project (i.e. GW01S, GW01D, GW02S, GW02D, MW1, MW2 and MW3). • Sampling would include collection of field analytes of pH and EC on a quarterly basis, as well as annual sampling for laboratory analysis of a full suite of analytes to determine any changes in beneficial groundwater. • Yearly reporting of the water quality results from the monitoring network would be included in the Annual Review. The Annual Review would consider if any additional monitoring sites are required, or if optimisation of the existing monitoring sites, frequency of sampling and analytical suite should be undertaken.	5.2 5.2 5.6
EIS Section 6.4.4	**Numerical Model Review** • After the first three years of mining, and every five years thereafter, the validity of the groundwater model predictions would be assessed and if the data indicates significant deviation from the model predictions, an updated groundwater simulation model would be developed.	5.1
EIS Section 6.4.4	**Make Good Provisions** Should monitoring or an investigation show greater than 2 m drawdown at a privately-owned bore, and the drawdown is attributable to the Project, 'make good' provisions for the affected groundwater user would be implemented, and may include: • deepening the affected groundwater bore; • construction of a new groundwater bore; and/or • provision of an alternative water supply of suitable quality and quantity.	4.3, 5.5
EIS Section 6.4.5	**Adaptive Measures** • Water level and water quality triggers (EC, pH and sulphate) would be developed as part of the Water Management Plan for the Project. In the event groundwater monitoring identifies an exceedance of an established trigger, Malabar would implement a response plan in accordance with the Water Management Plan for the Project. • The observed groundwater levels would also be reviewed against the model predictions on an annual basis. A suitably qualified hydrogeologist would determine when water levels deviate significantly from that predicted by the groundwater model and determine the reason for this deviation. The review would consider the impact of mining, and other factors that could result in declining water levels including climatic	5.3, 5.4, 5.5 5.6

Source	Details	Reference
	conditions, rainfall recharge and pumping from privately-owned bores and/or other mining operations. • During the Project, additional hydrogeological data would be collected, including details on lithology, groundwater intersection and intersection of structures (i.e. faults and dykes). The additional hydrogeological data would be stored and made available as required for future groundwater investigations and/or updates to the model.	5.1

3 BASELINE DATA

3.1 Existing Groundwater Regime

Three coal measure sequences occur within the Hunter Coalfield; these include the Early to Middle Permian Greta Coal Measures, the Late Permian Wittingham Coal Measures and the overlying Late Permian Newcastle Coal Measures (formerly known as the Wollombi Coal Measures) as shown in **Figure 1**. The target seams for the Maxwell UG Project (Whynot, Woodlands Hill, Arrowfield and Bowfield Seams) are within the Jerrys Plains Subgroup, forming part of the upper and middle units of the Wittingham Coal Measures as shown in **Figure 2**.

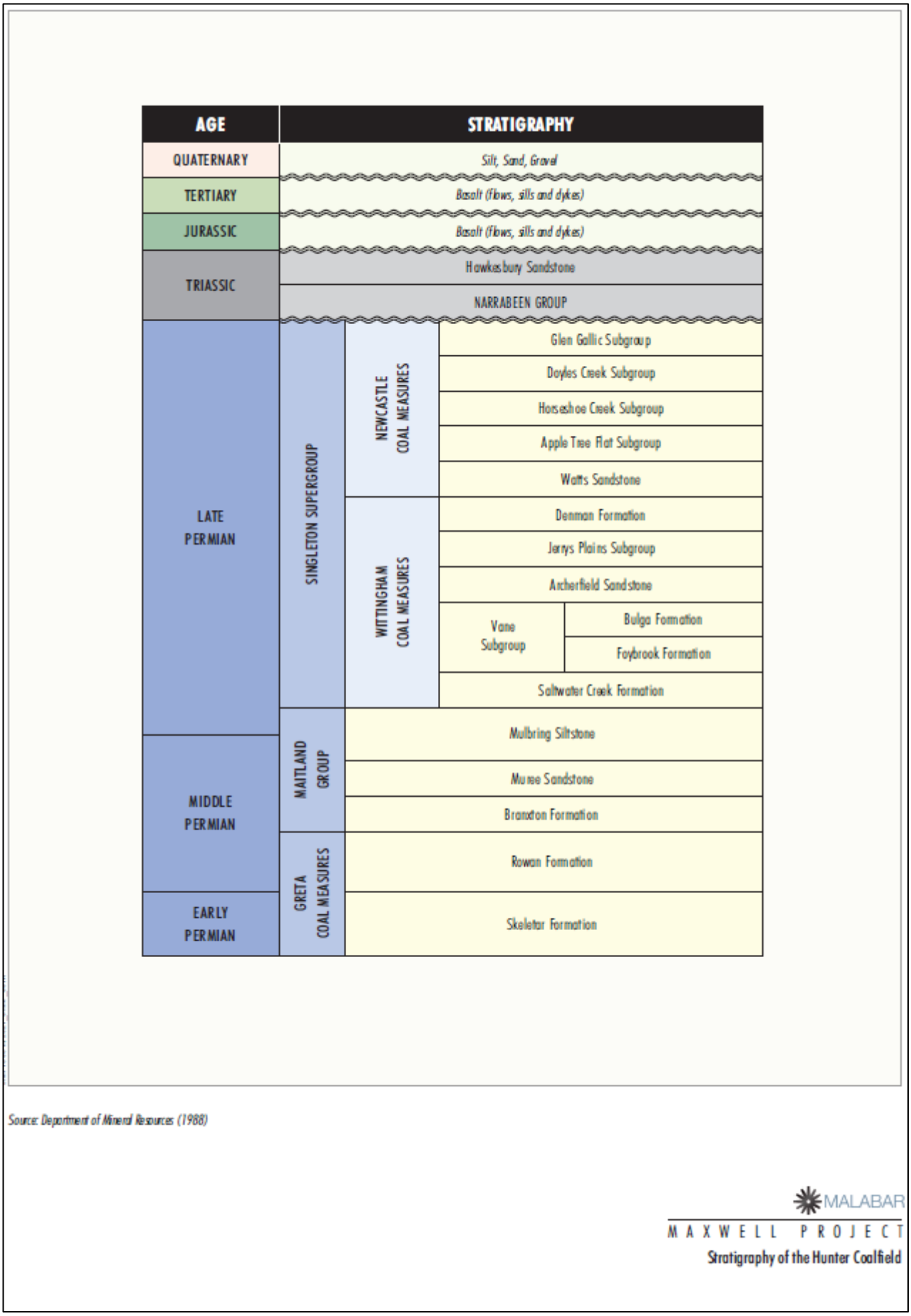
A conceptual hydrogeological model of the existing groundwater regime was developed by HydroSimulations (2019) for the groundwater assessment for the Project EIS. The model was based on a review of the available baseline groundwater data and relevant water sharing plans. The three main groundwater systems identified in the Project area are:

- alluvium associated with the Hunter River;
- regional regolith and alluvium associated with Saddlers Creek; and
- Permian strata that host the coal measures.

The Hunter River alluvium is the most productive aquifer in the region and comprises silt underlain by sands and gravels, reaching a thickness of up to 30 metres (m). Groundwater occurs within the alluvium at depths of around 5 m to 10 m below surface, generally over 2 m below the base of the Hunter River; this means that the river is losing water to the groundwater system.

Groundwater levels within the alluvium have remained relatively stable over time, despite periods of below average rainfall. This indicates a degree of recharge to the alluvium from the Hunter River, which has regulated flows. The alluvial sediments associated with the Hunter River, south of the underground area, are in the Upstream Glennies Creek Management Zone of the Hunter Regulated River Alluvial Water Source. The Jerrys Water Source and the Hunter Regulated River Alluvial Water Sources are regulated under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*. The thick sequences of permeable sands and gravels in the Hunter River alluvium are considered “highly productive” in accordance with the NSW Aquifer Interference Policy (AIP). The edge of the Hunter River alluvium primarily consists of silts and clays that are largely unsaturated and considered “less productive”.

The Saddlers Creek alluvium comprises surficial silts and clays overlying a heterogeneous distribution of clays, silts, sands and gravels. Spatially, the alluvium is variably saturated. Localised perched water tables occur where waterbodies continue to hold water throughout the dry period (e.g. pools along Saddlers Creek). Where groundwater is present, it occurs at depths of around 3 m to 10 m below surface. The alluvium is unconfined and is recharged from rainfall and potentially stream flow following peak rainfall events. There is also potential for upward leakage from the Permian coal measures at the lower reaches of Saddlers Creek. The alluvial sediments associated with Saddlers Creek and Saltwater Creek are in the Jerrys Management Zone of the Jerrys Water Source. The alluvium along Saddlers Creek is considered to fall within the category of “less productive”.



Source: Department of Mineral Resources (1988)

Figure 1: Stratigraphy of the Hunter Coalfield

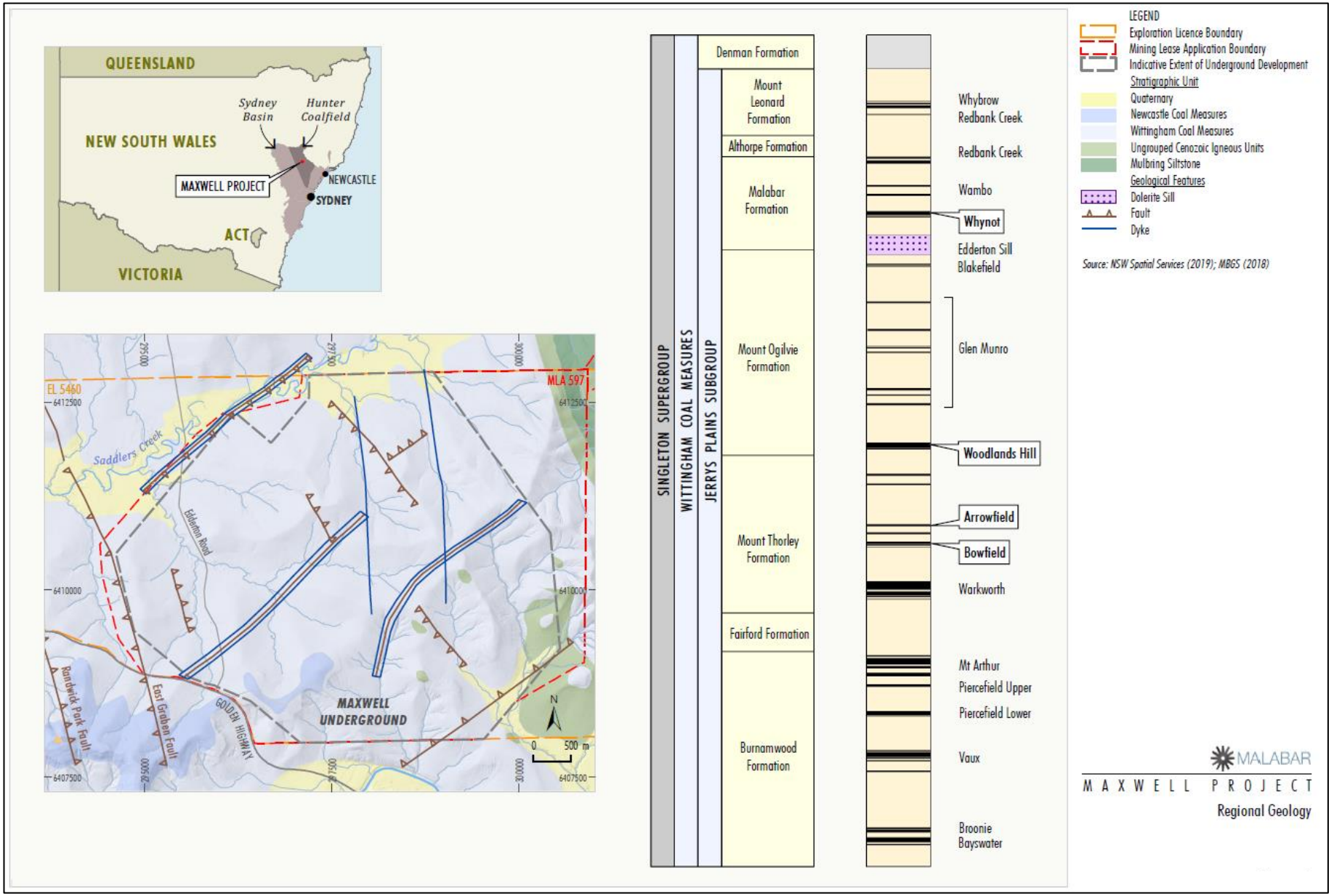


Figure 2: Regional Geology

At Maxwell Infrastructure, the regolith material overlying the Greta Coal Measures is largely unsaturated or only has water present at depth. In 2019, bores GW01S and GW02S were installed within the base of the weathered regolith material and indicated the presence of water over 14 m below surface. Data from neighbouring AGL bores indicates that the regolith is recharged locally by the Liddell Ash Dam.

The coal seams are the main groundwater bearing units within the Permian sequences, with low permeability interburden generally confining the individual seams. Vertical movement of groundwater (including recharge) is limited by the confining interburden layers, meaning that groundwater flow is primarily horizontal through the seams. Regionally, groundwater within the Permian coal measures flows in a southerly direction.

The underground mine coal resource is located within the Jerrys Plains Subgroup, forming part of the upper and middle units of the Wittingham Coal Measures, and is wholly located within the Sydney Basin-North Coast Groundwater Source. The former Drayton Mine (at the Maxwell Infrastructure) targeted the Greta Coal Measures where they occur at outcrop along the Muswellbrook Anticline. The Maxwell Infrastructure is located on the boundary of the Sydney Basin-North Coast Groundwater Source and the New England Fold Belt Coast Groundwater Source. Groundwater associated with the Permian coal measures is also categorised as “less productive”.

3.2 Groundwater Levels

AGE (2006) predicted groundwater inflows to the North, South and East Voids at Maxwell Infrastructure would cause groundwater level drawdown within the Greta Coal Measures extending up to 4 km north beyond Ramrod Creek, east to Lake Liddell and south to Plashett Reservoir. Several groundwater monitoring bores at Maxwell Infrastructure intersect the fresh Greta Coal Measures to monitor the predicted drawdown.

Hydrographs of past and present monitoring bores intersecting the Greta Coal Measures and cumulative departure from mean[1] (CDM) are shown on **Figure 3**. The bores in the Greta Coal Measures record a general decline in groundwater levels since monitoring commenced in 1982, often contrary to the increase in groundwater levels expected in wet periods, due to the influence of mining.

Mining at the Maxwell Infrastructure area was generally above the water table until 1994, after which the pit began to interact with the Permian coal seams; however, other mines and users in the area may also have interacted with the groundwater system prior to 1994. The available groundwater level data indicates that the North Void currently acts as a groundwater sink with groundwater flowing towards the pit area.

The locations of currently existing groundwater bores included in **Figure 3** are shown in **Figure 7.**

[1] Also called Cumulative Rainfall Deviation (CRD) or Rainfall Residual Mass (RRM).

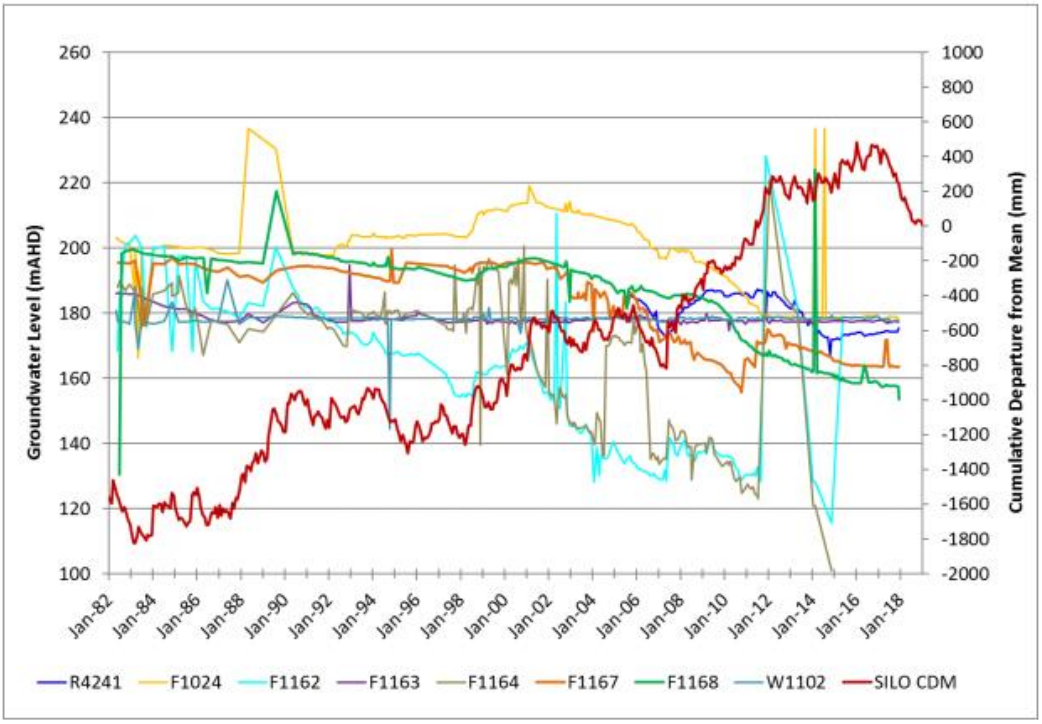


Figure 3: Hydrographs – Greta Coal Measures (Source: HydroSimulations (2019))

3.2.1 Maxwell Infrastructure Baseline Data

For stage 1 activities, the relevant existing groundwater monitoring bores for baseline purposes are:

- F1162;
- F1164;
- R4241;
- GW01S and GW01D; and
- GW02S and GW02D.

Hydrographs for each bore are shown in **Figure 4** and **Figure 5**, along with the CRD indication of climatic trend.

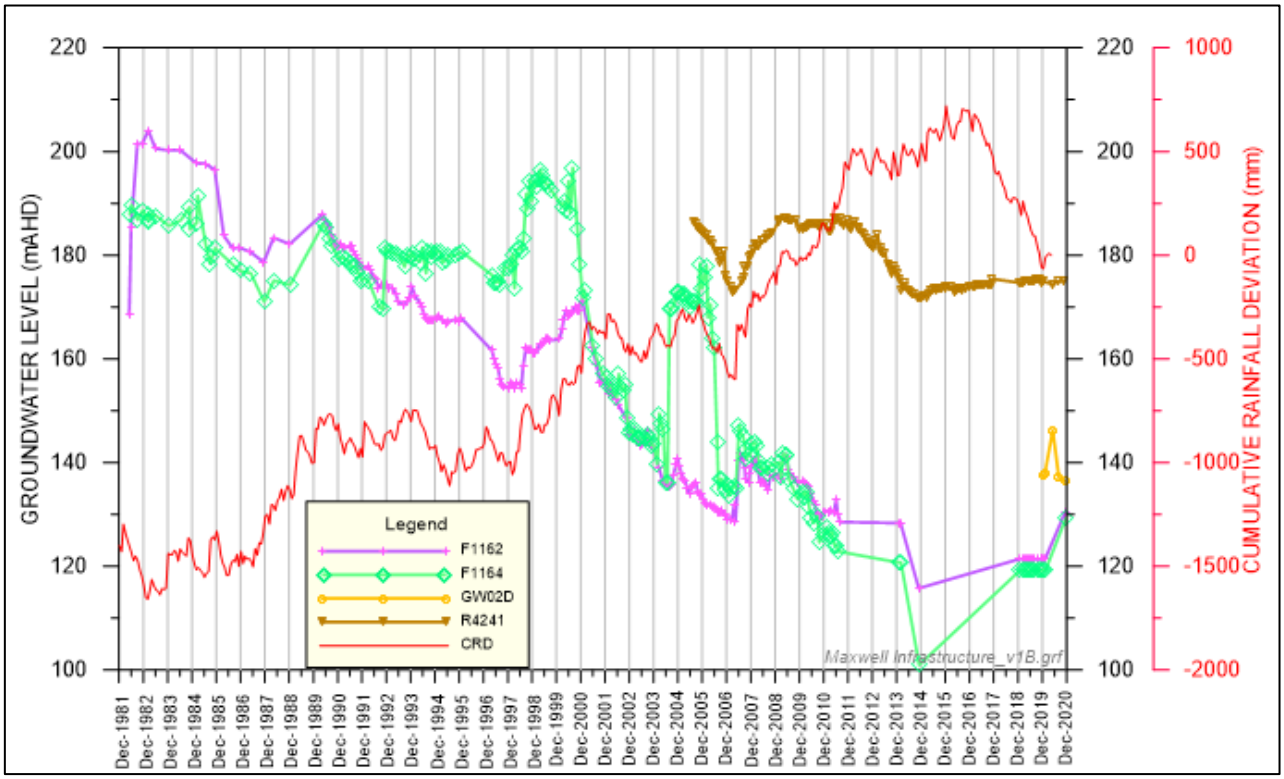


Figure 4: Groundwater hydrographs in the Maxwell Infrastructure area – Set A

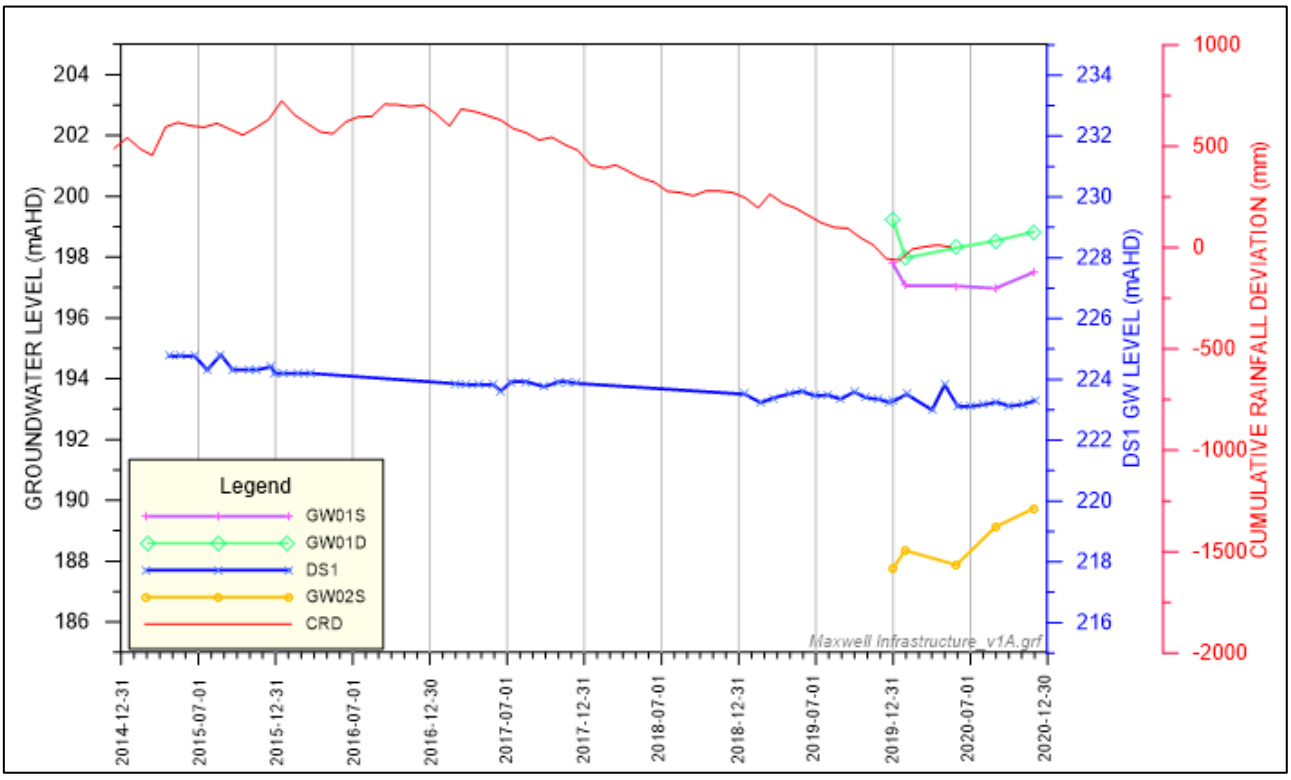


Figure 5: Groundwater hydrographs in the Maxwell Infrastructure area – Set B

3.2.2 Maxwell Underground Baseline Data

For stage 1 activities, the relevant existing groundwater monitoring bores for baseline purposes are:

- MW1;
- MB3-Alluvial;
- MB3-Regolith;
- DD1025; and
- DD1032.

Hydrographs for each bore are shown in **Figure 6**, along with the CRD indication of climatic trend.

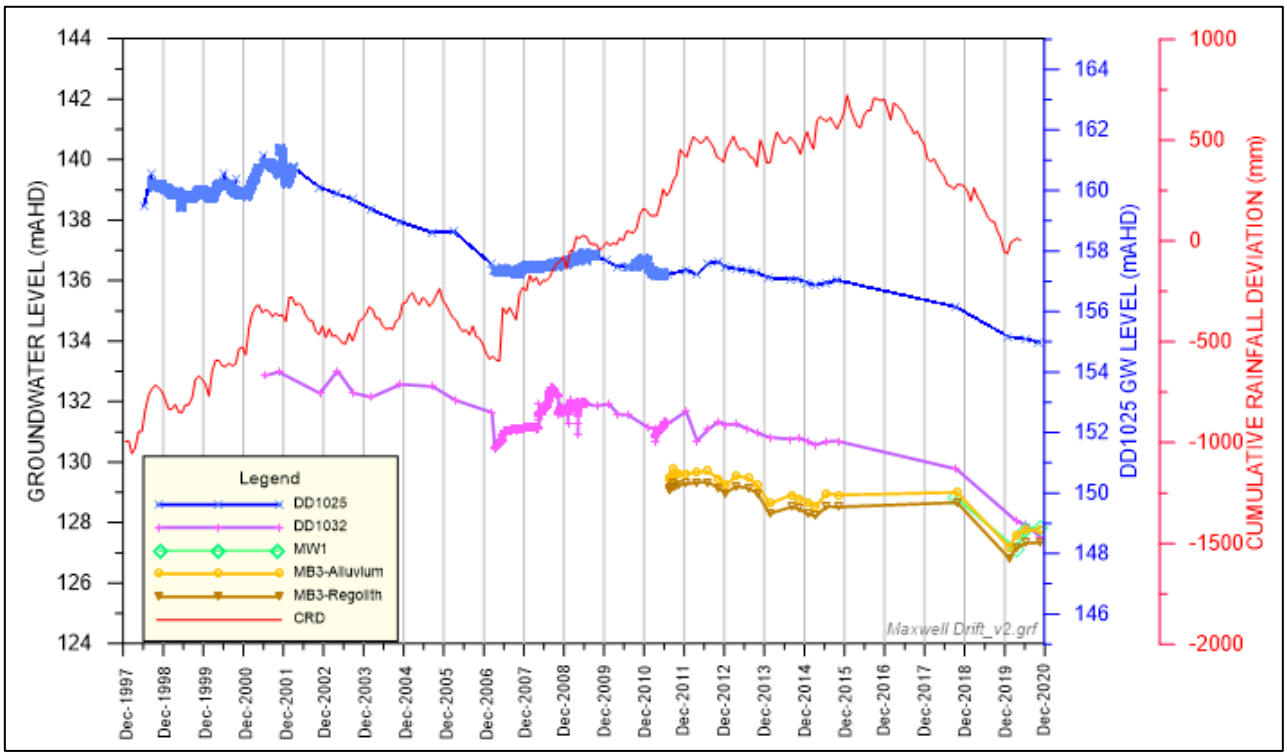


Figure 6: Groundwater hydrographs in the Maxwell Underground area close to drift development

3.3 Groundwater Quality

An analysis of water quality attributes of groundwater in the vicinity of the site is provided in the Project EIS (HydroSimulations 2019) and summarised in this section. The description of the existing groundwater quality in the vicinity of the site was developed using historical monitoring data for bores at the Maxwell Infrastructure, Maxwell Underground, Spur Hill and Mt Arthur Coal (MAC).

Salinity is a key constraint to water management and groundwater use and can be described by Total Dissolved Solids (TDS) concentrations:

- The Hunter River alluvium is generally fresh but can range between fresh to moderately saline. Measured TDS averages 791 mg/L and ranges between 354 mg/L and 5,070 mg/L.
- Alluvium within the upper reaches of Saddlers Creek is generally moderately saline, with an average TDS of approximately 3,400 mg/L.
- Where water is present within the regolith material, it is generally moderately saline. TDS of groundwater from the regolith ranges between 1,196 mg/L and 14,941 mg/L with an average of approximately 5,400 mg/L.
- The Wittingham Coal Measures generally record moderately saline water quality, with an average TDS of 2,932 mg/L for the interburden and 2,658 mg/L for the coal.
- Groundwater in the Greta Coal Measures is moderately saline with an average TDS of 2,858 mg/L.

Groundwater quality data have been compared to the Default Guideline Values (DGVs) for aquatic ecosystems and primary industries, as well as the Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) guidelines for drinking water, short-term and long-term irrigation and specific guideline values for livestock watering (beef cattle). Based on a review of the available groundwater quality data, HydroSimulations (2019) concluded:

- None of the nearby groundwater systems is considered suitable for drinking water or freshwater aquatic systems due to elevated EC, TDS, chloride, sodium, and some metals (i.e. aluminium, copper and manganese).
- The "highly productive" alluvial groundwater may be suitable for short-term irrigation (dependent on crop salt tolerance).
- All groundwater sources are unlikely to be suitable for long-term irrigation due to elevated salinity, iron and manganese. However, it is noted that there are several registered bores potentially utilising the Hunter River alluvium for irrigation purposes.

Baseline groundwater data will continue to be collected through the monitoring program described in **Section 5**. Updated baseline data will be presented in the updated water management plan to be prepared prior to secondary extraction.

Potentially impacted privately-owned bores will be monitored, upon agreement, to establish baseline water quality and level data.

3.4 Groundwater Dependent Ecosystems

An integrated assessment of potential impacts on Groundwater Dependent Ecosystems (GDEs) was undertaken for the Project EIS (Malabar Coal 2019) and identified the following potential GDEs in the vicinity of the Project:

- stygofauna in the Hunter River and Saddlers Creek alluvium (although none of the taxa collected were endemic to the site or surrounds); and
- Swamp Oak Forest (*Casuarina glauca*) identified along Saddlers Creek, Saltwater Creek and the lower sections of their tributaries.

An Aquatic Ecology and Stygofauna Assessment was undertaken for the Project by Eco Logical (2019) and included sampling 13 groundwater bores for stygofauna. One known and two likely stygofauna taxa were collected from the Hunter River alluvium and one likely stygofauna taxon was collected from the Saddlers Creek alluvium. None of the stygofauna taxa collected are endemic to the site and surrounds, as all are widespread along aquifers of the Hunter River and associated tributaries.

The Swamp Oak along Saddlers Creek and Saltwater Creek are considered to be a Type 2 GDE (ecosystems dependent on the surface expression of groundwater, i.e. baseflow) as defined in the *Australian Groundwater-Dependent Ecosystems Toolbox* (Richardson *et al*., 2011 in Malabar Coal 2019). Negligible reduction in baseflow due to subsidence is predicted for Saddlers Creek or Saltwater Creek. Consequently, it is unlikely that the predicted Project groundwater drawdown from subsidence would adversely impact the Swamp Oak along either Saddlers Creek or Saltwater Creek (Hunter Eco 2019; Malabar Coal 2019). Further, first workings are not predicted to cause subsidence, impact groundwater levels or GDEs.

4 IMPLEMENTATION

4.1 Performance Measures

The performance measures for Saddlers Creek, Saltwater Creek and Hunter River alluvial aquifers are:

- Negligible impacts to any alluvial aquifer as a result of the development, beyond those predicted in the Project EIS including:
    - negligible change in groundwater levels;
    - negligible change in groundwater quality; and
    - negligible impact to other groundwater users.

4.2 Predicted Impacts of Construction and First Workings

The final voids within the Maxwell Infrastructure area are predicted to act as groundwater sinks and are therefore unlikely to impact on water quality within the surrounding stratigraphy (HydroSimulations 2019).

A groundwater assessment for the Project EIS was undertaken by HydroSimulations (2019). A numerical regional groundwater model was used to simulate potential effects of changes in hydraulic properties on local and regional aquifer systems and groundwater users as a result of sub-surface fracturing of overburden above mining panels. The first workings comprise a network of access roadways (i.e. drifts and main headings) that will be designed to remain stable for the life of the mine. The second workings associated with the partial pillar extraction and longwalls will however result in subsidence that would develop above the area of secondary extraction. Site specific alluvial investigations, including drilling transects, indicate there is no alluvium within the footprint of the MEA (Gippel 2019). Also, no excavation of the alluvial sediments associated with the Saddler Creek is proposed. First workings and construction activities are therefore not predicted to impact groundwater levels, other groundwater users, groundwater quality, baseflows in Saddlers Creek or Saltwater Creek or GDEs. Impacts of second workings and mitigation measures will be described in the subsequent Water Management Plan that will be developed prior to secondary extraction.

4.3 Potentially Impacted Bores

A search of the online WaterNSW database of registered bores and a bore census were undertaken for the Groundwater Assessment for the Project EIS (HydroSimulations, 2019). The bore census identified 85 landholder bores within 10 km of the Project area including three unregistered wells and one unregistered steel bore that are currently unused. During the census, landholders with privately-owned groundwater bores (within 10 km of the Project) were offered water quality testing to establish baseline data. None of the landholders of the privately owned bores listed in **Table 3** accepted the offer for water quality testing of their bores and wells.

No bores in the “highly productive” Hunter River alluvium or the Saddlers Creek alluvium are predicted to experience cumulative drawdowns greater than 2 m. One privately-owned bore (GW029660) is predicted to experience cumulative drawdown greater than 2 m as a result of second workings at the site and MAC operations (including both open cut and approved underground operations) (refer to **Table 3**). The bore has an existing water column of 35 m and therefore the yield of the bore is unlikely to be materially affected by the Project. The maximum depressurisation due to second workings is predicted to occur within the recovery period. The predicted impact to GW029660 is due to the conservative assumptions within the recovery model (including averaged rainfall recharge and allowing groundwater level drawdown to extend across areas of mapped faults, which would likely act as barriers to flow in practice).

Two bores (GW029647 and GW029648) apparently intersect the shallow Permian coal measures, at depths of 36.6 m and 31.1 m and are thought to be dry given the predicted water table is approximately 20 m below the base of the bores. Whilst cumulative depressurisation of approximately 3 m is predicted to extend beneath the bores, the bores would be unaffected if they are already dry.

Five BHP-owned water supply bores accessing less productive hard rock groundwater systems are predicted to have over 2 m drawdown due to the cumulative impacts of second workings at the site in combination with MAC operations. All potentially affected BHP-owned bores intersect the Permian coal measures and are located north to north-west of the site, near MAC. All have a listed purpose of stock and domestic purposes and are constructed to depths of between 33 m and 91 m below surface (refer to **Table 3**).

Table 3: Predicted drawdown at privately-owned and mine-owned water supply bores

Bore ID	Use	Land Ownership	Bore Depth (mbgl)	Baseline Water Level (mbgl)	Predicted Water Level (mbgl)	Water column (m)	Maximum Drawdown Due to Project (m)	Maximum Cumulative Drawdown (m)
GW029660	Stock	Private	74.7	39.6	22.2	35.1	2.3	3.7
GW049223	Stock	BHP	67.1	-	1.9	65.2*	13.5	13.5
GW031622	Stock	BHP	91.4	30.5	40.0	60.9	3.9	10.2
GW031859	Stock	BHP	61	22.9	17.1	38.1	4.3	8.7
GW032077	Stock	BHP	53.3	28.7	42.6	13.9	3.1	11.6
GW032512	Stock	BHP	33.5	-	14.2	19.3*	1.8	17.6

Notes:
Baseline Water Level – water level recorded in recent years from the bore census or public domain documents.
Predicted Water Level – predicted water level for the location from the end of the calibration model (Dec 2018).
** Anticipated water column based on predicted water level where observed levels are not available.*

Landholder bores will be monitored, upon agreement, to establish baseline water quality and level data.

4.3.1 Notification to Bore Owners

Maxwell held an initial meeting with landowners of bore GW029660 in 2019 to provide an overview of the Groundwater Assessment for the Project EIS and in particular discussing the predicted impacts on bore GW029660. Prior to commencing secondary extraction, Maxwell shall notify the landowners of bore GW029660 that the bore is predicted to experience a cumulative drawdown of greater than 2 metres as a result of the Project and MAC operations (including both open cut and approved underground operations).

4.3.2 Compensatory Water Supply

Should monitoring or an investigation show greater than 2 m drawdown at a privately-owned bore, and the drawdown is directly attributable to the Project, compensatory water supply measures for the affected groundwater user will be implemented, and may include:

- deepening the affected groundwater bore;
- construction of a new groundwater bore; and/or
- provision of an alternative water supply of suitable quality and quantity.

Any compensatory water supply will be provided in consultation with DPIE Water, and to the satisfaction of the Planning Secretary. The compensatory water supply measures shall provide an alternative long-term supply of water that is equivalent, in quality and volume, to the loss attributable to the development. Equivalent water supply should be provided (at least on an interim basis) as soon as practicable after the loss is identified, unless otherwise agreed with the landowner. If Maxwell and the landowner cannot agree on whether the loss of water is to be attributed to the development or the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution. If Maxwell is unable to provide an alternative long-term supply of water, then Maxwell shall provide compensation, to the satisfaction of the Planning Secretary.

In the event of any complaint relating to a privately-owned licensed groundwater bore which may, in the opinion of the Planning Secretary, have been adversely and directly impacted as a result of the development (other than an impact that is minor or negligible), Maxwell shall, as soon as practicable, facilitate the provision of a temporary water supply, pending the outcome of any groundwater investigation and/or the provision of an alternative long-term supply of water, to the satisfaction of the Planning Secretary.

5 MONITORING AND REPORTING

5.1 Groundwater Model

The groundwater assessment for the Project EIS used hydrogeological information to characterise the groundwater regime. During the Project, additional hydrogeological data will be collected, including details on lithology, groundwater intersection and intersection of structures (i.e. faults and dykes) including further hydraulic testing of the fault in the vicinity of Saddlers Creek to be undertaken within the first three years of mining operations. The additional hydrogeological data will be stored and made available as required for future groundwater investigations and/or updates to the model. Every three years the validity of the groundwater model predictions will be assessed and if the monitoring data indicates significant deviation from the model predictions, an updated groundwater simulation model will be developed.

A program to undertake further hydraulic testing of the fault in the vicinity of Saddlers Creek will be undertaken within the first three years of mining operations and the results incorporated into subsequent reviews of the groundwater model.

5.2 Groundwater Monitoring

The groundwater assessment for the Project EIS included a proposed groundwater monitoring program, which is presented in this section.

5.2.1 Existing Maxwell Infrastructure and Maxwell Underground Bores

Existing bores in the groundwater monitoring program for both Maxwell Infrastructure and the underground area are listed in **Table 4** and shown in **Figure 7.** The groundwater monitoring network at Maxwell Infrastructure comprises eight monitoring bores including four groundwater monitoring bores (GW01S, GW01D, GW02S and GW02D) installed in 2019 to provide further data to monitor groundwater surrounding the pit. The groundwater monitoring network at the underground area has been progressively installed since 1998 and includes 31 monitoring bores and seven vibrating wire piezometers (VWPs). The sites listed in **Table 4** will continue to be monitored to identify if the final voids at Maxwell Infrastructure are interacting with the surrounding groundwater regime and provide baseline information for the underground area prior to commencement of second workings.

Table 4: Groundwater Monitoring Sites

Monitoring Site		Coordinates (GDA 94/MGA 56)		Location	Geology	Ground Elevation (mAHD)	Screen Interval (mBGL)
ID	Type	Easting (m)	Northing (m)				
DS1 (EPL 1323 requirement)	MB	305592	6420380	MI	Shallow bedrock aquifer	223.9	15
F1162	MB	301045	6420755	MI	Greta Coal Measures	228.2	274
F1164	MB	304223	6420406	MI	Greta Coal Measures	220.8	190.5
R4241	MB	305793	6416224	MI	Jurassic Volcanics	196.0	150
GW01S	MB (daily logger)	303386	6420691	MI	Base regolith	213.2	12-15
GW01D	MB (daily logger)	303391	6420683	MI	Greta Coal Measures	213.2	29-32

Monitoring Site		Coordinates (GDA 94/MGA 56)		Location	Geology	Ground Elevation (mAHD)	Screen Interval (mBGL)
ID	Type	Easting (m)	Northing (m)				
GW02S	MB (daily logger)	305647	6418664	MI	Base regolith	203.0	8-14
GW02D	MB (daily logger)	305647	6418664	MI	Greta Coal Measures	203.0	69-72
GW04	MB	304684	6415922	MI	Permian sequence	246.65	101–104
MB1 - Redbank	MB	297930	6407453	MU	JPS-Redbank Seam	80.89	51-57
MB1 - Whybrow	MB	297928	6407448	MU	JPS-Whybrow Seam	80.84	25-28
MB1 -Alluvial	MB (daily logger)	297933	6407459	MU	Hunter River Alluvium	81.01	8-11
MB2 - Regolith	MB	295004	6411675	MU	Regolith	115.43	20-29
MB2 - Alluvial	MB (daily logger)	294998	6411669	MU	Saddlers Creek Alluvium	115.34	5-7
MB3 - Regolith	MB	297328	6412729	MU	Regolith	137.34	27-30
MB3 - Alluvial	MB (daily logger)	297269	6412850	MU	Saddlers Creek Alluvium (upslope)	132.72	8.5-14.5
MB4 - Coal	MB	300302	6406234	MU	JPS-Coal	81.34	42-47
MB4 - Alluvial	MB (daily logger)	300307	6406231	MU	Hunter River Alluvium	81.43	10-18
MB03	MB (daily logger)	299649	6408297	MU	Saltwater Creek Alluvium	122.81	5–8
MW1	MB (daily logger)	297254	6412760	MU	Saddlers Creek Alluvium (upslope)	136.53	6-9
MW2	MB (daily logger)	294977	6411419	MU	Saddlers Creek Alluvium	119.36	4-9.5
MW3	MB	297904	6407652	MU	Hunter River Alluvium	81.641	2.9-6.9
DD1005	MB	298799	6410901	MU	JPS-Blakefield Overburden	225.02	138.6
DD1014	MB (daily logger)	296799	6410864	MU	JPS-Blakefield Overburden	183.4	90.5
DD1015	MB	298815	6409900	MU	JPS-Blakefield overburden	212.65	162.5
DD1016	MB	297801	6410882	MU	JPS-Blakefield overburden	201.15	126.4
DD1025	MB (daily logger)	298764	6411901	MU	JPS-Blakefield Overburden	169.81	44.6
DD1027	MB	301133	6410960	MU	JPS-Edderton Seam	235.82	252.8

Monitoring Site		Coordinates (GDA 94/MGA 56)		Location	Geology	Ground Elevation (mAHD)	Screen Interval (mBGL)
ID	Type	Easting (m)	Northing (m)				
DD1032	MB (daily logger)	297143	6412495	MU	JPS – Piercefield overburden	140.25	276.5
DD1043	MB	295200	6409458	MU	JPS-Woodlands Hill Overburden	173.78	182-203
DD1052	MB	296274	6408513	MU	JPS-Whynot Seam Overburden	183.12	105-127
DD1057	MB	295181	6410458	MU	JPS-Arrowfield Overburden	146.93	164-188
RD1189 (SD1_DD001)	VWP	299896	6412419	MU	Warkworth Seam Mt Arthur Seam Piercefield Seam	208.63	186.2 230 255.5
RD1192 (RBR2)	VWP	296092	6409038	MU	Wambo Seam Redbank Seam Blakefield Seam	177.06	61.2 80 148.5
BLK6R12 (RD1220)	VWP	293653	6409558	MU	Redbank Seam Whynot Seam Blakefield Seam	186.25	40.5 86.5 113.7
VWP1 (RD1221) (RDW006A)	VWP	297926	6407444	MU	Interburden Interburden Interburden Whybrow Seam Whynot Seam Blakefield Seam	80.96	21 40 73 87 109.2 138
RBD1 (DD1170)	VWP	295178	6409246	MU	Whybrow Seam Redbank Seam Whynot Seam Blakefield Seam	169.55	24.65 33.55 79.5 103.3
WND16 (DD1188)	VWP	298122	6408842	MU	Wambo Seam Whynot Seam Blakefield Seam Blakefield Seam	130.58	33.75 59.25 90.15 110.5
WND26 (DD1187)	VWP	299487	6409044	MU	Whybrow Seam Redbank Seam Wambo Seam Whynot Seam	163.71	77.3 84.6 123.45 144.25

Notes:
mbgl – metres below ground level
EPL – Monitoring of Bore DS1 is in accordance with EPL 1323 Condition U1.1
MB – Monitoring Bore
MI – Maxwell Infrastructure
MU – Maxwell Underground
JPS – Jerrys Plains Subgroup
VWP – Vibrating Wire Piezometer

Figure 7: Groundwater monitoring sites

Groundwater monitoring parameters and the frequency of monitoring is presented in **Table 5**.

Table 5: Groundwater Monitoring Parameters and Frequency

Monitoring Site	Parameter	Units	Frequency
Standpipes	Reduced standing water level (for bores with no data logger)	mAHD	Monthly
	pH	-	Quarterly
	Electrical conductivity	mS/cm	
	Redox potential	mV	
	Temperature	°C	
	Total dissolved solids	mg/L	Biennial (twice yearly)
	Total suspended solids		
	Major Cations (calcium, magnesium, sodium)		
	Major anions (chloride, sulfate, carbonate, bicarbonate)		
	Total alkalinity		
	Dissolved metals (Al, As, B, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Se, Ag & Zn)		
	Total Metals (Al, As, B, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Se, Ag & Zn)		
DS1 (*in accordance with EPL 1323 Condition U1.1)*	Reduced standing water level (for bores with no data logger)	mAHD	Monthly
	pH	-	
	Electrical conductivity	mS/cm	
	Total dissolved solids	mg/L	
	Salinity		
Data loggers	Reduced standing water level	mAHD	Continuous (downloaded quarterly)
VWPs	Reduced standing water level	mAHD	Continuous (downloaded quarterly)

5.2.2 Privately-Owned Bores

The groundwater levels, yield and quality at privately owned groundwater bores listed in **Table 6** will be reviewed annually (subject to accessibility).

Table 6: Privately-Owned Groundwater Monitoring Bores

Monitoring Site		Coordinates (GDA 94/MGA 56)	
ID	Type	Easting (m)	Northing (m)
GW029660	Off-site private landholder domestic bore (stock water)	290211	6413089
GW029647	Off-site private landholder domestic bore	291005	6413906
GW029648	Off-site private landholder domestic bore	290875	6413873

5.2.3 Proposed Future Bores

Maxwell committed to installing an additional groundwater monitoring bore within the Permian sequence south of the former pit batters and in the vicinity of Saltwater Creek. To meet this commitment Bore MB03 was installed in the Saddlers Creek Alluvium in August 2021 and Bore GW04 was installed in the Permian sequence representative of void storage in August 2021. MB03 and GW04 are included in Table 4.

The groundwater monitoring program proposed by HydroSimulations (2019) included future groundwater monitoring locations for bores to be installed prior to commencement of second workings. The proposed bore locations are listed in **Table7.** The final locations will be dependent upon access and due diligence inspections for ecology and cultural heritage. This plan will be update with the final coordinates, once available.

Table 7: Proposed Additional Groundwater Monitoring Sites

Monitoring Site		Proposed Location
ID	Type	
MB03	MB	Saltwater Creek Alluvium (Note: Installed in August 2021)
MB04	MB	Regolith associated with an unnamed Creek
MB05	MB	Saddlers Creek Alluvium
MB06S	MB	Jerrys Plains Subgroup – Shallow
MB06D	MB	Jerrys Plains Subgroup – Deep

Notes:
MB – Monitoring Bore

5.3 Groundwater Assessment Criteria – Maxwell Infrastructure

Stage 1 groundwater trigger levels have been established for Maxwell Infrastructure bores (Table 8) to determine the need for investigation and response, in accordance with the Trigger Action Response Plans (refer to Table 9). The trigger levels presented in Table 8 are for Stage 1 works only and will be reviewed and updated in the next Water Management Plan, when further data will be available.

Groundwater level trigger levels for Maxwell Infrastructure are determined as follows:

- The 5th percentile of groundwater level monitoring data to date, where there were sufficient data (>10 samples);
- The 95th percentile of field EC monitoring data to date, where there were sufficient data (>10 samples);
- The minimum value of monitoring data to date (for field pH minimum trigger);
- The maximum value of monitoring data to date (for field pH maximum trigger); or
- ANZECC & ARMCANZ (2000) and NHMRC and NRMMC recommended pH levels.

ANZECC & ARMCANZ (2000) recommends that wherever possible site-specific data be used to define trigger values for physical and chemical factors which can adversely impact the environment, rather than using default trigger values. However, a pH trigger range of 6 - 8.5 was applied to bores where the proposed 5th to 95th percentile trigger ranges, or the minimum to maximum of historical monitoring data trigger range, was too narrow to allow inaccuracy in pH measurement. The adopted range of 6 to 8.5 pH units is consistent with the pH recommended by ANZECC & ARMCANZ (2000) to prevent corrosion of infrastructure associated with the groundwater, as well as the recommend range for drinking water as outlined in the Australian Drinking Water Quality Guidelines (National Health and Medical Research Council (NHMRC] & National Resource Management Ministerial Council (NRMMC), 2011).

Table 8: Maxwell Infrastructure Stage 1 groundwater level and quality triggers

Bore	Screen level (metres below ground level)	Lithology Screened	Groundwater level, trigger level (mAHD)	pH trigger level - minimum	pH trigger level - maximum	EC trigger level (µS/cm)
R4241	150	Jurassic Volcanics	173.6[1]	6.0[2]	8.5[2]	6,253[3]
GW01D	29-32	Greta Coal Measures	198.2[1]	6.0[2]	8.5[2]	5,680[4]
GW01S	12-15	Base regolith	197.0[1]	6.0[2]	8.5[2]	9,260[5]
GW02D	69-72	Greta Coal Measures	135.7[1]	6.0[2]	8.5[2]	10,500[4]
GW02S	8-14	Base regolith	187.7[1]	6.0[2]	8.5[2]	9,480[4]

Notes:
[1] 5th percentile of monitoring data to date.
[2] ANZECC & ARMCANZ (2000) recommended pH range to prevent corrosion of infrastructure associated with the groundwater, and the recommend range for drinking water (as outlined in the Australian Drinking Water Quality Guidelines (National Health and Medical Research Council (NHMRC) & National Resource Management Ministerial Council (NRMMC), 2011).
[3] 95th percentile of monitoring data to date.
[4] Maximum value of monitoring data to date.
[5] Maximum value of monitoring data to date, plus standard deviation of data to date for Bore GW02S.

A Trigger Action Response Plan (TARP) for groundwater bores at Maxwell Infrastructure is presented in **Table 9**.

Table 9: Trigger Action Response Plan for hard rock aquifers at Maxwell Infrastructure

Status	Trigger	Action	Response
Normal	Groundwater level and quality below Maxwell Infrastructure Stage 1 groundwater triggers (Table 8).	Continue to minimise the long-term catchment areas of the mine voids and transfer water to and from voids. Continue water balance monitoring, groundwater monitoring, and assessment.	None

Status	Trigger	Action	Response
Level 1	Three consecutive groundwater level, pH or EC results exceed Maxwell Infrastructure Stage 1 groundwater triggers (Table 8).	A suitably qualified hydrogeologist reviews groundwater level or quality data to determine if trigger exceedances are caused by site activities and whether this has resulted in an exceedance of a Water Management Performance Measure in Table 4 of Development Consent SSD 9526.	If trigger exceedances are not caused by site activities and have not resulted in an exceedance of a Water Management Performance Measure in Table 4 of Development Consent SSD 9526, then review monitoring frequency. If trigger exceedances are caused by site activities and resulted in an exceedance of a Water Management Performance Measure in Table 4 of Development Consent SSD 9526, then undertake Level 2 Actions.
Level 2	Investigation following Level 1 trigger review indicates trigger exceedances are caused by site activities and this has resulted in an exceedance of a Water Management Performance Measure in Table 4 of Development Consent SSD 9526.	Undertake actions recommended by suitably qualified hydrogeologist which may include update to the groundwater model and/or review of monitoring program.	Report non-compliance. Undertake adaptive management strategies.

5.4 Groundwater Assessment Criteria - Underground

The groundwater monitoring at the underground area will continue to be undertaken to obtain baseline groundwater level and quality data for the hard rock and alluvial aquifers that will potentially be impacted by second workings. Baseline monitoring has commenced and will continue during Stage 1 and prior to the commencement of second workings.

Stage 1 groundwater trigger levels have been established for Maxwell Underground bores (refer to Table 10) to determine the need for investigation and response, in accordance with the Trigger Action Response Plans (refer to Table 11). The trigger levels presented in Table 11 are for Stage 1 works only and will be reviewed and updated in the next Water Management Plan, when further data will be available. This may include the establishment of trigger levels at alternative bores if these are deemed more appropriate for monitoring the effects of second workings.

Groundwater level trigger levels for Maxwell Underground are determined as follows:

- The 5th percentile of groundwater level monitoring data to date, where there were sufficient data (>10 samples);
- The 95th percentile of EC monitoring data to date, where there were sufficient data (>10 samples);
- ANZECC & ARMCANZ (2000) and NHMRC and NRMMC recommended pH levels.

Table 10: Maxwell Underground Stage 1 groundwater level and quality triggers for alluvial and hard rock aquifers

Bore	Screen level (metres below ground level)	Lithology Screened	Groundwater level, trigger level (mAHD)	pH trigger level - minimum	pH trigger level - maximum	EC trigger level (µS/cm)
DD1025	44.6	JPS[1]-Blakefield Overburden	157.3[2]	6.0[3]	8.5[3]	14,200[4]
DD1032	276.5	JPS[1] – Piercefield overburden	130.6[2]	6.0[3]	8.5[3]	7,170[4]
MB3-Alluvial	5-7	Saddlers Creek Alluvium (upslope)	127.7[2]	6.0[3]	8.5[3]	9,009[5]
MB3-Regolith	27-30	Regolith	127.3[2]	6.0[3]	8.5[3]	6,327[5]

Notes:
[1] JPS – Jerrys Plains Subgroup
[2] 5th percentile of monitoring data to date.
[3] ANZECC & ARMCANZ (2000) recommended pH range to prevent corrosion of infrastructure associated with the groundwater, and the recommend range for drinking water (as outlined in the Australian Drinking Water Quality Guidelines (National Health and Medical Research Council (NHMRC) & National Resource Management Ministerial Council (NRMMC), 2011).
[4] Maximum value of monitoring data to date.
[5] 95th percentile of monitoring data to date.

Table 11: Trigger Action Response Plan for Maxwell Underground bores

Status	Trigger	Action	Response
Normal	Groundwater level and quality below Maxwell Underground Stage 1 groundwater level triggers (Table 10).	Continue groundwater monitoring, and assessment.	None

Status	Trigger	Action	Response
Level 1	Three consecutive groundwater level, pH or EC results exceed Maxwell Underground Stage 1 groundwater level triggers (Table 10).	A suitably qualified hydrogeologist reviews groundwater level or quality data to determine if trigger exceedances are as a result of activities at the site and whether this has resulted in an exceedance of a Water Management Performance Measure in Table 4 of Development Consent SSD 9526.	If trigger exceedances are not caused by site activities and have not resulted in an exceedance of a Water Management Performance Measure in Table 4 of Development Consent SSD 9526, then review monitoring frequency. If trigger exceedances are caused by site activities and resulted in an exceedance of a Water Management Performance Measure in Table 4 of Development Consent SSD 9526, then undertake Level 2 Actions.
Level 2	Investigation following Level 1 trigger review indicates trigger exceedances are caused by activities at the Project and this has resulted in an exceedance of a Water Management Performance Measure in Table 4 of Development Consent SSD 9526.	Undertake actions recommended by suitably qualified hydrogeologist which may include update to the groundwater model and/or review of monitoring program.	Report non-compliance. Undertake adaptive management strategies. In consultation with suitably qualified hydrogeologist and other relevant specialists, undertake repair, mitigate and/or offset any adverse groundwater impacts of the development.

5.5 Trigger Action Response Plans – Privately-owned Bores

A TARP for groundwater levels at private bores, based on monitoring and actions in the Project EIS groundwater assessment, is presented in **Table 12**.

Table 12: Trigger Action Response Plan for groundwater levels at privately-owned bores

Status	Trigger	Action	Response
Normal	Drawdown at privately-owned bores less than 2 m. No complaints about potential impacts of the site on privately-owned bores.	Continue regular monitoring and review of potentially impacted private bores (refer to Section 5.2.2).	None

Status	Trigger	Action	Response
Level 1	Drawdown at privately-owned bores more than 2 m and/or complaint about potential impacts of the site on private bores.	A suitably qualified hydrogeologist reviews groundwater data to determine if 2 m drawdown is as a result of activities at the site (and/or MAC). Collect relevant data on privately-owned bores that are the subject of the complaint. Suitably qualified hydrogeologist to determine if privately-owned bore the subject of the complaint has been adversely and directly impacted as a result of the development (other than an impact that is minor or negligible).	If drawdown is not as a result of activities at the Project (and/or MAC) then review monitoring frequency. If privately-owned bore the subject of the complaint has not been adversely and directly impacted as a result of the development (other than an impact that is minor or negligible) then review monitoring frequency. If drawdown, or impacts the subject of the complaint, are due to site activities then undertake Level 2 actions.
Level 2	Investigation following Level 1 trigger review indicates drawdown is as a result of activities at the site.	Notify relevant bore owner and implement compensatory water supply actions. Undertake any other actions recommended by suitably qualified hydrogeologist which may include update to the groundwater model and/or review of monitoring program.	Review groundwater monitoring program.

The TARP for groundwater quality at private bores is based on changes to the groundwater quality that lower the beneficial use category of the groundwater source.

Table 1 of the *NSW Aquifer Interference Policy* described in (NOW, 2012) sets out the minimal impact considerations for aquifer interference activities for less productive groundwater sources, including (inter alia): “Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity”.

The following beneficial uses were recommended by the *National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia* for major (or significant) aquifers and have been adopted by the NOW in its *Groundwater Quality Protection Policy* (Department of Land and Water Conservation, 1998):

- ecosystem protection;
- recreation and aesthetics;
- raw water for drinking water supply; and
- agricultural water and industrial water.

The *National Land and Water Resources Audit* (Murray Darling Basin Commission, 2005) specified groundwater quality ranges for beneficial use categories based on salinity (Table 13). These salinity-based categories generally align with the beneficial uses within the *NSW Groundwater Quality Protection Policy.*

Table 13: Groundwater Quality Categories: Electrical Conductivity

Beneficial use	Quality Range	Description
Potable	Up to 800µS/cm (500 mg/L TDS)*	Suitable for all drinking water and uses

Beneficial use	Quality Range	Description
Marginal Potable	800 – 2,350 µS/cm (500 - 1,500 mg/L TDS)*	At the upper level this water is at the limit of potable water, but is suitable for watering of livestock, irrigation and other general uses
Irrigation	2,350 – 7,800 µS/cm (1,500 - 5,000 mg/L TDS)*	At the upper level, this water requires shandying for use as irrigation water or to be suitable for selective irrigation and watering of livestock
Saline	7,800 – 22,000 µS/cm (5,000 - 14,000 mg/L TDS)*	Generally unsuitable for most uses. It may be suitable for a diminishing range of salt-tolerant livestock up to about 6,500mg/L [~10,150 µS/cm] and some industrial uses
Highly Saline	>22,000 µS/cm (14,000 mg/L TDS)*	Suitable for coarse industrial processes up to about 20,000 mg/L [~31,000 µS/cm].

* Approximate EC ranges derived from TDS ranges, with conversion factor of 1.5625 applied.
Source: National Land and Water Resources Audit (Murray Darling Basin Commission, 2005).

Landholder bores will be monitored, upon agreement, to establish an appropriate baseline use category. A TARP for groundwater quality at private bores is presented in Table 14. This TARP will be implemented for private bores after a beneficial use category has been determined.

Table 14: Trigger Action Response Plan for groundwater quality at private bores

Status	Trigger	Action	Response
Normal	No change in beneficial use category	Continue regular monitoring and review of potentially impacted private bores (refer to Section 5.2.2).	None
Level 1	Two consecutive monitoring results indicate a change in beneficial use category.	A suitably qualified hydrogeologist reviews groundwater data to determine if change in water quality is caused by activities at the site.	If a privately-owned bore has not been adversely and directly impacted as a result of the activities at the site, then review monitoring frequency. If change in water quality is changed by activities at the site, then undertake Level 2 actions.
Level 2	Investigation following Level 1 trigger review indicates change in water quality is caused by activities at the site.	Implement compensatory water supply actions. Undertake any other actions recommended by suitably qualified hydrogeologist which may include update to the groundwater model and/or review of monitoring program.	Review groundwater monitoring program.

5.6 Groundwater Levels – Review and Reporting

The observed groundwater levels from the Maxwell Infrastructure groundwater monitoring program will be reviewed against the model predictions on an annual basis. A suitably qualified hydrogeologist will determine when water levels deviate significantly from that predicted by the groundwater assessment for the Project EIS and determine the reason for this deviation. The review will consider factors that could result in declining water levels including climatic conditions, rainfall recharge and pumping from privately-owned bores and/or other mining operations. If groundwater levels deviate significantly from that predicted by the groundwater assessment, as determined by a suitably qualified hydrogeologist, additional monitoring sites or optimisation of the existing monitoring sites will be considered, and the conceptual hydrogeological model will be revised prior to the next scheduled groundwater model update.

Yearly reporting of the water level results from the monitoring network will be included in the Annual Review. The reporting will include comparison to climate trends and surface water monitoring results to identify changes in the surface water and groundwater interactions. The Annual Review will also identify if any additional monitoring sites are required, or if optimisation of the existing monitoring sites should be undertaken.

Maxwell shall provide a Groundwater Monitoring Report to the EPA each year, which will include the following information for the respective monitoring period:

- the date and time of the monitoring;
- the location of the monitoring;
- analysis of trends; and
- an explanation for changes in parameter concentrations with a summary of any investigations or mitigation actions undertaken.

This information may be incorporated into the Annual Review.

5.7 EPBC Impact Response Plan

In accordance with Conditions 6 and 7 of EPBC Approval 2018/8287, Maxwell would prepare an EPBC Impact Response Plan in the event monitoring detects an exceedance of the 'Level 2' triggers outlined in Sections 5.3 and 5.4. The EPBC Impact Response Plan would be prepared by a suitably qualified water resources expert and describe all potential and actual impacts to water resources arising from the exceedance.

The EPBC Impact Response Plan would be published within three months of the exceedance being detected, unless an alternative timeframe is agreed with the Commonwealth Minister for the Environment.

An EPBC Impact Response Plan would not be prepared for exceedances of "Normal" or "Level 1" triggers, as these have been established to provide an early warning of any potential performance measure exceedances and therefore may be exceeded during the normal course of operations.

6 CONTINGENCY PLAN

Potential unpredicted impacts related to tgroundwater and contingency plans to address these are summarised in **Table 15**.

Table 15: Unpredicted impacts and contingency plans

Unpredicted impacts	Contingency plan
Insufficient data to support impact assessment and groundwater model.	Review site monitoring and amend update as required.
Groundwater level or quality determined to be impacted as a result of activities at the site.	Refer to TARPs in Tables 9, 11 and 12.
Privately-owned bore adversely and directly impacted as a result of the activities at the site.	Refer to TARP in Table 14

7 CONTINUOUS IMPROVEMENT

Results of the annual groundwater monitoring review will be used to determine if any changes to groundwater management are required.

8 DOCUMENT INFORMATION

8.1 References

Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Department of Land and Water Conservation (1998). *The NSW Groundwater Quality Protection Policy*.

Gippel, C.J (2019) *Maxwell Project, Environmental Impact Statement, Technical Study Report, Geomorphology Assessment*, Fluvial Systems Pty Ltd, Stockton, Malabar Coal Limited, Sydney, June.

Eco Logical Australia (2019). *Maxwell Project Aquatic Ecology and Stygofauna Assessment*.

HydroSimulations (2019) *Maxwell Project: Groundwater Assessment – In support of an EIS*.

Murray Darling Basin Commission (2005) *National Land and Water Resources Audit.*

NSW Office of Water, 2012. *NSW Aquifer Interference Policy*.

WRM Water & Environment Pty Ltd (2019) *Surface Water Assessment – Maxwell Project.*

8.2 Definitions and Abbreviations

Refer to **Appendix 10** of the WMP.

APPENDIX 5 – STAGING ACTIVITIES

Planning, Industry & Environment

Alex Newton
Environment and Approvals Coordinator
Malabar Coal Ltd
Thomas Mitchell Drive (PMB 9)
Muswellbrook, NSW, 2333

22/02/2021

Dear Mr. Newton

Maxwell Underground (SSD 9526)
Water Management Plan and Air Quality and Greenhouse Gas Management Plan

I refer to you letter dated 4 February 20201 requesting the staged submission of the Water Management Plan (WMP) and Air Quality and Greenhouse Gas Management Plan (AQGGMP) for the Maxwell Underground Mine (SSD 9526). The submission proposes that Stage 1 of these plans will include early preparation works, construction works and first workings.

Early preparation work activities at the Mine Entry Area (MEA) are listed in Section 3.4.2 of the EIS (SSD 9526).

Construction is in accordance with the definitions provided in SSD 9526 Conditions of Consent, involve all physical works to enable mining operations to be carried out, including demolition and removal of buildings or works, and erection of buildings and other infrastructure permitted by this consent. This includes the establishment of the MEA, construction of the access road and overland conveyor between the MEA and Coal Handling Preparation Plant (CHPP), upgrading of plant and infrastructure at the Maxwell Infrastructure site, and the realignment of Edderton Road, but does not include preparatory works described in Section 3.4.2. of the EIS.

First workings include activities listed as 'first workings' in accordance with the definitions provided in SSD 9526 Conditions of Consent, being development of main headings, long walls gate roads, related cut throughs and other workings for mine access and ventilation.

The Department has reviewed the information provided and does not object to the proposal. Accordingly, the Planning Secretary has agreed to stage the submission of the Water Management Plan and Air Quality and Greenhouse Gas Management Plan, as per the early preparation works, construction works and first workings.

The staging and timing for early preparation works, construction works and first workings will be generally consistent with the program schedule in Figure 3-4 of the EIS (SSD 9526).

If you wish to discuss the matter further, please contact Charissa Pillay on 99955944.

Yours sincerely

Matthew Sprott
Director
Resource Assessments (Coal & Quarries)
As nominee of the Planning Secretary

APPENDIX 6 – REGULATORY REQUIREMENTS

State Significant Development Consent 9526

Clause	Requirement	Section of Plan
B27	The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of the development to match its available water supply	Appendix 1
B28	The Applicant must report on water captured, intercepted or extracted from the site each year (direct and indirect) in the Annual Review, including water taken under each water licence. ***Note:*** *Under the Water Act 1912 and/or the Water Management Act 2000, the Applicant is required to obtain all necessary water licences for the development, including during rehabilitation and following mine closure.*	Appendix 1
B29	Prior to commencing extraction of ROM coal under this consent, the Applicant must notify owners of licensed privately-owned groundwater bores that are predicted to have a drawdown of greater than 2 metres as a result of the development.	Appendix 4
B30	The Applicant must provide a compensatory water supply to any landowner of privately-owned land whose rightful water supply is adversely and directly impacted (other than an impact that is minor or negligible) as a result of the development, in consultation with DPIE Water, and to the satisfaction of the Planning Secretary.	Appendix 4
B31	The compensatory water supply measures must provide an alternative long-term supply of water that is equivalent, in quality and volume, to the loss attributable to the development. Equivalent water supply should be provided (at least on an interim basis) as soon as practicable after the loss is identified, unless otherwise agreed with the landowner	Appendix 4
B32	If the Applicant and the landowner cannot agree on whether the loss of water is to be attributed to the development or the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.	Appendix 4
B33	If the Applicant is unable to provide an alternative long-term supply of water, then the Applicant must provide compensation, to the satisfaction of the Planning Secretary. ***Note:*** *The Water Management Plan (see condition B42) is required to include trigger levels for investigating potentially adverse impacts on water supplies.*	Appendix 4
B34	In the event of any complaint relating to a privately-owned licensed groundwater bore which may, in the opinion of the Planning Secretary, have been adversely and directly impacted as a result of the development (other than an impact that is minor or negligible), the Applicant must, as soon as practicable, facilitate the provision of a temporary water supply, pending the outcome of any groundwater investigation and/or the provision of an alternative long-term supply of water as required under conditions B30 and B31, to the satisfaction of the Planning Secretary.	Appendix 4
B35	The Applicant must ensure that all water discharges from the site comply with: c) discharge limits (both volume and quality) set for the development in any EPL; and d) the relevant provisions of the POEO Act.	Appendix 1
B36	The Applicant must implement all reasonable and feasible measures to avoid off-site discharges from the Access Road Dam or the Rail Loop Dam. However, should discharges from these dams be required, any such discharge may only be undertaken in accordance with the *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002*.	Appendix 1
B37	The Applicant may receive water from and/or transfer water to, the Mt Arthur Coal Complex.	Appendix 1
B38	The Applicant may, with the written approval of the Planning Secretary, receive water from and/or transfer water to, other mining and/or industrial operations in the vicinity of the development. *Note:*	Appendix 1

<table>
<tr><th>Clause</th><th>Requirement</th><th>Section of Plan</th></tr>
<tr><td></td><td>• Prior to the granting of written approval by the Planning Secretary, the Applicant must demonstrate that all necessary approvals and licences have been obtained for the sharing of water.</td><td></td></tr>
<tr><td>B39</td><td>The Applicant may, with the written approval of the Planning Secretary, integrate components of the site water management system with the water management system for the Mt Arthur Coal Complex</td><td>Appendix 1</td></tr>
<tr><td>B40</td><td>The Applicant must ensure that the development complies with the performance measures in Table 4.
Table 4: Water management performance measures
<table>
<tr><th>Feature</th><th>Performance Measure</th></tr>
<tr><td>Water management – General</td><td>(a) Maintain separation between clean, dirty (i.e. sediment-laden) and mine water management systems.
(b) Minimise the use of clean and potable water on the site.
(c) Maximise water recycling, reuse and sharing opportunities.
(d) Maximise the capture and reuse of mine water and dirty water to meet operational demands for water
(e) Minimise the use of make-up water from external sources.
(f) Design, install, operate and maintain water management systems in a proper and efficient manner.
(g) Minimise risks to the receiving environment and downstream water users.</td></tr>
</table>
<table>
<tr><th>Feature</th><th>Performance Measure</th></tr>
<tr><td>Saddlers Creek, Saltwater Creek and Hunter River alluvial aquifers</td><td>(h) Negligible impacts to any alluvial aquifer as a result of the development, beyond those predicted in the document/s listed in condition A2(c), including:
• negligible change in groundwater levels;
• negligible change in groundwater quality; and
• negligible impact to other groundwater users</td></tr>
</table>
<table>
<tr><th>Feature</th><th>Performance Measure</th></tr>
<tr><td>Saddlers Creek, Saltwater Creek and Hunter River aquatic and riparian ecosystems</td><td>(i) Negligible environmental consequences beyond those predicted in the document/s listed in condition A2(c).
(j) Negligible decline in baseline channel stability.
(k) Develop site-specific in-stream water quality objectives in accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000) and Using the ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006).</td></tr>
<tr><th>Feature</th><th>Performance Measure</th></tr>
<tr><td>Erosion and sediment control works</td><td>(l) Design, install and maintain any new infrastructure within 40 metres of watercourses in accordance with the guidance series for Controlled Activities on Waterfront Land (DPI Water, 2012).
(m) Design, install and maintain any creek crossings generally in accordance with the Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (DPI, 2013) and Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries 2003).
(n) Ensure all works on waterfront land are consistent with the guidance series for Controlled Activities on Waterfront Land (DPI Water, 2012).</td></tr>
</table></td><td>Appendix 3

Appendix 1
Appendix 1
Appendix 1

Appendix 1
Appendix 1

Appendix 1

Appendix 4

Appendix 3

Appendix 3

Appendix 3

Not triggered

Not triggered

Not triggered</td></tr>
</table>

Clause	Requirement		Section of Plan
	Feature	***Performance Measure***	
	Clean water diversions and storage infrastructure	• Design, install and maintain the clean water system to capture and convey the 100 year ARI flood. (o) Maximise as far as reasonable the diversion of clean water around disturbed areas on the site, except where clean water is captured for use on the site.	Appendix 3 Appendix 3
	Feature	***Performance Measure***	
	Sediment dams	• Design, install and/or maintain sediment dams to avoid off-site discharges to surface waters, except as may be permitted under conditions B35 and B36. • Design, install and maintain sediment dams in accordance with the guidance series *Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004) and 2E Mines and Quarries (DECC, 2008)* and the requirements under the POEO Act or *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002.* • Design, install and/or maintain sediment dams to ensure no discharges to surface waters (including Saddlers Creek and Ramrod Creek), except in accordance with an EPL or in accordance with Section 120 of the POEO Act.	Appendix 2 Appendix 2 Appendix 2
	Feature	***Performance Measure***	
	Mine water storages	• Design, install and maintain mine water storage infrastructure to avoid unlicensed or uncontrolled discharge of mine water. • Ensure adequate freeboards within all mine water storage dams and voids at all times to minimise the risk of discharge to surface waters. (p) New on-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and maintained, including being lined to comply with a permeability standard of $< 1 \times 10^{-9}$ m/s.	Appendix 3 Appendix 3 Appendix 3
	Feature	***Performance Measure***	
	Brine management	• Brine storage facilities are designed to store a 100 year ARI 72 hour storm event. (q) Brine storage dam[a] is suitably designed, installed and maintained, including being lined to comply with a permeability standard of $< 1 \times 10^{-9}$ m/s. [a] This performance measure relates to the Brine Dam at the MEA and not to the East Void	Not triggered Not triggered
	Feature	***Performance Measure***	
	Reject management	• Restrict any new emplacement of tailings and CHPP reject material to the East Void (r) Design and maintain tailings storage areas to prevent the movement of tailings seepage/leachate outside the Maxwell Infrastructure area. (s) Manage CHPP reject material in a manner that is consistent with the document/s listed in condition A2 (c)	Not triggered Not triggered Not triggered
	Feature	***Performance Measure***	
	Overburden emplacements	• Design, install and maintain emplacements to encapsulate and prevent migration of acid forming and potentially acid forming materials, and saline and sodic material. (t) Design, install and maintain emplacements to prevent and/or manage long term saline groundwater seepage.	Appendix 3 Appendix 3
	Feature	***Performance Measure***	
	Chemical and hydrocarbon storage	(u) Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standard	Appendix 3
B41	The performance measures in Table 4 apply to the entire site, including all landforms constructed under previous development consents. However, these performance measures do not require any additional earthmoving works be undertaken for landforms that have been approved and constructed under		Noted

Clause	Requirement	Section of Plan
	previous consents, except where those earthworks are required for the establishment of a stable and non-polluting landform.	
B42	Prior to the commencement of construction activities, the Applicant must prepare a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:	Section 1.2
	(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;	Appendix 8
	(b) be prepared in consultation with DPIE Water;	Appendix 9
	(c) describe the measures to be implemented to ensure that the Applicant complies with the water management performance measures (see Table 4)	Appendices 1,2, 3 and 4
	(d) utilise existing data from nearby mines and build on existing monitoring programs, where practicable;	Appendix 3
	(e) include a:	
	a. **Site Water Balance** that includes details of:	Appendix 1
	– predicted annual inflows to and outflows from the site;	
	– sources and security of water supply for the life of the development (including authorised entitlements and licences);	
	– water storage capacity;	
	– water use and management on the site, including any water sharing arrangements permitted under condition B37 and B38 of this Schedule;	
	– licenced discharge points and limits; and	
	– reporting procedures, including the annual preparation of a site water balance;	
	b. Salt Balance that includes details of**:**	Appendix 1
	– sources of saline material on the site;	
	– saline material and saline water management on the site;	
	– measures to minimise discharge of saline water from the site; and	
	– reporting procedures, including the annual preparation of an updated salt balance;	
	c. Erosion and Sediment Control Plan that**:**	Appendix 2
	– is consistent with the requirements of *Managing Urban Stormwater: Soils and Construction - Volume 1: Blue Book* (Landcom, 2004) and *Volume 2E: Mines and Quarries* (DECC, 2008);	
	– identifies activities that could cause soil erosion or generate sediment;	
	– describes measures to minimise soil erosion and the potential for the transport of sediment to downstream waters;	
	– describes the location, function and capacity of erosion and sediment control structures; and	
	– describes what measures would be implemented to maintain (and if necessary, decommission) the structures over time;	
	d. Surface Water Management Plan that includes:	Appendix 3
	– detailed baseline data on channel stability, water flows and water quality in the sections or parts of watercourses and/or water bodies potentially impacted by the development (including Saddlers Creek, Saltwater Creek, Ramrod Creek and the Hunter River);	
	– a detailed description of the surface water management system, including a Brine Management Plan as described in the Submissions Report in the EIS;	

Clause	Requirement	Section of Plan
	– detailed plans, design objectives and performance criteria for water management infrastructure including: 1. any approved creek diversions or restoration works associated with the development; 2. erosion and sediment controls; 3. any water storages, including mine water management systems; 4. tailings and brine transfer and storage infrastructure; and 5. reinstated drainage networks on rehabilitated areas of the site; 6. surface water performance criteria, including trigger levels for identifying and investigating any potentially adverse impacts (or trends) associated with the development for: – water supply for other water users; 1. downstream surface water flows and quality, including site-specific trigger levels for molybdenum, selenium, antimony and arsenic; 2. stream and riparian vegetation heath; and 3. post-mining water pollution from rehabilitated areas of the site; 4. a program to monitor and evaluate: – compliance with the relevant performance measures listed in Table 4 and the performance criteria in this plan; 1. controlled and uncontrolled discharges and seepage/leachate from the site; 2. impacts on water supply for other water users; 3. surface water inflows, outflows and storage volumes, to inform the Site Water Balance; and 4. the effectiveness of the surface water management system, and the measures in the Erosion and Sediment Control Plan; 5. reporting procedures for the results of the monitoring program, including notifying other water users of any elevated results; and 6. a trigger action response plan to respond to any exceedances of the performance measures in Table 4, and to repair, mitigate and/or offset any adverse surface water impacts of the development, including measures to provide compensatory water supply to affected water users under condition B30 of this Schedule; and	
	e. Groundwater Management Plan that includes: – detailed baseline data regarding groundwater levels, yield and quality for privately-owned groundwater bores and the condition of GDEs potentially impacted by the development; – a program to periodically review and update data regarding groundwater levels, yield and quality at privately-owned groundwater bores in the vicinity of the development – a detailed description of the groundwater management system, including a commitment to install additional shallow monitoring bores within the Saddlers Creek alluvium, in consultation with DPIE Water; – groundwater performance criteria, including trigger levels for identifying and investigating any potentially adverse groundwater impacts (or trends) associated with the development, on: 1. regional and local aquifers (alluvial and hard rock); and 2. licensed privately-owned groundwater bores;	Appendix 4

Clause	Requirement	Section of Plan
	– a program to monitor and evaluate: 1. compliance with the relevant performance measures listed in Table 4 and the performance criteria of this plan; 2. water loss/seepage from water storages into the groundwater system, including seepage from the final voids; 3. groundwater inflows, outflows and storage volumes, to inform the Site Water Balance; 4. impacts on water supply for other water users; 5. impacts on GDEs (including Swamp Oak Forest and stygofauna); 6. the hydrogeological setting of any nearby alluvial aquifers and the likelihood of any indirect impacts from the development; and 7. the effectiveness of the groundwater management system; – reporting procedures for the results of the monitoring program, including notifying other water users of any elevated results; – a trigger action response plan to respond to any exceedances of the relevant performance measures and groundwater performance criteria, and repair, mitigate and/or offset any adverse groundwater impacts of the development; – a program to periodically validate the groundwater model for the development, including an independent review of the model every 3 years, and comparison of monitoring results with modelled predictions; – a program to undertake further hydraulic testing of the fault in the vicinity of Saddlers Creek within the first three years of mining operations and incorporate the results into subsequent reviews of the groundwater model; and – a plan to respond to any exceedances of the performance measures.	
B43	The Applicant must not commence construction until the Water Management plan is approved by the Planning Secretary.	Section 1.2
B44	The Applicant must implement the Water Management Plan as approved by the Planning Secretary.	Section 1.2
E4	The Applicant must assess and manage development-related risks to ensure that there are no exceedances of the criteria and performance measures in this consent. Any exceedance of these criteria or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation. Where any exceedance of these criteria or performance measures has occurred, the Applicant must, at the earliest opportunity: (a) Take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur; (b) Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and (c) Implement reasonable remediation measures as directed by the Planning Secretary.	Section 4.2
E5	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include: (k) a summary of relevant background or baseline data;	Appendices 1,2, 3 and 4

Clause	Requirement	Section of Plan
	(l) details of: (vii) the relevant statutory requirements (including any relevant approval, licence or lease conditions); (viii) any relevant limits or performance measures and criteria; and (ix) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures; (m) any relevant commitments or recommendations identified in the document/s listed in condition A2(c); (n) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria; (o) a program to monitor and report on the: (iii) impacts and environmental performance of the development; and (iv) effectiveness of the management measures set out pursuant to condition E5(d); (p) A contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible; (q) a program to investigate and implement ways to improve the environmental performance of the development over time; (r) a protocol for managing and reporting any: (i) incident, non-compliance or exceedance of any impact assessment criterion or performance criterion); (ii) complaint; or (iii) failure to comply with other statutory requirements; (s) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and (t) a protocol for periodic review of the plan. ***Note:*** *The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*	
E6	The Applicant must ensure that management plans prepared for the development are consistent with the conditions of this consent and any EPL issued for the site.	Appendix 6
E7	Within three months of: (a) the submission of an incident report under condition E9; (b) the submission of an Annual Review under condition E11; (c) the submission of an Independent Environmental Audit under condition E13; (d) the approval of any modification of the conditions of this consent (unless the conditions require otherwise); or (e) notification of a change in development phase under condition A13; The suitability of existing strategies, plans and programs required under this consent must be reviewed by the Applicant.	Section 5.1

Clause	Requirement	Section of Plan
E8	If necessary, to either improve the environmental performance of the development, cater for a modification or comply with a direction, the strategies, plans and programs required under this consent must be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document must be submitted to the Planning Secretary for approval within six weeks of the review. *Note: This is to ensure strategies, plans and programs are updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the development.*	Section 5.1
E9	The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name) and set out the location and nature of the incident.	Section 4.1
E10	Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non- compliance. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name), set out the condition of this consent that the development is non-compliant with, why it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. Note: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.	Section 4.1

Development Consent 106-04-00

Clause	Requirement	Section of Plan
3.1	Surface & Ground Water Management and Monitoring The Applicant shall: (a) Prepare a site water management plan and monitoring system for the Drayton rail loading facility to include the revised coal transport operations in consultation with DLWC prior to commencement of operations, and to the satisfaction of the Director-General. The plan shall include but not be limited to the following matters:	
	(i) details of the integration of the revised coal transport operations with the existing Drayton mine water management plan and monitoring system;	Appendix 1
	(ii) management of the quality and quantity of surface and groundwater within the areas covered by the Site Water Management Plan, which shall include preparation of monitoring programs;	Appendix 3 and 4
	(iii) management of stormwater and general surface runoff diversion to ensure separate effective management of clean and dirty water;	Appendix 2
	(iv) measures to prevent the quality of any surface waters being degraded due to the revised coal transport operations, below that identified in Table 2.5 of the EIS	Appendix 3
	(v) contingency plans for managing adverse impacts of the development on surface or ground water quality and quantity below that identified in Table 2.5 of the EIS;	Appendix 3 and 4
	(vi) identification of any possible adverse effects on water supply sources of surrounding land holders as a result of the revised coal transport operations, and implementation of mitigation measures as necessary; and	Section 4 of WMP
	(vii) a program for reporting on the effectiveness of the water management systems and performance against objectives contained in the water management plan.	Section 5.2 of WMP

Environment Protection Licence No. 1323

<table>
<tr><th>Clause</th><th>Requirement</th><th>Section of Plan</th></tr>
<tr><td>P1.3</td><td>The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

Water and land
<table><tr><th>EPA Identification no.</th><th>Type of Monitoring Point</th><th>Type of Discharge Point</th><th>Location Description</th></tr><tr><td>3</td><td>Discharge to utilisation area.
Effluent volume monitoring.</td><td>Discharge to utilisation area.
Effluent volume monitoring.</td><td>Utilisation area as shown on Drayton Coal Pty Ltd's Map No. ENV-0005, dated 12-MAR-2009.</td></tr></table></td><td>Section 4.8 of Appendix 3</td></tr>
<tr><td>L2.1</td><td>For each discharge point or utilisation area specified below (by a point number), the volume/mass of:
a) liquids discharged to water; or;
b) solids or liquids applied to the area;
must not exceed the volume/mass limit specified for that discharge point or area
<table><tr><th>Point</th><th>Unit of Measure</th><th>Volume/Mass Limit</th></tr><tr><td>3</td><td>kilolitres per day</td><td>140</td></tr></table></td><td>Section 4.8 of Appendix 3</td></tr>
<tr><td>O4.5</td><td>The proponent must construct, implement and utilise a wastewater management system to manage the collection, storage, treatment and disposal of all sewage effluent and related wastewater generated onsite</td><td>Section 4.8 of Appendix 3</td></tr>
<tr><td>O4.6</td><td>The wastewater management system/s in use at the Premises must be inspected and assessed by a suitably qualified and experienced wastewater technician at least once in each quarterly period and a minimum of four times per year and serviced as required.</td><td>Section 4.9 of Appendix 3</td></tr>
<tr><td>O4.7</td><td>In relation to condition O4.5, the Proponent must record details of each inspection undertaken (date and time), the actions required or recommended following each inspection, the date those actions were completed or detail the reasons if they were not completed and the results of any test performed on the wastewater management system by the technician.</td><td>Section 4.9 of Appendix 3</td></tr>
<tr><td>R3.11</td><td>Sewage Treatment System Maintenance Report
The Proponent must provide a Sewage Treatment System Maintenance Report each year that provides details of the actions required by conditions O4.5 to O4.7</td><td>Section 4.9 of Appendix 3</td></tr>
<tr><td>O4.8</td><td>Spray from effluent application to the utilisation area(s) must not drift beyond the boundary of the utilisation area(s) to which it has been applied</td><td>Section 4.8 of Appendix 3</td></tr>
<tr><td>O4.9</td><td>Effluent application to the utilisation area(s) must not occur in a manner that causes surface run-off from the utilisation area(s).</td><td>Section 4.8 of Appendix 3</td></tr>
<tr><td>O4.10</td><td>The quality of effluent/solids applied to the utilisation area must not exceed the capacity of the area to effectively utilise the effluent/solids. For the purposes of this condition, 'effectively utilise' includes the use of the effluent/solids for pasture or crop production, as well as the ability to absorb the nutrient, salt, hydraulic load and organic material.</td><td>Section 4.8 of Appendix 3</td></tr>
<tr><td>L1.2</td><td>The proponent must install works and operate them to ensure that the Access Road and Rail Loop Dams do not overflow or discharge saline water from the Premises; or that they only discharge saline water from the Premises in accordance with the Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation (2002).
Note: Saline water is defined in the Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation (2002).</td><td>Section 4.4 of Appendix 1</td></tr>
<tr><td>R1.1</td><td>The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,</td><td>Section 5.2 of WMP</td></tr>
</table>

Clause	Requirement	Section of Plan
	4. a Statement of Compliance - Load based Fee, 5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan, 6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and 7. a Statement of Compliance - Environmental Management Systems and Practices.	
R1.2	An Annual Return must be prepared in respect of each reporting period, except as provided below	Section 5.2 of WMP
R3.9	Surface Water Report The Proponent must provide a Surface Water Monitoring Report each year, which must include the following information during the respective monitoring period: a) the date and time of the monitoring; b) the location of the monitoring consistent with those in Table 9.1 of the Surface Water Assessment (WRM, 2019); c) analysis and trends for the monitoring parameters given in Table 9.1 of the Surface Water Assessment (WRM, 2019); and d) an explanation for changes in parameter concentrations with a summary of any investigations or mitigation actions undertaken. This information may be incorporated into the Annual Review required to be prepared under the conditions of Development Consent 9526	Section 5.2 of the WMP. Section 5.8 of Appendix 3
R3.10	Groundwater Monitoring Report The Proponent must provide a Groundwater Monitoring Report each year, which must include the following information during the respective monitoring period: a) the date and time of the monitoring; b) the location of the monitoring consistent with those in Table 9.1 of the Groundwater Assessment (Hydro Simulations, 2019); c) analysis of trends for the monitoring parameters given in Table 9.1 of the Groundwater Assessment (Hydro Simulations, 2019); d) an explanation for changes in parameter concentrations with a summary of any investigations or mitigation actions undertaken. This information may be incorporated into the Annual Review required to be prepared under the conditions of Development Consent 9526	Section 5.2 of the WMP. Section 5.6 of Appendix 4.
U1	V Notch Weir Monitoring Program U1.1 The licensee must: 1. Conduct a targeted V Notch weir (‘the weir’) monitoring program that includes: - Continued monthly monitoring of water quality at the V Notch Weir (the Weir) (pollutants/parameters to include those reported in the document titled 'Access Road Dam' dated 24 September 2014, pg 4). - real-time flow monitoring at the weir and recording of daily flows (in L/day) - rainfall monitoring (existing licence condition M4.1) - monitoring at the groundwater monitoring bore (DS1) on a monthly basis for the following parameters: groundwater level, electrical conductivity, pH, total dissolved solids, and salinity. - monitoring of electrical conductivity in the Access Road Dam (at least quarterly) at 3 different depths within the dam – 30cm, 4m and 8m depth. 2. Return all water draining to the Weir back to the Access Road Dam (or an alternate ‘dirty’ water dam on the premises) to ensure that saline water is not discharged from the premises. Pumping is to commence no later than 28 August 2015.	Table 5 in Appendix 1 Section 5.4 in Appendix 1 Table 5 in Appendix 4 Section 5 in Appendix 3

APPENDIX 7 – MAXWELL PROJECT EIS AND SUPPORTING DOCUMENT COMMITMENTS

Source	Details	Reference
EIS Section 6.4.4	**Groundwater monitoring** • Groundwater monitoring for the Project would be undertaken to demonstrate compliance with regulatory requirements. In addition, consistent with the recommendation made by Dr Frans Kalf, Malabar would establish additional alluvial monitoring bores in the Saddlers Creek alluvium. • Manual groundwater level monitoring would be conducted for all monitoring bores, with dataloggers installed within selected bores to gather temporal variations in water levels. Data would also be downloaded from the existing VWPs, pressure readings recorded and converted to groundwater elevations within a central database. • Ongoing monitoring would enable natural groundwater level fluctuations (such as responses to rainfall) to be distinguished from potential groundwater level impacts due to depressurisation resulting from Project. Ongoing monitoring of groundwater levels would also be used to assess the extent and rate of depressurisation against model predictions. • Yearly reporting of the water level results from the monitoring network would be included in the Annual Review. The reporting would include comparison to climate trends and surface water monitoring results to identify changes in the surface water and groundwater interactions. The Annual Review would also identify if any additional monitoring sites are required, or if optimisation of the existing monitoring sites should be undertaken	Appendix 4 Appendix 4 Appendix 4 Appendix 4
EIS Section 6.4.4	**Groundwater Quality** • Groundwater quality sampling would be conducted to monitor groundwater quality during and post-mining. Additional data would be collected prior to commencement of mining, particularly for bores recently installed as part of the Project (i.e. GW01S, GW01D, GW02S, GW02D, MW1, MW2 and MW3). • Sampling would include collection of field analytes of pH and EC on a quarterly basis, as well as annual sampling for laboratory analysis of a full suite of analytes to determine any changes in beneficial groundwater. • Yearly reporting of the water quality results from the monitoring network would be included in the Annual Review. The Annual Review would consider if any additional monitoring sites are required, or if optimisation of the existing monitoring sites, frequency of sampling and analytical suite should be undertaken.	Appendix 4 Appendix 4 Appendix 4
EIS Section 6.4.4	**Numerical Model Review** • After the first three years of mining, and every five years thereafter, the validity of the groundwater model predictions would be assessed and if the data indicates significant deviation from the model predictions, an updated groundwater simulation model would be developed.	Appendix 4

Source	Details	Reference
EIS Section 6.4.4	**Make Good Provisions** Should monitoring or an investigation show greater than 2 m drawdown at a privately-owned bore, and the drawdown is attributable to the Project, 'make good' provisions for the affected groundwater user would be implemented, and may include: • deepening the affected groundwater bore; • construction of a new groundwater bore; and/or • provision of an alternative water supply of suitable quality and quantity.	Appendix 4
EIS Section 6.4.5	**Adaptive Measures** • Water level and water quality triggers (EC, pH and sulphate) would be developed as part of the Water Management Plan for the Project. In the event groundwater monitoring identifies an exceedance of an established trigger, Malabar would implement a response plan in accordance with the Water Management Plan for the Project. • The observed groundwater levels would also be reviewed against the model predictions on an annual basis. A suitably qualified hydrogeologist would determine when water levels deviate significantly from that predicted by the groundwater model and determine the reason for this deviation. The review would consider the impact of mining, and other factors that could result in declining water levels including climatic conditions, rainfall recharge and pumping from privately-owned bores and/or other mining operations. • During the Project, additional hydrogeological data would be collected, including details on lithology, groundwater intersection and intersection of structures (i.e. faults and dykes). The additional hydrogeological data would be stored and made available as required for future groundwater investigations and/or updates to the model.	Appendix 4 Appendix 4 Appendix 4
EIS Section 6.5.4	**Surface Water Licensing** • An objective of the water management on-site throughout the Project life is to maintain separation between runoff from areas undisturbed by mining and water generated within active disturbance areas. • No surface water is proposed to be directly extracted from the Hunter River for the Project. Accordingly, water access licences under the *Water Sharing Plan for the Hunter Regulated River Water Source 2016* would not be required for Project water supply.	Appendix 3 Appendix 1
EIS Section 6.5.4	**Erosion and Sediment Control Plan** • An erosion and sediment control plan would be developed to manage runoff during the construction phase and to manage runoff from the disturbed areas peripheral to the MEA (i.e. transport and services corridor and ventilation shaft site). • Erosion and sediment control structures would be maintained in accordance with *Managing Urban Stormwater Soils and Construction* (Landcom, 2004). Proper drainage of the site would be maintained by: • removing accumulated sediment from basins/drains (if required); • checking that drains are operating as intended and any damaged works are repaired where necessary;	Appendix 2 Appendix 2 Appendix 2

Source	Details	Reference
	• confirming recent works have not resulted in the diversion of sediment-laden water away from their intended destination; and • checking that rehabilitated lands have established sufficient groundcover.	
EIS Section 6.5.4	**Surface Water Monitoring** • Surface water monitoring for the Project would be undertaken to demonstrate compliance with regulatory requirements, as well as improve the understanding and efficiency of the site water management system. The proposed monitoring program for the Project addresses the following issues: o water quality; o water balance; o site water management system integrity; o erosion and sediment control; o stream health; and o geomorphic response to subsidence. • The existing surface water monitoring network would form the basis for the monitoring network for the Project, augmented with additional monitoring sites proposed in Appendix C (or other suitable, similar locations). • Malabar would seek to integrate the monitoring program with monitoring undertaken for the Mt Arthur Mine. • Sampling standards, parameters and frequency are summarised in Appendix C. The results of surface water monitoring would be reported in the Annual Reviews for the Project. • Storage volume and water quality data would be collected from the various water storages to assist in the verification/calibration of the site water balance and salt balance for the Project and to mitigate the risk of an uncontrolled spill from the dams. • The site water balance would be periodically reviewed and updated as additional and/or newer information becomes available with the progression of the underground operations. The following parameters would be recorded to validate the assumptions of the water balance model: o site rainfall; o dam and void water levels and volumes; o pump rates between storages, particularly major pipelines between the MEA and Maxwell Infrastructure; o actual demand rates for CHPP makeup water (and losses), dust suppression and vehicle washdown during operation of the mine; o groundwater inflows; and o general mine site water management practices. • The site water balance would be reviewed following review of the numerical groundwater model, which would be periodically evaluated during the life of the Project. • Regular monitoring of infrastructure such as pumps, pipelines and dams would be undertaken to monitor whether they are working effectively.	Appendix 3 Appendix 3 Appendix 3 Appendix 3 Appendix 1 Appendix 1 Appendix 1 Appendix 1

Source	Details	Reference
	• In accordance with DSC requirements, an annual surveillance report would continue to be undertaken and submitted for the Access Road Dam and any other Project dams that are determined to be a 'prescribed dam' and/or 'declared dam'.	Appendix 1
	• The outcomes of the surveillance reports would be included in the Annual Reviews for the Project.	Appendix 1
	• Site drainage and sediment control structures would be inspected regularly (monthly or following rainfall greater than 25 mm in 24 hours) to check for scouring of diversion drains (and their outlets) and accumulation of sediment in sediment traps (including sediment fences, sediment basins, etc.).	Appendix 2
	• The extent of riparian vegetation and extent of erosion and sedimentation deposits would be used as an indicator of stream health. Monitoring would be undertaken quarterly by taking photographs at each of the Saddlers Creek surface water monitoring sites. The photographs would be taken at the same location (identified by GPS or permanent photographic ID post) and taken of the relevant bed and bank features looking upstream and downstream. These photographs would be documented with the location, direction and date as well as a log of erosional and depositional features at each location.	Appendix 3
	• Monitoring of potential geomorphic impacts to drainage lines overlying the Maxwell Underground area would primarily utilise LiDAR survey. The total coverage achieved by LiDAR survey is considered superior to the traditional method of establishing sampling locations where cross-sections and long profiles are re-surveyed from time to time. The geomorphic response to subsidence is likely to be slow, so a frequency of five years for catchment-wide re-survey (including LiDAR survey) and reporting of stream geomorphological condition is suggested in addition to annual visual inspection.	Appendix 3
	• A surface water response plan would be developed as part of the Water Management Plan for the Project. The surface water response plan would determine trigger levels based on historical monitoring data and identify proposed actions to be taken if the monitoring program identifies the exceedance of a trigger level.	Appendix 3

APPENDIX 8 – PLANNING SECRETARY ENDORSEMENT

Planning, Industry & Environment

Alex Newton
Environment and Approvals Coordinator
Thomas Mitchell Drive
Muswellbrook, NSW 2333

24/02/2021

Dear Mr Alex

Maxwell Underground (SSD-9526-PA-9)
Water Management Plan

I refer to your request (SSD – 9526-PA9) for the Planning Secretary's approval of suitably qualified persons to prepare the Water Management Plan for the Maxwell Underground (SSD-9526-PA-9).

The Department has reviewed the nominations and information you have provided and is satisfied that these experts are suitably qualified and experienced. Consequently, I can advise that the Planning Secretary approves the appointment of Noel Merrick to prepare the Groundwater component of the Water Management Plan and Matthew Briody for preparation of the surface water component of the Water Management Plan.

If you wish to discuss the matter further, please contact Charissa Pillay on 0299955944.

Yours sincerely

Matthew Sprott
Director
Resource Assessments (Coal & Quarries)

As nominee of the Planning Secretary

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APPENDIX 9 – CONSULTATION WITH DPIE WATER

NSW GOVERNMENT Department of Industry

Contact: Natural Resources Access Regulator
Phone: 1800 633 362
Email: nrar.enquiries@nrar.nsw.gov.au

Our ref: DOC21/239983, V15/3875-5#36

20 September 2021

Alex Newton
Thomas Mitchell Drive
Muswellbrook NSW 2333

Uploaded to the Major Projects Portal

Dear Alex,

Re: Maxwell Underground Coal (SSD-9526-PA-30) Water Management Plan

Thank you for giving the Department of Planning, Industry and Environment – Water (DPIE-Water) the opportunity to review Maxwell Underground Coal (SSD-9526-PA-30) Water Management Plan.

Department of Planning, Industry and Environment - Groundwater Management & Science Team (DPIE-Water) recommends the following:

Prior to approval

The proponent must:

1. Set TARP quantification criterion for site specific bores and the response action accordingly for both:
   a) groundwater level drawdown thresholds (private and observation)
   b) water quality (salinity and pH)
2. Nominate the performance measures that identifies thresholds leading to initiating updated simulations and/or calibration of the groundwater model for a revised impact predictions.
3. The bore sampling frequency to be set at:
   a) manual water level reading monthly for all sites without an automatic logger installed
   b) quarterly water quality for EC, pH, redox potential and temperature for all open bore holes
   c) twice yearly for full major ion suite and trace metals
4. A commitment to install additional monitoring bore infrastructure representative of the alluvial and underlying porous rock aquifers along Saddlers Creek and void/dam storages be installed within 4 months.

Not required prior to approval

A recommended condition of consent stating the following:

5. The proponent must install meters to measure volumes of water take/transferred at:
   i. all bore pumps used to extract groundwater;

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ii. the pipeline used to transfer extracted mine water to the mine dam/void pit storages;

iii. water extracted by the proponent from the dam/void pit storages;

iv. water extracted by any 3rd party accessing dam/void pit storages under management of the proponent

6. Groundwater level monitoring and water quality data be presented as a timeline/graph in the annual report.

Should you have any further queries in relation to this submission please do not hesitate to contact the Natural Resources Access Regulator's Service Support Team at nrar.servicedesk@dpie.nsw.gov.au.

Yours Sincerely

Jane Curran
A/Manager Licensing & Approvals
Water Regulatory Operations
Natural Resources Access Regulator

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Consultation Feedback – DPIE Water	Outcome
Prior to approval, the proponent must:	
1. Set TARP quantification criterion for site specific bores and the response action accordingly for both: a) groundwater level drawdown thresholds (private and observation) b) water quality (salinity and pH)	Maxwell Infrastructure Stage 1 groundwater level and quality triggers (pH and EC) have been developed and are provided in Table 8 of the Groundwater Management Plan. An associated trigger action response plan (TARP) is provided in Table 9 of the Groundwater Management Plan. Maxwell Underground Stage 1 groundwater level and quality triggers (pH and EC) have been developed and are provided in Table 10 of the Groundwater Management Plan. An associated TARP is provided in Table 11 of the Groundwater Management Plan. Trigger criteria and a TARP for groundwater levels at private bores is have been developed and are provided in Table 12 of the Groundwater Management Plan. A TARP for groundwater quality at privately-owned bores is provided in Table 13 of the Groundwater Management Plan. Trigger levels will be developed at individual private bores, subject to access agreements with landholders. Note that the trigger levels presented in the groundwater management plan are for Stage 1 works only and will be reviewed and updated when this plan is updated for second workings and the Extraction Plan.
2. Nominate the performance measures that identifies thresholds leading to initiating updated simulations and/or calibration of the groundwater model for a revised impact predictions.	Section 5.1 of the Groundwater management Plan states that every three years the validity of the groundwater model predictions will be assessed and if the monitoring data indicates significant deviation from the model predictions, an updated groundwater simulation model will be developed. Performance measures that identify thresholds leading to initiating updated simulations and/or calibration of the groundwater model are included in the TARPs in the Groundwater Management Plan.
3. The bore sampling frequency to be set at: a) manual water level reading monthly for all sites without an automatic logger installed	Table 5 of the Groundwater Management Plan has been updated to include monthly water level monitoring for bores with no data logger installed.
b) quarterly water quality for EC, pH, redox potential and temperature for all open bore holes	Table 5 of the Groundwater Management Plan has been updated to include quarterly monitoring of EC, pH, redox potential and temperature for all monitoring bores.
c) twice yearly for full major ion suite and trace metals	Table 5 of the Groundwater Management Plan has been updated to twice yearly sampling and analysis for the full major ion suite and trace metals.
4. A commitment to install additional monitoring bore infrastructure representative of the alluvial and underlying porous rock aquifers along Saddlers Creek and void/dam storages be installed within 4 months.	Bore MB03 was installed in the Saddlers Creek Alluvium in August 2021 and Bore GW04 was installed in the Permian sequence representative of void storage in August 2021. MB03 and GW04 are now included in Table 4 of the Groundwater Management Plan. Proposed future bores are detailed in Table 7 of the Groundwater Management Plan.

APPENDIX 10 – DEFINITIONS AND ABBREVIATIONS

Term	Definition
AEP	Annual Exceedance Probability
ARD	Acid Rock Drainage
ARI	Average Recurrence Interval
ASC	Australian Soil Classification
AWS	Automatic Weather Station
BL	Bore Licence
BoM	Bureau of Meteorology
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CCC	Community Consultative Committee
CHPP	Coal Handling Preparation Plant
CL	Coal Lease
DA	Development Approval
DEMs	Digital Elevation Models
DGV	Default Guideline Values
DPIE	NSW Department of Planning, Infrastructure and Environment
DSC	Dams Safety Committee
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act 1979
EPL	Environment Protection Licence
ESCP	Erosion and Sediment Control Plan
GDEs	Groundwater Dependent Ecosystems
GDP	Ground Disturbance Permit
Ha	Hectare
MAC	Mt Arthur Coal
Malabar	Malabar Resources Limited
MEA	Mine Entry Area

Term	Definition
ML	Mining Lease
MLA	Mining Lease Application
mm	Millimetres
OPC	Oil Pollution Control
OPSIM	Operational Simulation Model
PA	Project Approval
PAHs	Polycyclic Aromatic Hydrocarbon
PMF	Probable Maximum Flood
PIRMP	Pollution Incident Response Management Plan
SSD	State Significant Development
SWMP	Surface Water Management Plan
TDS	Total Dissolved Solids
TPHs	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TWD	Treated Water Dam
WAL	Water Access Licence
WMP	Water Management Plan
UG	Underground
°C	Degrees Celcius

APPENDIX 11 – PLANNING SECRETARY APPROVAL