



# 918 Panel Water Management Plan

## Clarence Colliery

Clarence Colliery Pty Ltd

24 April 2026

→ The Power of Commitment



<b>Project name</b>	Clarence Colliery - WMP Update						
<b>Document title</b>	918 Panel Water Management Plan   Clarence Colliery						
<b>Project number</b>	12655704						
<b>File name</b>	12655704-REP_Clarence_918_Extraction_Plan_WMP.docx						
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	I Gilmore	S Gray		S Gray		24/02/26
S4	1	I Gilmore	S Gray	<i>S Gray</i>	S Gray	<i>S Gray</i>	24/04/26

**GHD Pty Ltd | ABN 39 008 488 373**

GHD Tower, Level 3, 24 Honeysuckle Drive

Newcastle, New South Wales 2300, Australia

**T** +61 2 4979 9999 | **E** ntlmail@ghd.com | **ghd.com**

© GHD 2026

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

# Glossary

<b>Alkalinity</b>	A measure of the ability of an aqueous solution to neutralise acids. Alkalinity of natural waters is due primarily to the presence of hydroxides, bicarbonates, and carbonates. It is expressed in units of calcium carbonate (CaCO <sub>3</sub> ).
<b>Alluvial</b>	Deposition from running waters.
<b>Aquifer</b>	An underground layer of permeable material from which groundwater can be usefully extracted.
<b>Australian Height Datum</b>	A common national surface level datum approximately corresponding to sea level.
<b>Baseflow</b>	The component of flow in a watercourse that is driven from the discharge of underground water.
<b>Baseline monitoring</b>	Monitoring conducted over time to collect a body of information to define specific characteristics of an area (e.g., species occurrence or water quality) prior to the commencement of a specific activity.
<b>Bore</b>	Constructed connection between the surface and a groundwater source that enables groundwater to be transferred to the surface either naturally or through artificial means.
<b>Catchment</b>	The land area draining through the main stream, as well as tributary streams, to a particular location.
<b>Cumulative rainfall departure</b>	Monthly accumulation of the difference between the observed monthly rainfall and long-term average monthly rainfall.
<b>Dewatering</b>	The removal or pumping of water from an above or below ground storage, including the mine water within the water collection system of mine workings. Water removed from mine workings is regarded as dewatering unless the workings are flooded and at equilibrium with the surrounding strata (in which case the removal is considered groundwater extraction).
<b>Discharge</b>	The quantity of water per unit of time flowing in a stream, for example cubic metres per second or megalitres per day.
<b>Electrical conductivity</b>	A measure of the concentration of dissolved salts in water.
<b>Ephemeral</b>	Stream that is usually dry, but may contain water for rare and irregular periods, usually after significant rain.
<b>Fracture</b>	Cracks within the strata that develop naturally or as a result of underground works.
<b>Geomorphology</b>	Scientific study of landforms, their evolution and the processes that shape them. In this report relates to the form and structure of waterways.
<b>Groundwater</b>	Water occurring naturally below ground level.
<b>Groundwater extraction</b>	For the purposes of this report, groundwater extraction has been defined as the removal of groundwater from a groundwater source or aquifer, either via direct removal for use via a production bore or via incidental flow of groundwater from the aquifer into the mine workings during and after mining. Groundwater extraction includes the pumping of underground water from flooded mine workings in equilibrium with the surrounding strata as well as the removal of water from perched aquifers recharged directly from rainfall infiltration.
<b>Goaf</b>	The void created in a panel once the coal has been extracted, into which the overlying roof will ultimately fracture and cave/collapse (IESC, 2023).
<b>Guideline value</b>	The concentration or load of physicochemical characteristics of an aquatic ecosystem, below which there exists a low risk that adverse ecological effects will occur. They indicate a risk of impact if exceeded and should 'trigger' action to conduct further investigations or to implement management or remedial processes.
<b>Hydrogeology</b>	The area of geology that deals with the distribution and movement of groundwater in soils and rocks.
<b>Hydrograph</b>	Graph of water level or head in a bore or flow in a river or stream.
<b>Hydrology</b>	The study of rainfall and surface water runoff processes.

<b>Infiltration</b>	The downward movement of water into soil and rock. It is largely governed by the structural condition of the soil, the nature of the soil surface (including presence of vegetation) and the antecedent moisture content of the soil.
<b>Ion</b>	Electrically charged atom.
<b>Longwall</b>	Longwall mining is a form of underground coal mining where a block of coal is mined using a longwall shearer. The longwall mining method is supported by roadway development, mined using a continuous miner unit.
<b>Median</b>	The middle value, such that there is an equal number of higher and lower values. Also referred to as the 50th percentile.
<b>Percentile</b>	The value of a variable below which a certain percent of observations fall. For example, the 80th percentile is the value below which 80% of values are found.
<b>pH</b>	The value taken to represent the acidity or alkalinity of an aqueous solution. It is defined as the negative logarithm of the hydrogen ion concentration of the solution.
<b>Reach</b>	Defined section of a stream with a uniform character and behaviour.
<b>Recharge</b>	Inflow of water from surrounding strata into underground mine workings via infiltration. This can be as a result of rainfall events or from surrounding aquifers.
<b>Riparian</b>	Pertaining to, or situated on, the bank of a river or other water body.
<b>Run of mine</b>	Raw coal production (unprocessed).
<b>Sediment</b>	Soil or other particles that settle to the bottom of lakes, rivers, oceans, and other waters.
<b>Second workings</b>	Also referred to as secondary extraction. Any form of extraction beyond first workings where larger areas of coal, with spans usually beyond the width of a normal roadway, are extracted without installation of support. These unsupported areas constitute goaf, regardless of whether caving occurs. Secondary extraction includes longwall, short wall, partial and total pillar extraction mining systems; it excludes first workings only (IESC, 2023).
<b>Strata</b>	Geological layers below the ground surface.
<b>Stream order</b>	Stream classification system, where order 1 is for headwater (new) streams at the top of a catchment. Order number increases downstream using a defined methodology related to the branching of streams.
<b>Subsidence</b>	The vertical difference between the pre-mining surface level and the post-mining surface level at a point.
<b>Surface water</b>	Water that is derived from precipitation or pumped from underground and may be stored in dams, rivers, creeks, and drainage lines.
<b>Tributary</b>	A stream or river that flows into a main river or lake.
<b>Turbidity</b>	A measure of clarity (turbidity) of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

# Abbreviations

<b>2D</b>	Two dimensional
<b>AHD</b>	Australian Height Datum
<b>BCS</b>	Biodiversity, Conservation and Science Directorate
<b>bgl</b>	Below ground level
<b>BMP</b>	Biodiversity Management Plan
<b>BOM</b>	Bureau of Meteorology
<b>C</b>	Celsius
<b>Centennial</b>	Centennial Coal Company Pty Limited
<b>Clarence</b>	Clarence Colliery Pty Ltd
<b>CRD</b>	Cumulative rainfall departure
<b>DCCEEW</b>	NSW Department of Climate Change, Energy, the Environment and Water
<b>DGV</b>	Default guideline value
<b>DO</b>	Dissolved oxygen
<b>EC</b>	Electrical conductivity
<b>EEC</b>	Endangered Ecological Community
<b>EPL</b>	Environment Protection Licence
<b>Fe</b>	Iron
<b>GDE</b>	Groundwater dependent ecosystem
<b>kL/day</b>	Kilolitres per day
<b>km</b>	Kilometre
<b>L/s</b>	Litre per second
<b>LCC</b>	Lithgow City Council
<b>m</b>	Metre
<b>mg/L</b>	Milligram per litre
<b>ML</b>	Megalitre
<b>ML/day</b>	Megalitre per day
<b>mm</b>	Millimetre
<b>mm/year</b>	Millimetre per year
<b>Mn</b>	Manganese
<b>NPHS</b>	Newnes Plateau Hanging Swamp
<b>NPWS</b>	NSW National Parks and Wildlife Service
<b>NPSS</b>	Newnes Plateau Shrub Swamp
<b>NSMC</b>	Null Space Monte Carlo
<b>NTU</b>	Nephelometric turbidity unit
<b>PIRMP</b>	Pollution Incident Response Management Plan
<b>ROM</b>	Run of mine
<b>SDWC</b>	Sydney Drinking Water Catchment
<b>SILO</b>	Scientific Information for Land Owners database

<b>SSGV</b>	Site-specific guideline value
<b>TARP</b>	Trigger action response plan
<b>TDS</b>	Total dissolved solids
<b>THPSS</b>	Temperate Highland Peat Swamps on Sandstone
<b>TSS</b>	Total suspended solids
<b>VWP</b>	Vibrating wire piezometer
<b>WAL</b>	Water Access Licence
<b>WMP</b>	Water management plan
<b>µS/cm</b>	Microsiemens per centimetre

# Contents

<b>1. Introduction</b>	<b>1</b>
1.1 Background	1
1.2 Overview of site operations	1
1.3 Study area	1
1.4 Purpose	1
1.5 Consultation	2
<b>2. Monitoring requirements</b>	<b>3</b>
2.1 Surface water	3
2.1.1 Surface water quality and flow monitoring	3
2.1.2 Swamp surface water monitoring	3
2.1.3 Stream and riparian vegetation	1
2.1.4 Stream stability inspections	1
2.2 Groundwater	3
2.2.1 Monitoring network	3
2.2.2 Underground water management	8
2.2.3 Numerical groundwater model	10
2.2.4 Water Licensing	14
<b>3. Baseline data</b>	<b>15</b>
3.1 Climate	15
3.1.1 Rainfall and evaporation	15
3.1.2 Temperature	16
3.2 Surface water	17
3.2.1 Surface water quality	19
3.2.2 Flow monitoring	19
3.2.3 Stream and riparian vegetation	20
3.2.4 Stream and flow path stability	22
3.3 Groundwater	23
3.3.1 Overview	23
3.3.2 Groundwater levels	25
3.3.3 Groundwater users	26
<b>4. Impact assessment criteria</b>	<b>30</b>
4.1 Surface water	30
4.1.1 Water quality	30
4.1.2 Water flow	30
4.2 Groundwater	31
4.2.1 Groundwater levels	31
4.3 Performance criteria	32
4.3.1 Watercourses	32
4.3.2 Stream health	32
4.3.3 Groundwater environment	33
<b>5. Groundwater model validation program</b>	<b>34</b>
5.1 Data review	34
5.2 Calculation of groundwater take	34

<b>6.</b>	<b>Risks and mitigation plan</b>	<b>35</b>
6.1	Trigger action response plans	35
	6.1.1 Compensatory water supply	35
	6.1.2 Subsidence remediation	35
6.2	Management plan review	35
6.3	Reporting	36
<b>7.</b>	<b>Limitations</b>	<b>37</b>
<b>8.</b>	<b>References</b>	<b>38</b>

## Table index

Table 1.1	Development consent DA504-00 requirements for Water Management Plan	1
Table 2.1	Surface water quality monitoring frequency and parameters	3
Table 2.2	Swamp monitoring frequency and parameters	4
Table 2.3	Stream stability monitoring locations	1
Table 2.4	Groundwater monitoring	4
Table 3.1	Period of recorded water quality data	19
Table 3.2	Flow monitoring	19
Table 4.1	Surface water quality trigger values – Bungleboori Creek and Paddys Creek	30
Table 4.2	Groundwater level trigger values	31
Table 4.3	Watercourse criteria – Bungleboori Creek and Paddys Creek	32
Table 4.4	Stream health criteria	32
Table 4.5	Groundwater environment criteria	33
Table 6.1	Summary of management actions and mitigation measures	36

## Figure index

Figure 1.1	Locality plan	2
Figure 1.2	Extraction Plan Area	1
Figure 2.1	Surface water monitoring locations	1
Figure 2.2	Watercourse stability monitoring	2
Figure 2.3	Groundwater monitoring locations	7
Figure 2.4	Underground water management features	9
Figure 2.5	Typical setting of shrub swamps and hanging swamps (approximately SW to NE)	12
Figure 2.6	Predicted groundwater inflows into the Clarence Colliery workings – approved (existing) vs proposed (JBS&G, 2025)	13
Figure 3.1	Historical annual rainfall record	15
Figure 3.2	Average daily rainfall and evaporation rates	16
Figure 3.3	Average daily temperature	16
Figure 3.4	Sydney drinking water catchment	18
Figure 3.5	Comparison of mapped swamps and High Ecological Value Aquatic Ecosystem mapping	21
Figure 3.6	Conceptual hydrogeological model (JBS&G, 2026)	24
Figure 3.7	Registered groundwater bores	28

Figure 3.8 Clarence Colliery surface geology mapping, showing relationship between Burrellow Formation aquitards and swamp location (supplied: Clarence Colliery, 16/09/25)

29

## Appendices

Appendix A	Correspondence with regulators
Appendix B	Consultation outcomes
Appendix C	Baseline Data
Appendix D	Registered groundwater bores
Appendix E	Trigger action response plans

# 1. Introduction

## 1.1 Background

Clarence Colliery is an underground coal mine located in the Western Coalfield approximately 15 kilometres (km) east of Lithgow, NSW, as shown in Figure 1.1. Clarence Colliery is owned by Centennial Coal Company Pty Limited (Centennial) through a joint venture structure. Clarence Colliery Pty Limited (Clarence) is the manager of the joint venture. Clarence Coal Pty Limited is the statutory operator of Clarence Colliery. Clarence Colliery currently operates as authorised by three development consents, those being DA504-00 MOD 10 issued by the Department of Planning, as well as IRM.GE.76 and 174/93 both of which were issued by the Lithgow City Council (LCC). All consents authorise underground mining activities enabling the extraction of up to 3 million tonnes per annum of run of mine (ROM) coal.

This 918 Panel Water Management Plan (WMP) has been prepared to support an Extraction Plan for the secondary extraction of Panel 918 (consisting of sub panels 918A, 918B1 and 918B2) as located within the DA504-00 partial extraction mining area. The mine plan for Panel 918 and the Extraction Plan Area is shown in Figure 1.2. The Extraction Plan area is the greater boundary of the 20 mm subsidence contour and 35 degree angle of draw, provided by MSEC (2026) and Centennial respectively, as shown on Figure 1.2. The WMP has been developed for the management of potential impacts to watercourses and aquifers from the proposed second workings of the 918 Panel at Clarence Colliery, as stipulated by development consent DA504-00.

The WMP has been prepared by Ian Gilmore and Dr Stuart Gray of GHD Pty Ltd. Preparation of the WMP was undertaken in consultation with Clarence and in accordance with the conditions of development consent DA504-00 for Clarence Colliery. Consultation with Water NSW, NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) – formerly the Department of Planning and Environment, and the Biodiversity Conservation Science Directorate (BCS), has been carried out as part of the preparation of this plan. Records of this consultation is presented in Appendix A, and summarised in Section 1.5.

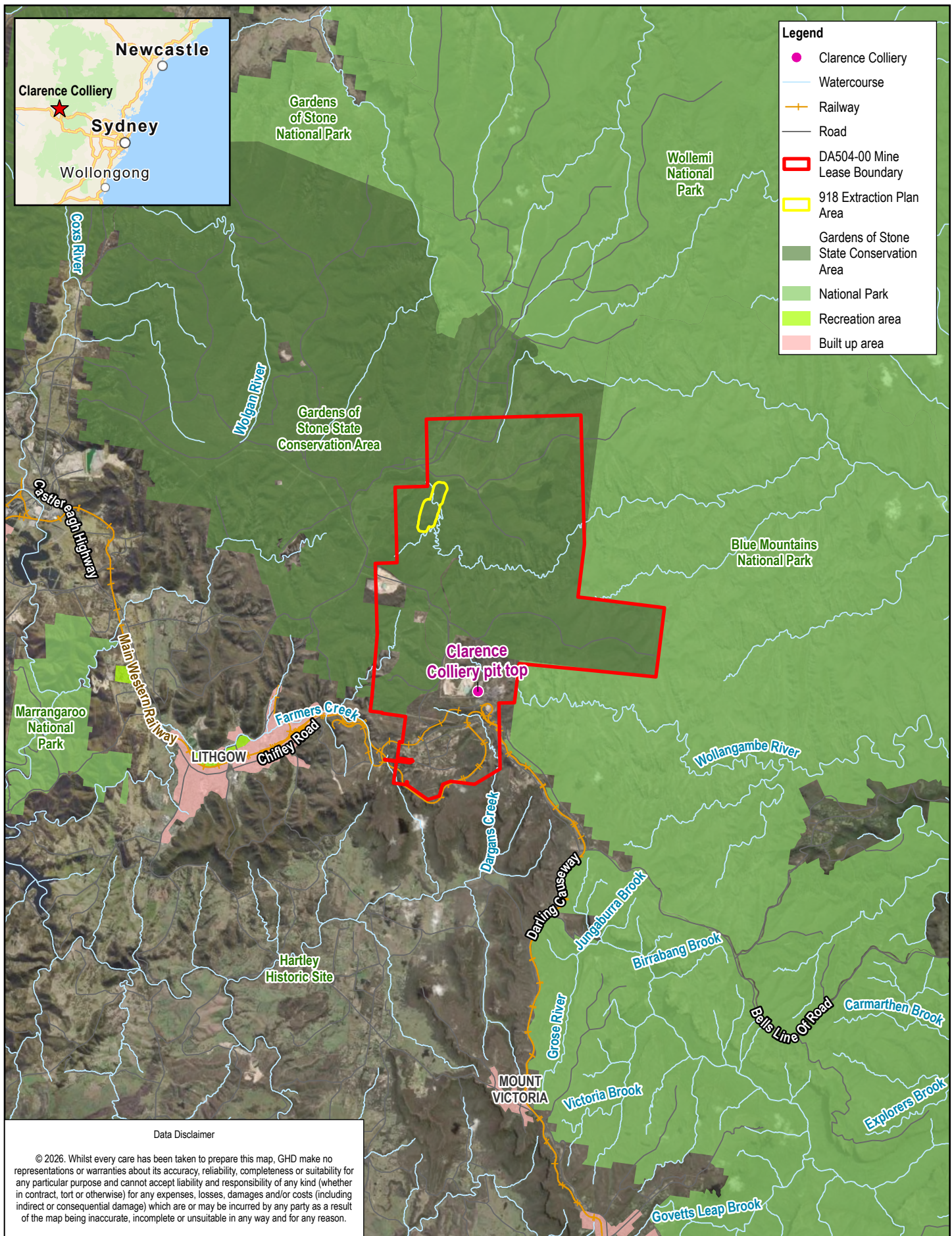
## 1.2 Overview of site operations

Coal at Clarence Colliery is extracted from the Katoomba Seam. Initially operating as a bord and pillar partial and total extraction mine throughout the 1980s, Clarence employed the longwall mining technique in the 1990s, before returning to purely partial extraction mining techniques from around 1999. Centennial purchased the mine in 1998 and reintroduced bord and pillar mining methods using partial extraction to minimise surface subsidence and impacts to groundwater, whilst maximising resource recovery and mine productivity.

Removal of water from the underground workings is critical to the safety and productivity of the mine. Contemporary management of this water resource includes primary and secondary treatment, removing dissolved metals to meet the conditions and criteria set out in Clarence's Environment Protection Licence (EPL) 726. The treated water is then discharged into Clarence's Main Dam, where it overtops into the Wollangambe River. Water stored in Main Dam at Clarence Colliery is transferred to the Lithgow No. 2 Dam (also known as Farmers Creek Dam) as part of the Clarence Water Transfer Scheme. Water from the Lithgow No. 2 Dam supplies the Lithgow town water supply via the Oakey Park Water Treatment Plant, which is owned and operated by LCC.

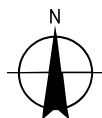
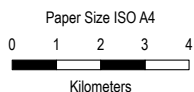
## 1.3 Study area

The Extraction Plan Area (also referred to as study area) for this WMP, defined by the greater boundary of the 20 mm subsidence contour and 35 degree angle of draw, is shown in Figure 1.2. This WMP also considers impacts on mine water inflows, underground water storages and groundwater bores both within and beyond the Extraction Plan Area.



Data Disclaimer

© 2026. Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.



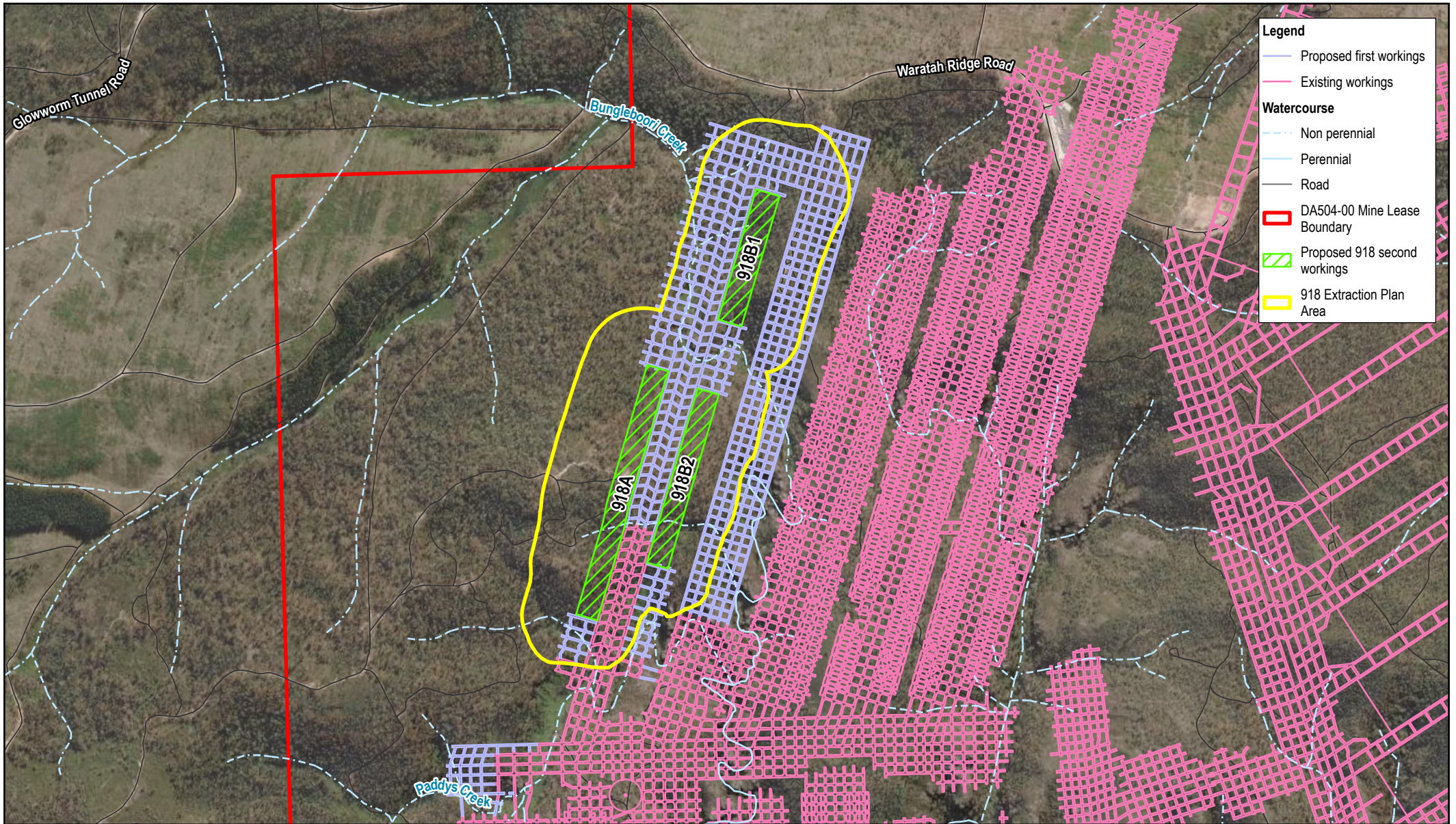
Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 56

Clarence Colliery  
918 Extraction Plan WMP

Project No. 12655704  
Revision No. 0  
Date 22/02/2026

Locality plan

FIGURE 1.1



**Legend**

- Proposed first workings
- Existing workings

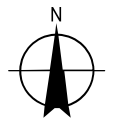
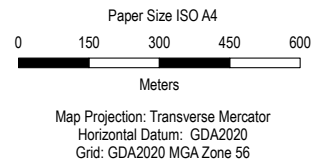
**Watercourse**

- - - Non perennial
- Perennial
- Road

- DA504-00 Mine Lease Boundary
- Proposed 918 second workings
- 918 Extraction Plan Area

**Data Disclaimer**

© 2026. Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.



**Clarence Colliery  
918 Extraction Plan WMP**

Project No. **12655704**  
Revision No. **0**  
Date **24/02/2026**

**918 Extraction plan area**

**FIGURE 1.2**

## 1.4 Purpose

This WMP addresses specific water related conditions of development consent DA504-00. Schedule 3, Condition 2 g (iii) of development consent DA504-00 requires Clarence to develop and implement a WMP as part of an Extraction Plan. The relevant requirements of the WMP content are outlined in Table 1.1, along with the sections of the plan where these have been addressed.

**Table 1.1** Development consent DA504-00 requirements for Water Management Plan

Condition	Where addressed
Each Extraction Plan must include a Water Management Plan which has been prepared in consultation with DPIE Water and BCS, which provides for the management of potential impacts and environmental consequences of the proposed underground workings on watercourses and aquifers.	Section 1.5 Appendix A Appendix B
Detailed baseline data on: <ul style="list-style-type: none"> <li>– Surface water flows, quality, and geomorphic conditions of watercourses and/or water bodies that could be affected by subsidence.</li> <li>– Groundwater levels, yield, and quality in the region, including for privately-owned licensed bores.</li> </ul>	Section 3.2 Section 3.3 Appendix C
Detailed surface and groundwater impact assessment criteria, including specific trigger levels for: <ul style="list-style-type: none"> <li>– Investigating any potentially adverse impacts on water resources or water quality.</li> <li>– Active remediation of geomorphic and erosional impacts (including supporting justification for the selected triggers).</li> <li>– Providing compensatory water supply to affected water users.</li> </ul>	Section 4 Section 6.1.1 Appendix E
A surface water monitoring program to monitor and report on: <ul style="list-style-type: none"> <li>– Stream flows and quality.</li> <li>– Stream and riparian vegetation.</li> <li>– Channel and bank stability.</li> <li>– The effectiveness of remediation measures in controlling geomorphic and erosional impacts.</li> </ul>	Section 2.1 Section 6.1.2
A groundwater monitoring program to monitor and report on: <ul style="list-style-type: none"> <li>– Groundwater inflows to the underground mining operations.</li> <li>– The height of groundwater depressurisation.</li> <li>– Height of fracturing above extraction areas following mining.</li> <li>– Background changes in groundwater yield/quality against mine-induced changes, in particular, on privately-owned groundwater bores in the vicinity of the site.</li> <li>– Permeability, hydraulic gradient, flow direction and connectivity of the deep and shallow groundwater aquifers.</li> <li>– Impacts of the development on groundwater dependent ecosystems.</li> </ul>	Section 2.2 Section 2.2.3.1
A description of any adaptive management practices implemented to guide future mining activities in the event of greater than predicted impacts on aquatic habitat.	Section 6.1.2
A program to validate the surface water and groundwater models for the development and compare monitoring results with modelled predictions.	Section 5
A plan to respond to any exceedances of the surface water and groundwater assessment criteria.	Section 6 Appendix E

## 1.5 Consultation

The WMP is required to be prepared in consultation with the NSW DCCEEW (formally the DPIE Water Group (DPIE-Water)) and BCS, as per Schedule 3 (Specific Environmental Conditions) conditions 2 g (iii). A copy of the draft 918 and 920 Panels WMP was provided to DPE-Resource Assessments, DPE-Water, BCS, National Parks and Wildlife Service (NPWS) and Water NSW in November 2023 and was updated for regulatory comments and later submitted to DPHI in April 2024. The 918 and 920 Panels Extraction Plan and associated 918 and 920 WMP was withdrawn from DPHI assessment in October 2024. The 918 and 920 Panel mine plan was reviewed, in consultation with the Independent Expert Advisory Panel for Mining, and the 918 sub-panels were changed to reduce second workings footprint above the swamps and Bungleboori creek and 920 Panel removed. Similarly, consultation was undertaken with the Independent Expert Advisory Panel for Mining regarding the monitoring network for this WMP.

A draft for comment copy of the 918 WMP was provided to Clarence employees with roles and responsibilities under the WMP in January 2026. A copy of the WMP was provided to NSW DCCEEW-Water Group, DCCEEW-CPHR, National Parks and Wildlife Service (NPWS) and WaterNSW on 26 February 2026. This document will form a component of the 918 Extraction Plan documentation. Evidence of 918 Panel WMP consultation is provided in Appendix A with outcomes of consultations provided in Appendix B.

## 2. Monitoring requirements

A comprehensive groundwater and surface water monitoring program has been developed by Clarence, as detailed in the Clarence Colliery: Water Management Plan (GHD, 2025). The main objective of surface and groundwater monitoring is to confirm that the performance of water management measures implemented function as designed.

The predicted 2D (two-dimensional) vertical subsidence was determined by SCT (2026) using numerical modelling. SCT (2026) predicted that the maximum predicted vertical subsidence at the surface due to extraction of 918 sub-panels is 76 millimetres (mm) with  $\pm 20$  mm tolerance. 3D (three-dimensional) subsidence due to mining of 918 Panel has been predicted by MSEC (2026), using the Incremental Profile Method (IPM) based on the 2D profiles from SCT (2026). Predicted 3D subsidence contours developed by SCT (2026) are shown in Figure 2.2. Subsidence monitoring and response to subsidence triggers will be undertaken in accordance with the 918 Panel Subsidence Monitoring Program.

This section summarises the water monitoring specifically relevant to extraction of Panel 918.

### 2.1 Surface water

The Extraction Plan Area is within the catchment of Bungleboori Creek and the lower reaches of Paddys Creek. Paddys Creek is a tributary of Bungleboori Creek. Newnes Plateau Shrub Swamps (NPSS) and Newnes Plateau Hanging Swamps (NPHS) are Endangered Ecological Communities (EEC). Together NPSS and NPHS comprise the federally listed Temperate Highland Peat Swamps on Sandstone (THPSS). The THPSS flank Bungleboori Creek and Paddys Creek as presented in Figure 2.1. THPSS are herein also referred to as swamps.

#### 2.1.1 Surface water quality and flow monitoring

Surface water quality and flow monitoring in Bungleboori Creek and Paddys Creek catchments is summarised in Table 2.1 with monitoring locations shown in Figure 2.1.

Flow monitoring is measured at these locations using hand-held flow meters during monthly water quality sampling.

Table 2.1 Surface water quality monitoring frequency and parameters

Location	UTM	Eastings	Northings	Frequency	Parameters
Bungleboori Creek U/S	56H	242272	6301056	Monthly	<b>Physicochemical:</b> Temperature, pH, electrical conductivity (EC), dissolved oxygen (DO), turbidity, total suspended solids (TSS), total dissolved solids (TDS), redox potential. <b>Total and dissolved metals:</b> Manganese (Mn), Iron (Fe)
Bungleboori Creek D/S	56H	244546	6298417		
Paddys Creek ^	56H	241629	6299143		

^ Paddys Creek is monitored by Springvale Mine.

#### 2.1.2 Swamp surface water monitoring

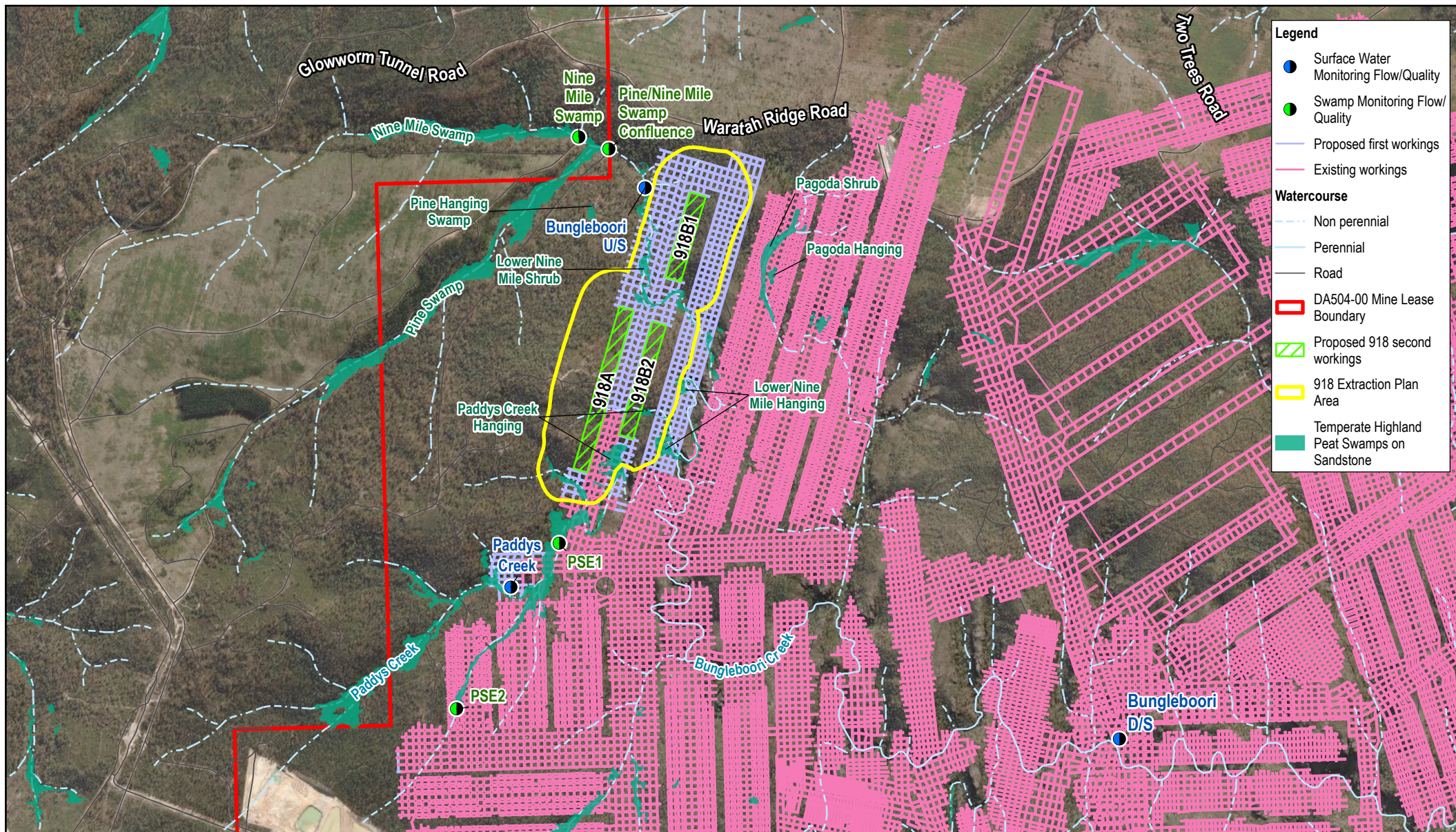
Locations of swamp surface water quality and flow monitoring are shown in Figure 2.1 and details are shown in Table 2.2.

Changes to swamp baseflow volumes are also inferred through swamp groundwater level monitoring which is undertaken in specific swamps set out in Section 2.2.1. Flow monitoring is measured at locations set out in Table 2.2 using hand-held flow meters during monthly water quality sampling.

Table 2.2 Swamp monitoring frequency and parameters

Location	UTM	Eastings	Northings	Catchment	Frequency	Parameters
PSE1	56H	241860	6299353	Paddys Creek	Monthly	Flow rate <b>Physicochemical:</b> Temperature, pH, EC, DO, TSS, TDS, redox potential. <b>Total and dissolved metals: Mn, Fe</b>
PSE2	56H	241368	6298559			
Nine Mile Swamp ^	56H	241941	6299143	Bungleboori Creek		
Pine/Nine Mile Swamp Confluence ^	56H	242124	6301225	Bungleboori Creek		

^ Form part of the Springvale Mine monitoring program



**Legend**

- Surface Water Monitoring Flow/Quality
- Swamp Monitoring Flow/Quality
- Proposed first workings
- Existing workings

**Watercourse**

- Non perennial
- Perennial
- Road
- DA504-00 Mine Lease Boundary
- ▨ Proposed 918 second workings
- ▭ 918 Extraction Plan Area
- Temperate Highland
- Peat Swamps on Sandstone

**Data Disclaimer**

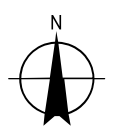
© 2026. Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Paper Size ISO A4

0 150 300 450 600

Meters

Map Projection: Transverse Mercator  
Horizontal Datum: GDA2020  
Grid: GDA2020 MGA Zone 56



**Clarence Colliery**  
**918 Extraction Plan WMP**

**Surface water**  
**monitoring locations**

Project No. **12655704**  
Revision No. **0**  
Date **24/02/2026**

**FIGURE 2.1**

## 2.1.3 Stream and riparian vegetation

Monitoring requirements for stream and riparian vegetation monitoring are addressed in the 918 Panel Biodiversity Management Plan (BMP) (RPS 2026).

## 2.1.4 Stream stability inspections

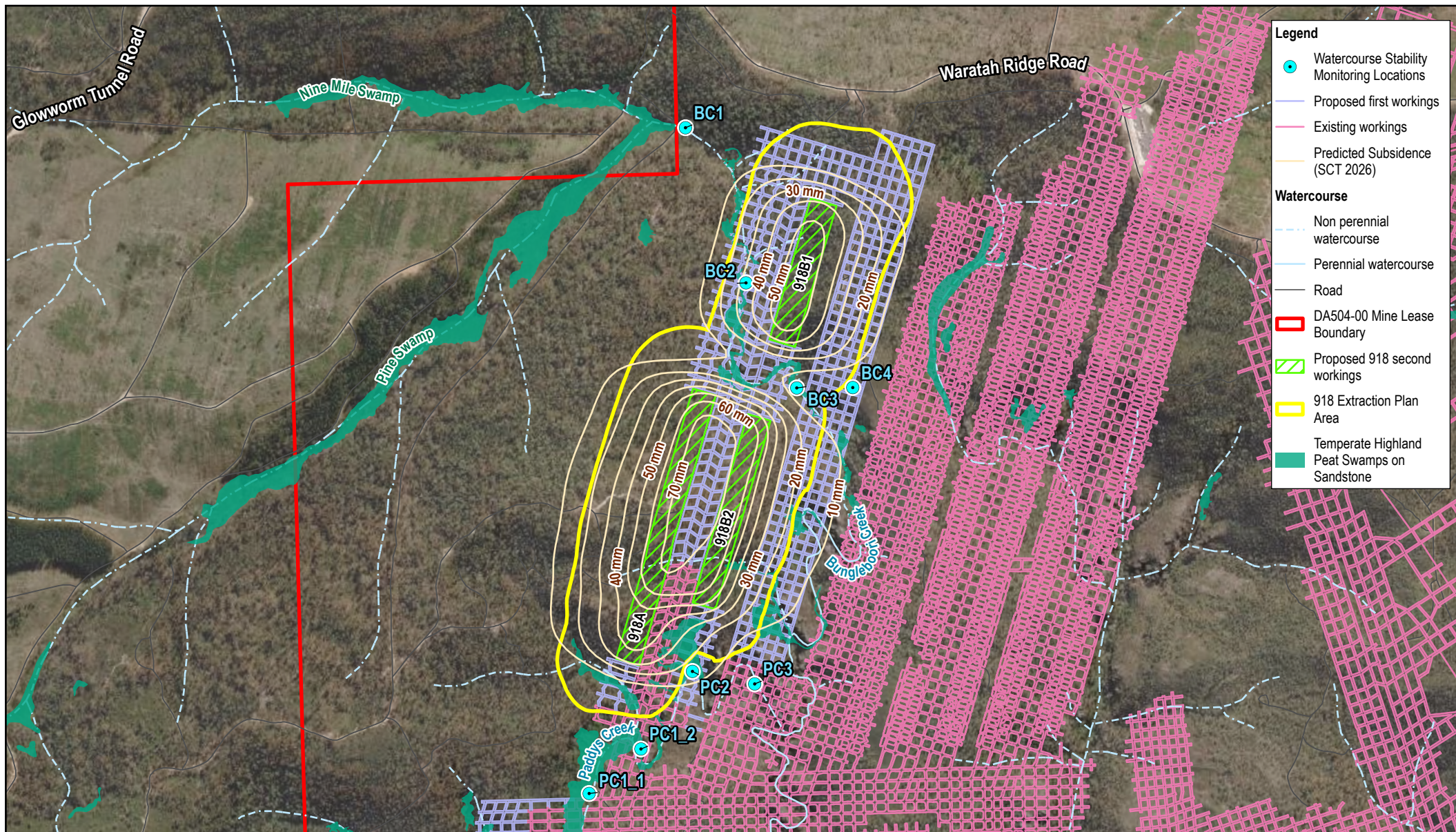
Pre-mining stream flow path, channel and bank stability was undertaken by GHD in 2023 (GHD, 2023) and 2025 (GHD, 2025a) and is planned to be conducted post mining. Stream flow path, channel and bank stability monitoring locations are listed in Table 2.3 and shown in Figure 2.2. All baseline photos and photo locations are shown in Appendix C, Figure C.1. Refer to Section 3.2.4 for further detail regarding baseline stream stability monitoring from which these monitoring locations were derived.

Monitoring is to include visual inspection of swamp condition upstream and downstream of the monitoring location. This should include photographs of the left and right banks and upstream and downstream of the monitoring location. The monitoring should be preceded by a desktop review of subsidence monitoring, groundwater level and streamflow results. Field monitoring should be complemented by review of aerial photograph / lidar assessment to review swamp conditions in difficult to access areas.

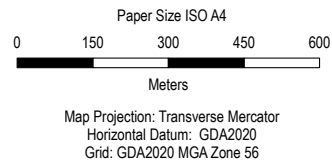
Monitoring is proposed to be undertaken on a six-monthly basis for a period of three years post panel extraction with additional monitoring undertaken if a red subsidence trigger (i.e., subsidence >100 mm) is exceeded as per the 918 Subsidence Monitoring Program.

*Table 2.3 Stream stability monitoring locations*

Monitoring locations	Easting (GDA2020 Zone 56)	Northing (GDA2020 Zone 56)
BC1	242129	6301239
BC2	242303	6300793
BC3	242449	6300491
BC4	242610	6300492
PC1_2	242001	6299453
PC1_1	241852	6299325
PC2	242149	6299676
PC3	242328	6299640



**Data Disclaimer**  
 © 2026. Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.



**Clarence Colliery  
 918 Extraction Plan WMP**

**Watercourse stability  
 monitoring locations**

Project No. **12655704**  
 Revision No. **0**  
 Date **24/02/2026**

**FIGURE 2.2**

## 2.2 Groundwater

### 2.2.1 Monitoring network

Monitoring of groundwater bores CLRP18, CLRP27, CLRP40, CLRP41A, CLRP41R, CLRP42R, PG1, PG2, PSE1, CSP1 (BSE1), CSP2 (BSE2), CSP4 (PHS1), CSP5 (PHS2), CSP34, CSP35, CSP36, will allow for the assessment of potential change during and after the mining of the 918 Panel, with a focus on CSP1 (BSE1), CSP2 (BSE2), CSP4 (PHS1), CSP5 (PHS2), within the Extraction Plan Area. These monitoring locations are shown in Figure 2.3 and details are shown in Table 2.4.

The monitoring network includes vibrating wire piezometers (VWPs) and standpipes. All VWPs are logged for piezometric head and groundwater levels. Groundwater levels are recorded regularly using installed loggers in monitoring standpipes. Data are usually downloaded every two to three months.

The wider groundwater monitoring network also includes a number of monitoring bores at Springvale Mine. Whilst some of these bores have already been affected by activities not related to Clarence Colliery, these bores will also be monitored in the unlikely instance that there are potential changes in groundwater level due to mining of the 918 Panel. These Springvale Mine monitoring bores are also shown in Figure 2.3 and details are shown in Table 2.4.

The groundwater monitoring network provides adequate coverage of the swamps based on the predictions of the numerical groundwater model (JBS&G, 2026). The numerical groundwater model has been developed to predict changes to groundwater levels due to proposed mining. The numerical groundwater model predicts that greater than 5% change in groundwater levels due to mining is limited to Nine Mile Lower Swamp where CSP2 is installed. At greater distances from the extraction area, the numerical model predicts less than 5% decrease in groundwater levels. All changes in groundwater levels in swamps are temporary only (JBS&G, 2026).

Groundwater quality is not monitored at any of the groundwater monitoring sites in the Extraction Plan Area monitoring network. There is no extraction or use of shallow or regional groundwater in the vicinity of the Extraction Plan Area, and monitoring of perched groundwater is undertaken via monitoring of swamp water quality.

Table 2.4 Groundwater monitoring

Location name	UTM	Easting	Northing	Monitoring type	Period of data	Monitoring depth (m bgl)	Lithology	Aquifer type (JBS&G 2025)
CLRP18	56H	243123	6301411	VWP	December 2014 – present	230.00	Burra-Moko Head Sandstone	Deep
						75.00	Burralow Formation	Shallow
CLRP27	56H	242577	6300786	VWP	April 2021 – present	275.00	Caley Formation	Deep
						220.00	Burra-Moko Head Sandstone	Deep
						190.00	Burra-Moko Head Sandstone	Deep
						130.00	Banks Wall Sandstone	Shallow
						80.00	Banks Wall Sandstone	Shallow
CLRP40	56H	242033	6301012	Standpipe bore	April 2023 – present	70.00	Banks Wall Sandstone	Shallow
CLRP41A	56H	242091	6300145	Standpipe bore	November 2022 – present	55.01	Burralow Formation	Shallow
CLRP41R	56H	242074	6300148	VMP	December 2025 – present	260	Caley Formation	Deep
						230	Burra-Moko Head Sandstone	Deep
						200	Burra-Moko Head Sandstone	Deep
						175	Burra-Moko Head Sandstone	Deep
						155	Mount York Claystone	Shallow
						125	Banks Wall Sandstone	Shallow
						85	Banks Wall Sandstone	Shallow
						55	Burralow Formation	Shallow
CLRP42R	56H	241794	6300552	Standpipe bore	March 2023 – present	70.00	Banks Wall Sandstone	Shallow
PG1	56H	242845	6300646	Standpipe bore	August 2019 - present	1.60	Quaternary Sediments (Pagoda Shrub Swamp)	Perched
PG2	56H	242888	6300470	Standpipe bore	August 2019 - present	1.90	Quaternary Sediments (Pagoda Shrub Swamp)	Perched

Location name	UTM	Easting	Northing	Monitoring type	Period of data	Monitoring depth (m bgl)	Lithology	Aquifer type (JBS&G 2025)
PSE1	56H	241840	6299288	Standpipe bore	March 2017 – present	1.20	Quaternary Sediments (Paddys Swamp East)	Perched
CSP1 (BSE1)	56H	242271	6300696	Standpipe bore	August 2022 – present	1.85	Quaternary Sediments (Nine Mile Lower Swamp)	Perched
CSP2 (BSE2)	56H	242280	6300540	Standpipe bore	August 2022 – present	0.90	Quaternary Sediments (Nine Mile Lower Swamp)	Perched
CSP4 (PHS1)	56H	241949	6299626	Standpipe bore	August 2022 – present	1.48	Quaternary Sediments (Paddys Creek Shrub Swamp)	Perched
CSP5 (PHS2)	56H	241826	6299725	Standpipe bore	August 2022 – present	0.90	Quaternary Sediments (Paddys Swamp)	Perched
CSP34	56H	242398	6300544	Standpipe bore	May 2025 - present	0.57	Lower Nine Mile Shrub Swamp	Perched
CSP35	56H	242297	6299980	Standpipe bore	May 2025 - present	1.09	Quaternary Sediments (Paddys Creek Hanging Swamp)	Perched
CSP36	56H	242150	6299815	Standpipe bore	May 2025 - present	1.05	Quaternary Sediments (Paddys Creek Hanging Swamp)	Perched
<b>Springvale Bores</b>								
BS3+SM	56H	242008	6301245	Standpipe bore	August 2016 – present	0.80	Pine Swamp monitoring	Perched
NM	56H	241425	6301308	Standpipe bore	September 2022 - present	1.09	Nine Mile Swamp monitoring	Perched
NMSS+SM	56H	241913	6301327	Standpipe bore	July 2018 - present	0.93	Nine Mile Swamp monitoring	Perched
PS	56H	241519	6300715	Standpipe bore	September 2022 – present	1.32	Pine Swamp monitoring	Perched
PSS+SM	56H	241959	6301201	Standpipe bore	July 2018 - present	1.16	Pine Swamp monitoring	Perched

Location name	UTM	Easting	Northing	Monitoring type	Period of data	Monitoring depth (m bgl)	Lithology	Aquifer type (JBS&G 2025)
SPR1605	56H	241966	6301250	Standpipe bore	May 2018 - present	12.00	Shallow Aquifer	Shallow
SPR1606	56H	241416	6299067	Standpipe bore	May 2018 - present	10.00	Shallow Aquifer	Shallow

Note to table:

m bgl – metres below ground level

Aquifer type is defined by JBS&G (2025):

Deep: considered to comprise units below the Mt York Claystone

Shallow: consists of the Banks Wall Sandstone

Perched: the Burrellow Formation constitutes the variably saturated 'perched' groundwater system



## 2.2.2 Underground water management

Mining at Clarence Colliery extracts coal from the Katoomba Seam and currently uses partial extraction bord and pillar mining methods. Watering for mining activities is supplied by treated water from the water treatment plant (WTP), which is stored in the Fire Tanks. The use of partial extraction mining methods aims to minimise subsidence and therefore disturbance to natural surface water and groundwater systems and thereby minimises inflows to mine workings. Underground water management is discussed in Section 3.3 of the Clarence Colliery WMP (GHD 2025). The Clarence Colliery WMP (GHD, 2025) is an overarching WMP that addresses site-wide water management, including addressing specific water components of the conditions of development consents IRM.GE.76, DA 174/93, and DA 504-00.

The largest underground water storage within the underground workings, referred to as the 301 sump, is located in the lowest region of the existing workings and includes the old longwalls and the 600 Area, as shown in Figure 2.4.

There are a number of smaller underground water storages typically located in the down dip area or low points of the existing workings. These smaller storages include the 203 Area, the 310 Area and the 304 Area. The major active, or recently active, areas of the workings are the 900 Area, 700 Area and 800 Area, shown in Figure 2.4. Water is stored and/or transferred between underground storage areas as required operationally, before being dewatered via the 203 Area.

The major water inputs into the underground workings are:

- Groundwater inflow from the coal seam and adjacent strata.
- Transfer of leachate water to the underground workings from the Polishing Lagoon, Primary Arrestor, Leachate Dam 1 and Leachate Dam 2.
- Transfer of water reticulated to the underground workings from the Fire Tanks for mining activities.

In order to dewater the underground workings, water is transferred to the underground storage in the 203 Area where there are two existing dewatering bores, one each in 79 and 82 c/t. The 203 Area was formed from previous mining activities and has a volume of approximately 40 ML. The underground storage area provides a sediment settlement function due to the low velocity of water within the underground workings and relatively long retention time in the 203 Area of approximately two to four days. The infiltrated water blends with underground water for a period of time, prior to being pumped to the WTP for treatment and discharge via the 79 c/t and 82 c/t dewatering bores.

### 2.2.2.1 Underground water transfer monitoring

Daily monitoring is undertaken using inline meters for the following transfers:

- Fire Tanks to underground workings
- Primary arrestor to underground workings
- Underground storage to WTP (via dewatering bores)
- Transfer from Leachate Dam 1 and Leachate Dam 2 to the underground workings

If practical, a flow meter will be installed in the underground workings in the 918 Panel to monitor rate of groundwater inflow into the proposed workings. This will be undertaken at the commencement of extraction (second workings) of Panel 918.

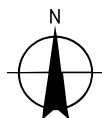
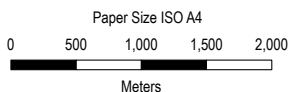
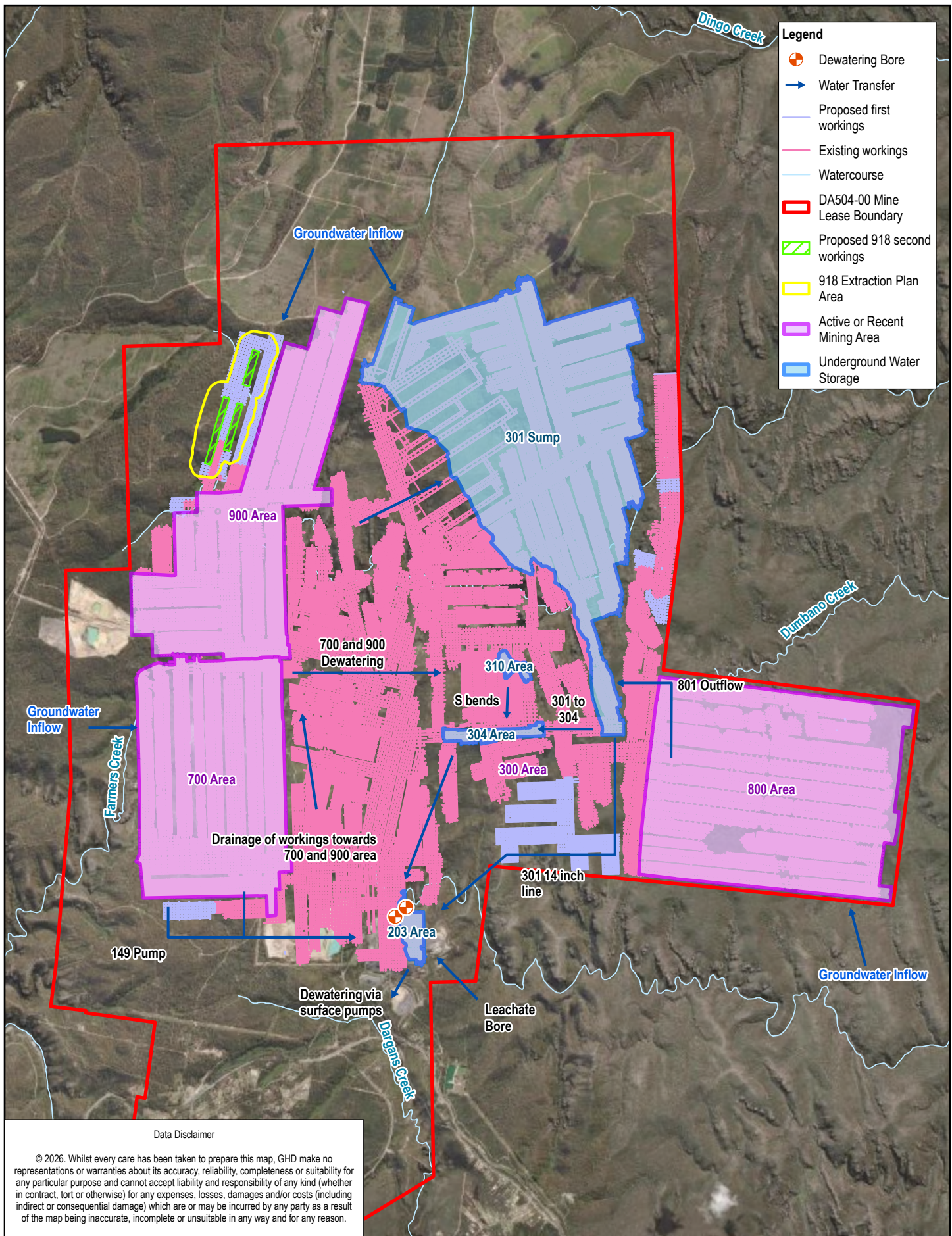
### 2.2.2.2 Calculation of groundwater inflows

Groundwater inflows from the adjacent strata into the mine workings are calculated as part of the annual water balance review. Due to transfers of water into the workings and the variability in the water level in the 301 sump, inflows from adjacent strata into the workings are not equal to dewatered volumes. The actual volume of groundwater inflow from the adjacent strata is calculated using the following formula:

Groundwater inflow =  $\Delta$  storage + dewatering volume – inputs (other inputs not including Groundwater inflow).

Where groundwater inflow is the seepage of groundwater from adjacent strata into the workings, change in storage is the change in storage of the 301 sump and inputs include transfer of water from fire tanks to underground workings and transfer from Leachate Dam 1 and Leachate Dam 2.

The calculated groundwater inflows were utilised by JBS&G (2026) in the calibration of the numerical groundwater model developed for the 918 Extraction Plan WMP.



Map Projection: Transverse Mercator  
Horizontal Datum: GDA2020  
Grid: GDA2020 MGA Zone 56

Clarence Colliery  
918 Extraction Plan WMP

Project No. 12655704  
Revision No. 0  
Date 24/02/2026

**Underground Water  
Management Features**

**FIGURE 2.4**

## 2.2.3 Numerical groundwater model

A numerical groundwater model has been developed to assess the potential impacts from mining from Clarence Colliery (JBS&G, 2026). The model includes the proposed mining of the 918 Panel. The model has been peer reviewed by GHD (2026).

The model development and calibration are documented in JBS&G (2025). The model predicts the rate of groundwater inflow into the Clarence Colliery workings. The modelled rate of groundwater inflow is shown in Figure 2.6.

Proposed mining has the potential to result in drawdown in groundwater levels in aquifers within and above the Katoomba seam. The numerical model has been utilised to predict the magnitude and extent of groundwater drawdown. A detailed discussion of potential impacts on groundwater levels is outlined in JBS&G (2025).

Prediction results for stochastic uncertainty analysis are presented in this WMP. The method of uncertainty analysis adopted by JBS&G (2026) is an adaptation of the Calibration-Constrained Null Space Monte Carlo (NSMC) method. Based on the outcomes of the stochastic analysis, 10<sup>th</sup> percentile predictions of impacts due to extraction of the 918 Panel was estimated. The 10<sup>th</sup> percentile predictions denotes that only 10 per cent of predicted impacts are greater than this value.

The effects of existing mining at Clarence Colliery and surrounding mines were compared to the proposed mining case, which includes existing mining and the development (first workings) and extraction (second workings) of the 918 Panel. Therefore some of the predicted impacts (groundwater inflows, drawdown) from the model may be attributed to the development, not exclusively the extraction, of the 918 Panels.

Groundwater model results incorporating uncertainty analysis indicate that decline in groundwater elevation is negligible (change of less than 5%) at all THPSS within the Extraction Plan area, with the exception of the swamp where CSP2 is installed. At the location of CSP2 there is a small (change of 5 to 10%) to medium (change of 10 to 25%) transitory decline in groundwater level. However, these are considered to be insignificant as this decline is transitory and does not lead to long-term change.

Changes in seepage to swamps was assessed using predictions of the numerical groundwater model for groundwater contribution to surface water and the Swamp Water Balance Model (JBS&G, 2026a).

Modelling indicates that there is a negligible (less than 5%) change in groundwater contribution to surface water from the inclusion of 918 Panel Extraction at Paddy's Creek Swamp, Pine Swamp, and the catchments of Bungleboori Creek and Paddys Creek tributaries.

The groundwater model predicts drawdown due to the extraction of the 918 Panel in the Mount York Claystone to be negligible (change is less than 2 m) and large (change is greater than 25 m) in the Katoomba Seam.

The model has been utilised to predict drawdown at groundwater monitoring bores (standpipes) within the Extraction Plan Area (Section 2.2.1). Modelled drawdown at each of the bores within the Extraction Plan Area is presented in Section 4.2.1.

### 2.2.3.1 Height of fracturing

SCT (2026) modelled the potential height of mining induced fracturing due to extraction of the 918 Panel using a 2D numerical geotechnical model. The model was calibrated using observations of subsidence and stress measurements at previous mining areas at Clarence Colliery. The model results indicates that the height of fracturing does not extend to the Mount York Claystone.

The Mount York Claystone is a regionally significant aquitard and is an important geological unit in the stratigraphy as highly productive aquifers overlie it. The Mount York Claystone consists of interbedded claystone, siltstone, and sandstone beds, typically with a total interval thickness of around 20 m and a gradational contact to the underlying Burra-Moko Head Sandstone. The typical thickness of the Mount York Claystone is 20 m and is separated from the Katoomba Seam by over 100 m of overburden within the Extraction Plan Area (SCT, 2026). Figure 2.5 shows an indicative presentation of the stratigraphy above the Katoomba seam including the location of the Mount York Claystone.

The Mount York Claystone forms the boundary between the shallow and deep groundwater systems. The shallow system is important from both an ecological and economic perspective as it supports groundwater users particularly in the vicinity of the township of Clarence approximately 6 km south of the Extraction Plan Area, and Groundwater Dependent Ecosystems (GDEs). Surface alluvium and weathered rock overlying fine-grained claystone / shale layers (Burralow Formation) support threatened ecological communities that rely on the shallow and perched aquifers (within the Burralow Formation), including THPSS.

For the above-mentioned reasons, the maintenance of the Mount York Claystone integrity is very important to avoid disruption to the shallow / upper aquifers located higher up in the stratigraphy.

SCT (2026) undertook a desktop review of the proposed mine geometry and available monitoring data to determine the potential height of fracturing above the mine workings. SCT (2026) concluded that mining induced, vertically connected fracturing above each panel is expected to remain substantially below the Mount York Claystone. The maximum extent of caving fracturing is 90 m above the mining horizon of the 918 Panel compared to Mount York Claystone which is approximately 110 m above the mining horizon.

The hydrogeological model (JBS&G, 2026) implemented the use of 'stacked drains' to represent depressurisation to the height of continuous fracturing. Further information regarding the representation of the height of fracturing in the hydrogeological model can be referred to in JBS&G (2026).

Height of fracturing will be monitored via a surface to seam extensometer installed above the first sub-panel to be extracted (918A) as set out in the 918 Panel Subsidence Monitoring Program.

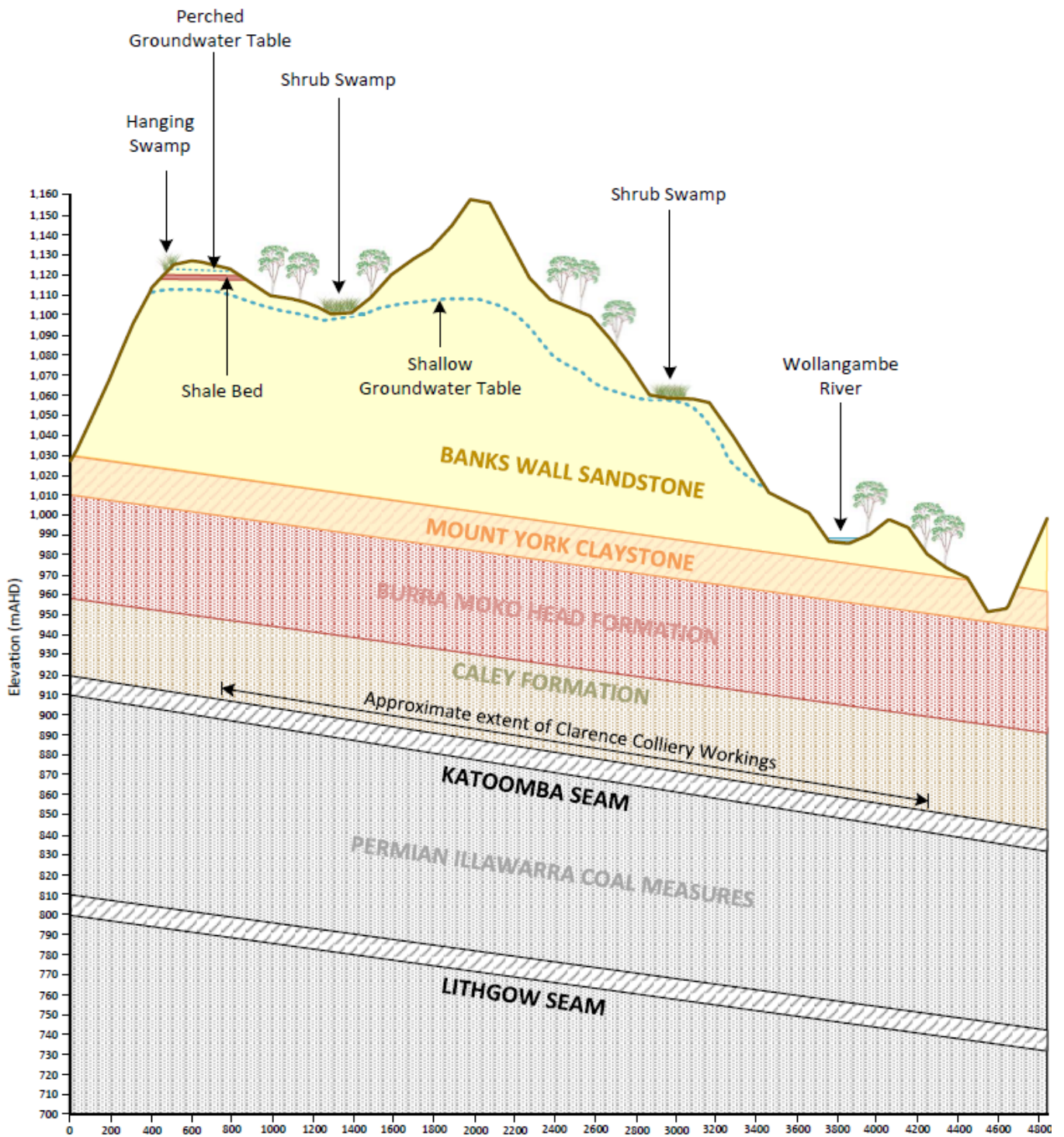


Figure 2.5 Typical setting of shrub swamps and hanging swamps (approximately SW to NE)

Note that the elevation and presence of the shallow and perched groundwater table in Figure 2.5 is indicative only. The seam elevation and thickness shown in Figure 2.5 are based on Centennial geological data. The extent of shrub swamps and hanging swamps in Figure 2.5 is indicative only. Refer to Figure 2.1 for mapped swamp locations in the vicinity of the Extraction Plan Area.

### 2.2.3.2 Predicted groundwater inflows

Figure 2.6 shows the predicted groundwater inflows into the Clarence Colliery workings from the existing numerical groundwater model, developed for the 918 Panel WMP (JBS&G, 2026). The numerical groundwater model was developed in MODFLOW-USG (Modular Flow – Unstructured Grid). Modelled mine inflows have been presented for an Approved and Proposed case. The Approved Case includes the existing mining workings at Clarence Colliery and surrounding mines, with no mining of the 918 Panel. The proposed case includes mining of the 918 Panel and the existing mining workings.

As shown in Figure 2.6, the difference in mine inflows from the inclusion of the effects of Panel 918 extraction and development is insignificant (change is less than 10%). The maximum modelled increase in inflow due to extraction of the 918 panel is 0.9 ML/day in mid-2027. The long-term modelled increase in inflows due to extraction of the 918 panel is predicted to be less than 0.2 ML/day.

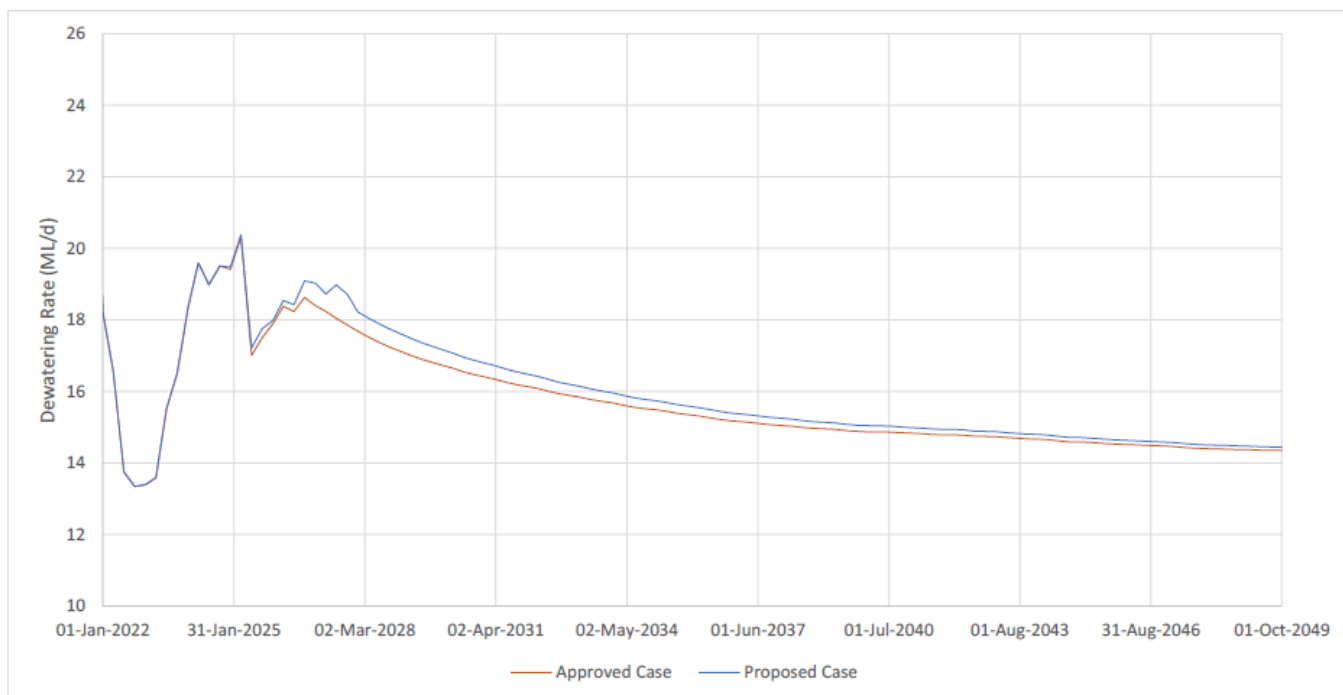


Figure 2.6 Predicted groundwater inflows into the Clarence Colliery workings – approved (existing) vs proposed (JBS&G, 2025)

## 2.2.4 Water Licensing

Clarence holds two Water Access Licences (WALs) authorising groundwater extraction from the mine. Clarence also holds a number of Water Supply and Works Approvals authorising the operation of infrastructure to enable the groundwater extraction. The details of these authorisations are included within the Clarence Colliery: WMP (GHD, 2026).

The two WALs that Clarence holds includes:

- WAL 36479, within the Sydney Basin West Groundwater source has an allocation of 6,623 megalitres (ML) per water year.
- WAL 41882, within the Sydney Basin West Groundwater source has an allocation of 1,095 ML per water year.

Together, the two WALs authorise Clarence to extract up to 7,718 ML per water year. Averaged over a year, this equates to 21.1 ML/day. Reviewing Clarence predicted water make from JBS&G (2026), inflows into the mine workings at Clarence, including the inflows from the extraction of the 918 Panel, is expected to peak in early 2025 around 20 ML of groundwater and to be maintained at 16 ML/day, which is less than the authorised take. Therefore, Clarence has sufficient allocation in place to cater for the predicted groundwater make for the mine.

Groundwater management at Clarence is highly complex as water is stored in large storage areas which are pumped down based on operational needs, so volumes of water pumped from the mine is likely to be different to groundwater inflows (see also Section 2.2.2.2). Therefore, a review of actual water extracted per water year, averaged to daily extraction to the nearest ML, has been undertaken to ensure, empirically, that there is sufficient allocation.

Reviewing the last eight years of water extraction, Clarence has extracted the following quantities in ML per day (ML/day) over the water year:

- 2017-2018 - 13 ML/day
- 2018-2019 - 12 ML/day
- 2019-2020 - 10 ML/day
- 2020-2021 - 15 ML/day
- 2021-2022 - 19 ML/day
- 2022-2023 - 21 ML/day
- 2023-2024 - 17 ML/day
- 2024-2025 - 17 ML/day

The above data demonstrates that Clarence has historically had sufficient allocation available via its two WALs. Furthermore, if there is an additional water make of 1 ML/day due to the extraction of the 918 Panel, it could be estimated that, on average, Clarence will likely extract up to 18 ML/day (i.e., 2024/2025 average water extraction plus the additional 1 ML/day predicted as a result of extracting the proposed 918 Panel) depending on operational requirements. This is an estimate as dewatering from various storage areas due to operational requirements will change. In any case, Clarence currently has an additional 4 ML/day of allocation available, therefore has sufficient allocation to support the extraction of the predicted additional 1 ML/day of additional water make as a result of the proposed 918 Panel. Importantly, Clarence has sufficient allocation available to extract predicted mine inflows.

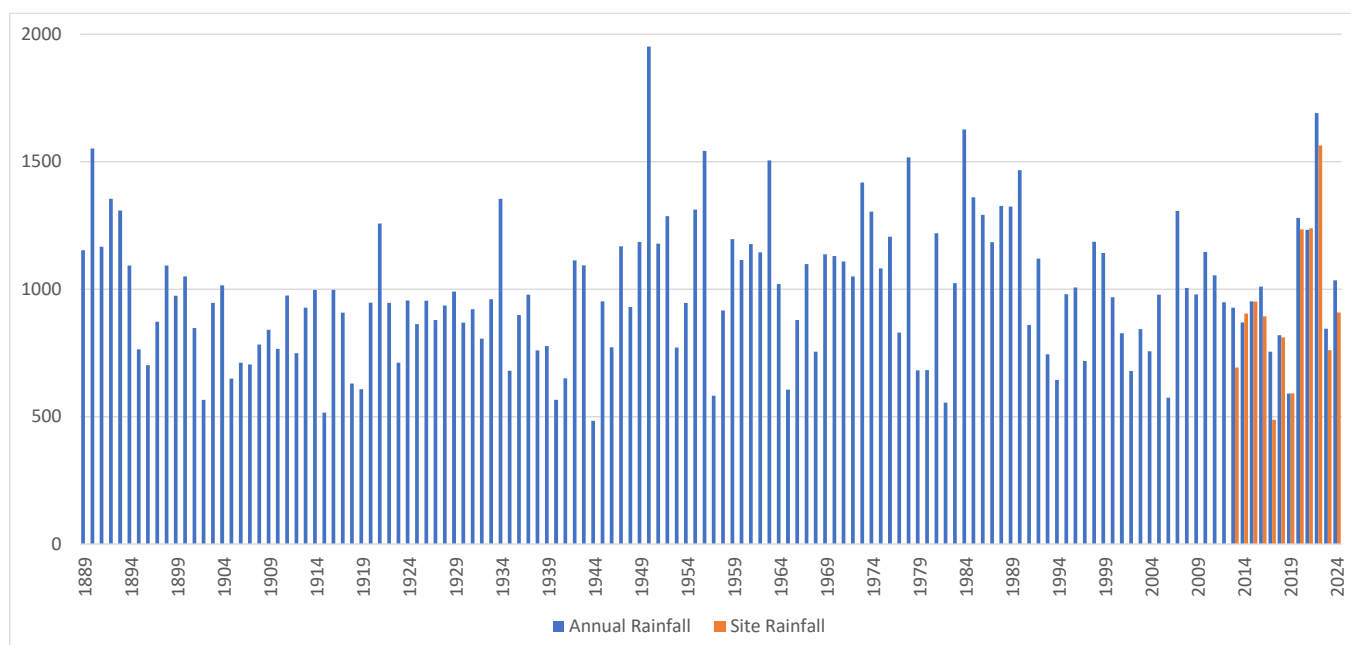
# 3. Baseline data

## 3.1 Climate

### 3.1.1 Rainfall and evaporation

Clarence Colliery has a site-based meteorological station that has monitored rainfall on a daily basis since May 2012. A more complete record was required to adequately consider the long-term wet and dry conditions of the site. Point rainfall and evaporation data were obtained from the Scientific Information for Land Owners (SILO) database operated by the Science Division of the Queensland Government's Department of Environment and Science. SILO point data consist of interpolated estimates based on historically observed data from Bureau of Meteorology (BOM) stations. For this assessment, SILO data were obtained for the grid point located at 33.45S, 150.25E, which is located at the pit top of Clarence Colliery.

Figure 3.1 presents the historical annual SILO rainfall data between January 1889 and January 2024 and annual rainfall data from Clarence Colliery between January 2013 and December 2024, presented by the orange bars.



**Figure 3.1** Historical annual rainfall record

The annual rainfall statistics associated with the SILO data presented in Figure 3.1 are:

- Minimum rainfall total – 483 mm in 1944
- Median rainfall total – 961 mm/year
- Average rainfall total – 987 mm/year
- Maximum rainfall total – 1936 mm in 1950

Annual rainfall and evaporation rates per month determined from the historical SILO point data between 1889 and 2024 are presented in Figure 3.2.

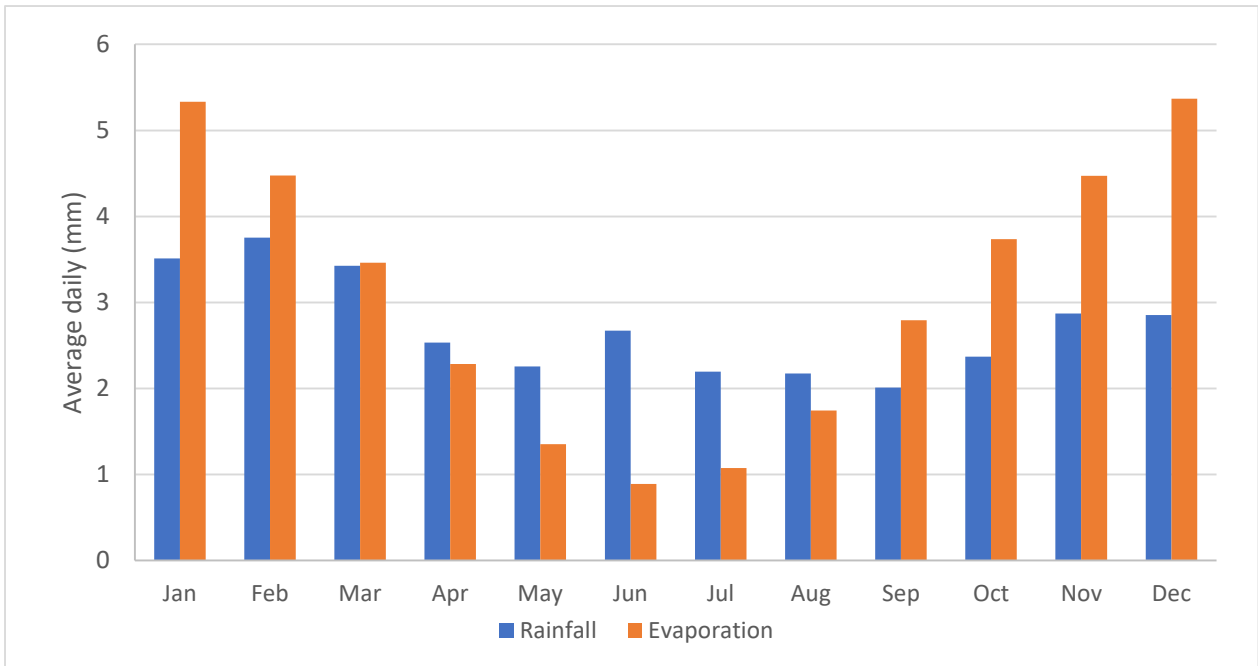


Figure 3.2 Average daily rainfall and evaporation rates

Total average annual evaporation is approximately 1124 mm, compared to the average annual rainfall total of 990 mm. This gives an annual deficit (difference between rainfall and evaporation) of approximately 134 mm.

### 3.1.2 Temperature

Average daily temperatures for each month, based on the SILO dataset, are shown in Figure 3.3. Climate at Clarence Colliery is temperate with warm summers and cold winters.

The highest maximum temperature was 38.6 degrees Celsius (°C) recorded on 4 January 2020. The lowest minimum temperature was -7.2°C recorded on 15 June 1959. The average maximum temperature varies from 24.0°C in January to 9.4°C in July. The average minimum temperature varies from 12.3°C in February to 1.1°C in July.

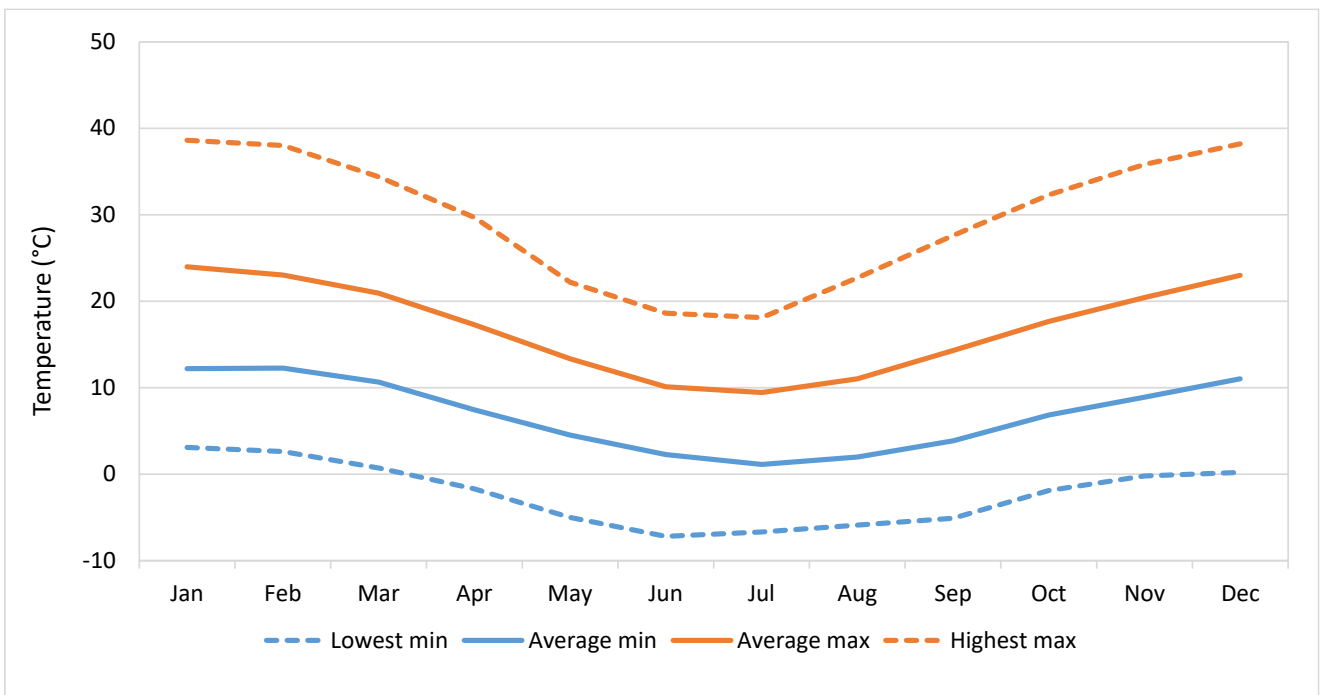
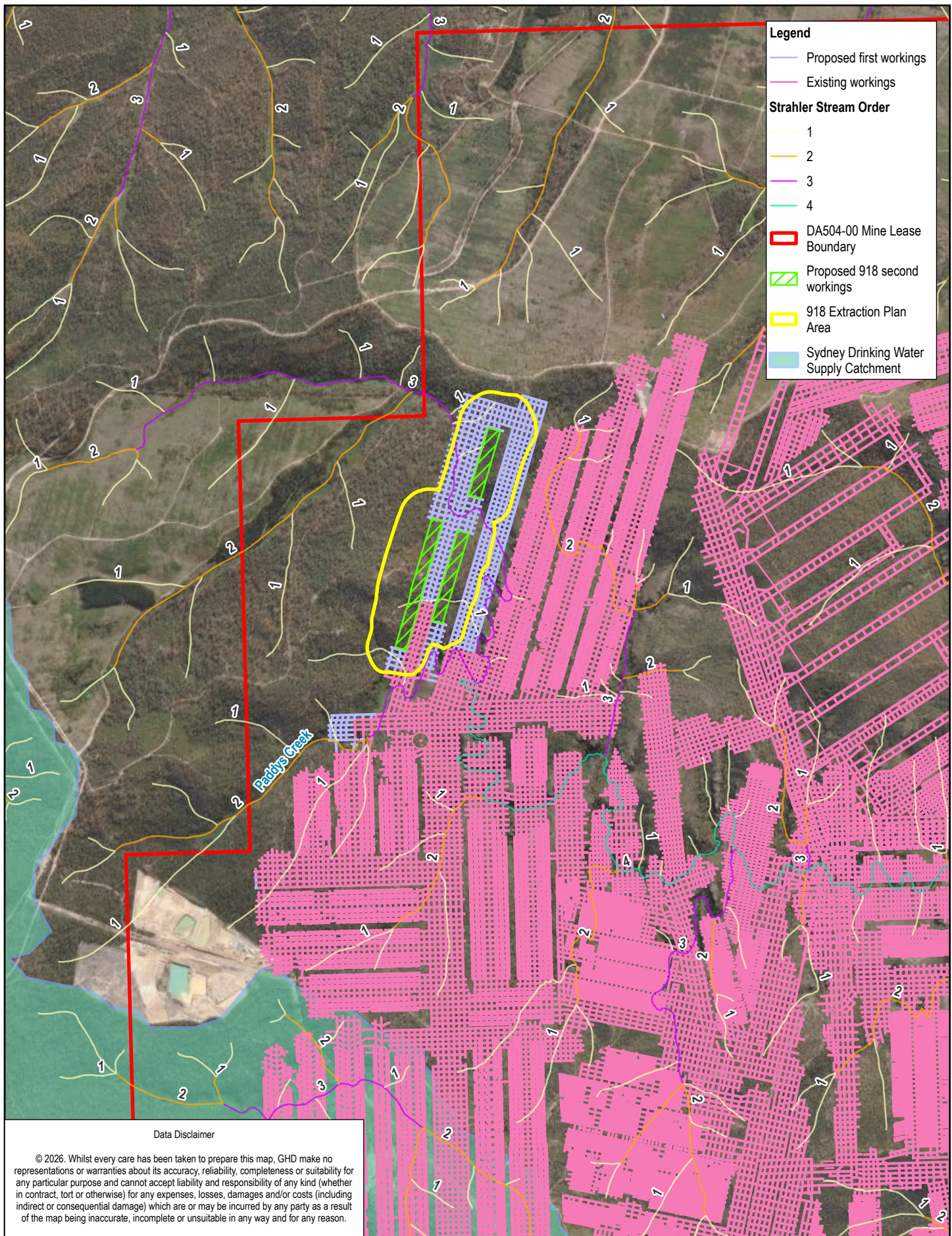


Figure 3.3 Average daily temperature

## 3.2 Surface water

The Extraction Plan Area lies within the catchment of Bungleboori Creek and the lower reaches of Paddys Creek. Paddys Creek is a tributary of Bungleboori Creek. Paddys Creek discharges into Bungleboori Creek approximately 200 metres east of the Extraction Plan Area. Bungleboori Creek discharges into the Wollangambe River approximately 23 km east of the Extraction Plan Area. The Extraction Plan Area is located outside the Sydney drinking water (SDWC) catchment, as shown in Figure 3.4. The topographic ridgeline to the south and southeast of the Extraction Plan Area forms the boundary of the Bungleboori Creek catchment. There are several first order and one third order stream (Bungleboori Creek) as defined by the Strahler Stream Order. Strahler Stream Order of watercourses within the Extraction Plan Area is presented in Figure 3.4.



**Legend**

- Proposed first workings
- Existing workings

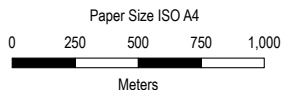
**Strahler Stream Order**

- 1
- 2
- 3
- 4

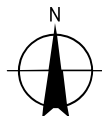
- DA504-00 Mine Lease Boundary
- Proposed 918 second workings
- 918 Extraction Plan Area
- Sydney Drinking Water Supply Catchment

**Data Disclaimer**

© 2026. Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.



Map Projection: Transverse Mercator  
Horizontal Datum: GDA2020  
Grid: GDA2020 MGA Zone 56



**Clarence Colliery  
918 Extraction Plan WMP**

Project No. 12655704  
Revision No. 0  
Date 24/02/2026

**Sydney drinking water catchment**

**FIGURE 3.4**

## 3.2.1 Surface water quality

Table 3.1 presents the extent of baseline watercourse quality data recorded within Paddys Creek and Bungleboori Creek catchments. Figure 2.1 presents the relevant surface water monitoring locations.

**Table 3.1** *Period of recorded water quality data*

Surface water site	Period from	Period to	Number of data points*
Bungleboori Creek U/S	29/09/2021	Current	41
Bungleboori Creek D/S (OLD) ^	29/09/2021	22/12/2023	7
Bungleboori Creek D/S ^	15/05/2025	Current	2
Paddys Creek	24/11/2017	Current	60
PSE1	22/09/2021	Current	35
Nine Mile Swamp	27/11/2017	Current	61
Pine/Nine Mile Swamp	27/11/2017	Current	65

^ The Bungleboori Creek D/S sampling site was relocated due to persistent difficulties in accessing the previous location for sampling. As a result, few samples were taken with three samples collected from January 2022 to April 2025.

\* Data points for each analyte vary at locations as parameters sampled increased over time.

Appendix C presents the baseline data for water quality within Paddys Creek and Bungleboori Creek. Baseline data for Paddys Creek and Bungleboori Creek indicates a fresh water system with slightly acidic to acidic pH.

## 3.2.2 Flow monitoring

Table 3.2 presents the extent of baseline flow monitoring data in kilolitres per day (kL/day) recorded within Paddys Creek and Bungleboori Creek catchments. Figure 2.1 presents the relevant flow monitoring locations.

**Table 3.2** *Flow monitoring*

Site	Period from	Period to	Number of flow measurements	Flow (kL/day)		
				Minimum	Mean	Maximum
Bungleboori Creek U/S <sup>3</sup>	29/09/2021	Current	22	285	2,287	15,977
Bungleboori Creek D/S (OLD)^	29/09/2021	22/12/2023	7	1,467	5,640	15,854
Bungleboori Creek D/S^	15/05/2025	Current	2	4,026	4,609	5,192
Paddys Creek <sup>6</sup>	24/11/2017	Current	42	20	561	2419
PSE1 <sup>1</sup>	22/09/2021	Current	27	30	2,755	11,251
PSE2 <sup>2</sup>	22/09/2021	Current	2	561	2,780	7,091
Nine Mile Swamp <sup>4</sup>	27/11/2017	Current	5	125	312	599
Pine/Nine Mile Swamp <sup>5</sup>	27/11/2017	Current	17	99	726	3,873

1. Very low flow recorded on nine occasions at PSE1 (not included in number of flow measurements).
2. Very low flow recorded on 39 occasions at PSE2 (not included in number of flow measurements).
3. Bungleboori Creek U/S recorded 18 events as 'low flow or dry' (not included in number of measurements).
4. Nine Mile Swamp is typically low flow/pooled with no measurements in 2024 or 2025.
5. Pine/Nine Mile Swamp is typically low flow/pooled with only two measurements during the 2024 to 2025 period.
6. Paddys Creek measurements have decreased over time, with the frequency of low flow/pooled increasing.

Flow rates increase as the monitoring sites extend downstream in the Paddys Creek and Bungleboori Creek catchment. Very low flow has been observed at PSE2 at 39 out of 41 monitoring events indicating the ephemeral nature of Paddys Creek.

Periods of low or no flow have been observed over the baseline monitoring period at all monitoring locations except for Bungleboori Creek D/S monitoring location.

Assessment by JBS&G (2026a) predicted negligible (less than 2%) change in the number of no flow days due to extraction of the 918 Panel.

### 3.2.3 Stream and riparian vegetation

Baseline aquatic habitat and ecology monitoring has been undertaken seasonally by Marine Pollution Research in 2021 - 2023 as outlined in the 918 Panels Biodiversity Management Plan (RPS, 2026). Baseline aquatic habitat and ecology data are included within RPS (2026).

#### 3.2.3.1 Groundwater dependent ecosystems

THPSS are formally recognised as high priority GDEs under the Water Sharing Plan (WSP) for the Greater Metropolitan Region Groundwater Sources 2023.

The location of THPSS in the Extraction Plan area were identified by field survey undertaken by RPS (2026).

The field survey of THPSS are presented in Figure 3.5. This mapping is compared with High Ecological Value Aquatic Ecosystem (HEVAE) GDE mapping (NSW DCCEE, 2025). HEVAE GDEs were assessed by NSW DCCEE from high to low value based on naturalness, diversity, distinctiveness and vital habitat. All HEVAE GDEs in the Extraction Plan Area are medium value.

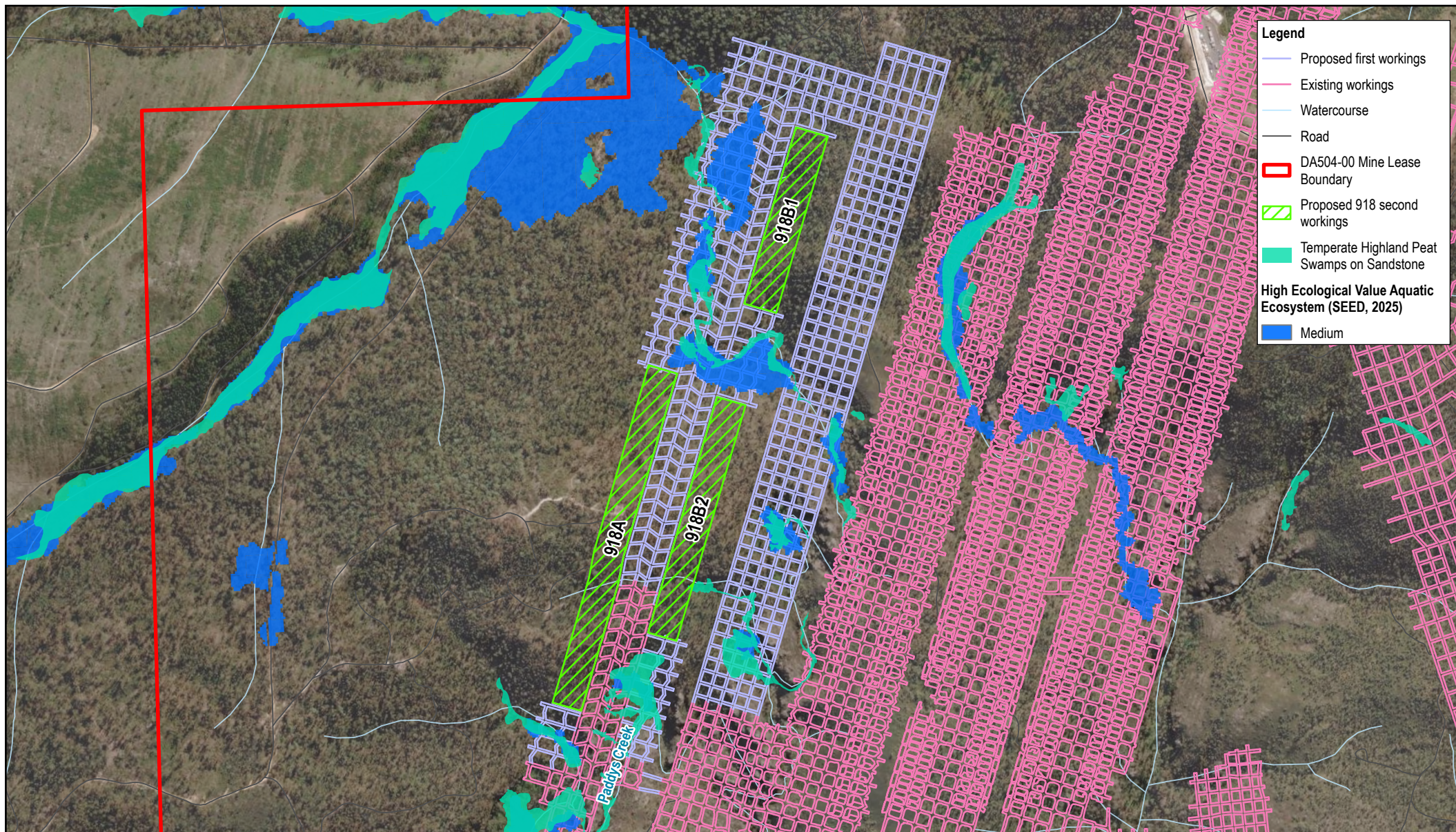
#### Facultative groundwater dependent ecosystems

Outside of THPSS, riparian vegetation within the Extraction Plan Area is also likely to be at least facultatively dependent on sub-surface flows (i.e., have rooting zones which overlap the sub-surface water interface) or are located such that surface flows partially originate from sub-surface flows. These facultative GDEs may partially depend on groundwater.

These facultative GDEs correspond with areas within the riparian zone mapped as the following Plant Community Types (PCT):

- PCT 3688 Newnes Plateau Silvertop Ash Woodland (where it occurs in riparian areas)
- PCT 3946 Newnes Plateau Swamp Woodland
- PCT 3691 Upper Blue Mountains Fringing Swamp Woodland
- PCT 3862 Newnes Plateau Rockplate Heath (where groundwater is expressed, typically in rocky areas)
- PCT3865 Western Blue Mountains Pagoda Scrub (where groundwater is expressed, typically in rocky areas)

These PCTs are mapped in the 918 Panels Biodiversity Management Plan (RPS, 2026).



**Legend**

- Proposed first workings
- Existing workings
- Watercourse
- Road
- DA504-00 Mine Lease Boundary
- Proposed 918 second workings
- Temperate Highland Peat Swamps on Sandstone
- High Ecological Value Aquatic Ecosystem (SEED, 2025) Medium

**Data Disclaimer**  
 © 2026. Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Paper Size ISO A4

Meters

Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 56



**Clarence Colliery**  
**918 Extraction Plan WMP**

**Comparison of mapped swamps and High Ecological Value Aquatic Ecosystem mapping**

Project No. **12655704**  
 Revision No. **0**  
 Date **24/02/2026**

**FIGURE 3.5**

## 3.2.4 Stream and flow path stability

A baseline stream stability assessment of reaches of Paddys Creek and Bungleboori Creek within the Extraction Plan Area was undertaken by GHD (2025a). An initial site assessment to establish baseline conditions was conducted in May 2023. Prior to the site visit, there had been no significant rainfalls in the area for several weeks; however, a significant period over above average rainfall had occurred in 2021 and 2022. A follow-up site assessment in November 2023 assessed areas outside the initial scope.

The following sections describe the baseline conditions at the time of inspection in May 2023. All baseline photo locations are shown in Appendix C Figure C.1, while baseline photos of respective photo locations for Bungleboori Creek and Paddys Creek are also presented in Appendix C.

The site visit identified that both Bungleboori and Paddys Creek are fed by elongate NPSS generally flanked by NPSS fed predominantly by groundwater. NPSS within the area were heavily impacted by the Gospers Mountain fire in late 2019. This was followed by a period of higher-than-usual rainfall in 2021, 2022 and early 2023. During the site visit in 2023, the Newnes plateau and study area experienced some dry months during the spring of 2023 and 2024, followed by wetter than usual conditions with high rainfall totals during summer/autumn 2024 and autumn/winter 2025. The swamps observed appeared to be in good condition, with complete recovery of vegetation.

Both creeks transition into steep, narrow bedrock gorges. These are characterised by incised, contorted meanders which have left pagoda formations many tens of metres tall within the meander core. Several very steep hanging swamps are located above the valley floor.

During the site visit, free flowing surface water was observed within the swamp-fed creeks and swamp surfaces were nearly all waterlogged with visible surface water. It is anticipated that during prolonged drought periods, groundwater to the creeks may be reduced or dry up completely.

### 3.2.4.1 Bungleboori Creek

Bungleboori Creek rises within a twin-headed, elongate, narrow swamp (known as Pine Swamp and Nine Mile Swamp) fed predominantly by shallow groundwater and also minor, rainfall-activated watercourses flowing down the valley sides. The creek transitions into a steep valley downstream of monitoring point BC3 (shown in Figure 2.2). Baseline photos of Bungleboori Creek at associated monitoring locations (BC1, BC2 and BC3) are included in Appendix C-1-3.

At the time of the site inspection, within Bungleboori Creek, all swamps were waterlogged and flowing, other than the upper twin-headed swamp, Nine Mile Swamp, and Pine Swamp, which appeared drier than others observed. Free surface water was flowing in the channel through this swamp, noting that the swamp had broad areas of less-dense shrub vegetation without surface water. It is possible that groundwater within this swamp had been impacted by the two large tracks crossing upstream of BC1 (Figure 2.2), although there is no visible evidence of such impact much beyond the track area. It is also noted that the headwaters and interfluvium between the twin swamps (Nine Mile Swamp and Pine Swamp) have been impacted by forestry clearance and tracks.

The condition assessment of swamps on Bungleboori Creek was undertaken using the methods proposed by Fryirs et al. 2016. All inspected swamps were assessed as good, with the exception of the Nine Mile Swamp and Pine Swamp in the vicinity of BC1 that was assessed as moderate, likely due to the impact of tracks. Nine Mile Swamp and Pine Swamp lie largely outside the Extraction Plan Area.

### 3.2.4.2 Paddys Creek

Paddys Creek is bedrock-controlled, flowing within a narrow valley. Similar to Bungleboori Creek, the upper reaches are characterised by a series of swamps fed predominantly by groundwater. Paddys Creek also transitions into a bedrock-controlled valley with contorted meanders incised into bedrock. Baseline photos of Paddys Creek at associated monitoring locations (PC1 (including PC1\_2 and PC1\_1) and PC2) are included in Appendix C-1-5.

Monitoring points PC1\_2 and PC1\_1 are located within Paddys Creek Swamp. Paddys Creek Swamp lies largely outside the Extraction Plan Area. At monitoring point PC1\_2, minor slumping of the erodible sandy right bank was observed. The major swamp at PC1\_1 would be classified as good condition (in accordance with Fryirs *et al.*, 2016). Monitoring point PC2 is located in Paddys Creek Hanging Swamp. Paddys Creek Hanging Swamp is within the Extraction Plan Area. The steep hanging swamp above PC2 would be classified as a good condition swamp.

## 3.3 Groundwater

### 3.3.1 Overview

There are three broad groundwater systems that have been identified in the region including perched, shallow, and deep groundwater systems. The locations of these groundwater systems are shown in Figure 3.6.

The perched groundwater system consists of a discontinuous, near-surface system generally independent of the regional groundwater system. The perched groundwater is derived from excess rainfall which is largely prevented from infiltrating deeper to the regional systems by the presence of near-surface shale, claystone, or siltstone beds.

The shallow groundwater system is a regional groundwater system located in the Narrabeen Group, largely in the Banks Wall Sandstone. Most groundwater flow in the water-bearing sequence is generally in the horizontal direction, with some vertical flow occurring from ground surface infiltration. The Mount York Claystone forms a low permeability barrier to vertical infiltration, resulting in most of the natural groundwater occurring above this horizon in the Banks Wall Sandstone. The general flow direction in the aquifers in this system is sub-horizontally towards the north-east, away from the sub-crop zone, where recharge to the lower aquifers can occur. This potential recharge zone is located to the west and north-west of the existing workings.

The deep groundwater system exists in the strata below the Mount York Claystone, including the Burra-Moko Head Sandstone, which has occasional water-bearing zones, and the Illawarra Coal Measures. The coal measures generally lie at a depth of more than 200 m and typically have a low permeability. The few water-bearing zones that occur in these strata are generally fractured rock aquifers that comprise jointed coal seams, including the Katoomba Seam, and localised jointed or fractured zones, often adjacent to faults. The general flow direction in the water-bearing zones in this system is sub-horizontally towards the north-east, away from the sub-crop zone, where recharge can occur towards the Colo River at a significant distance to the north and east of Clarence Colliery. Locally, the groundwater flow direction is more easterly at Clarence (JBS&G, 2026).

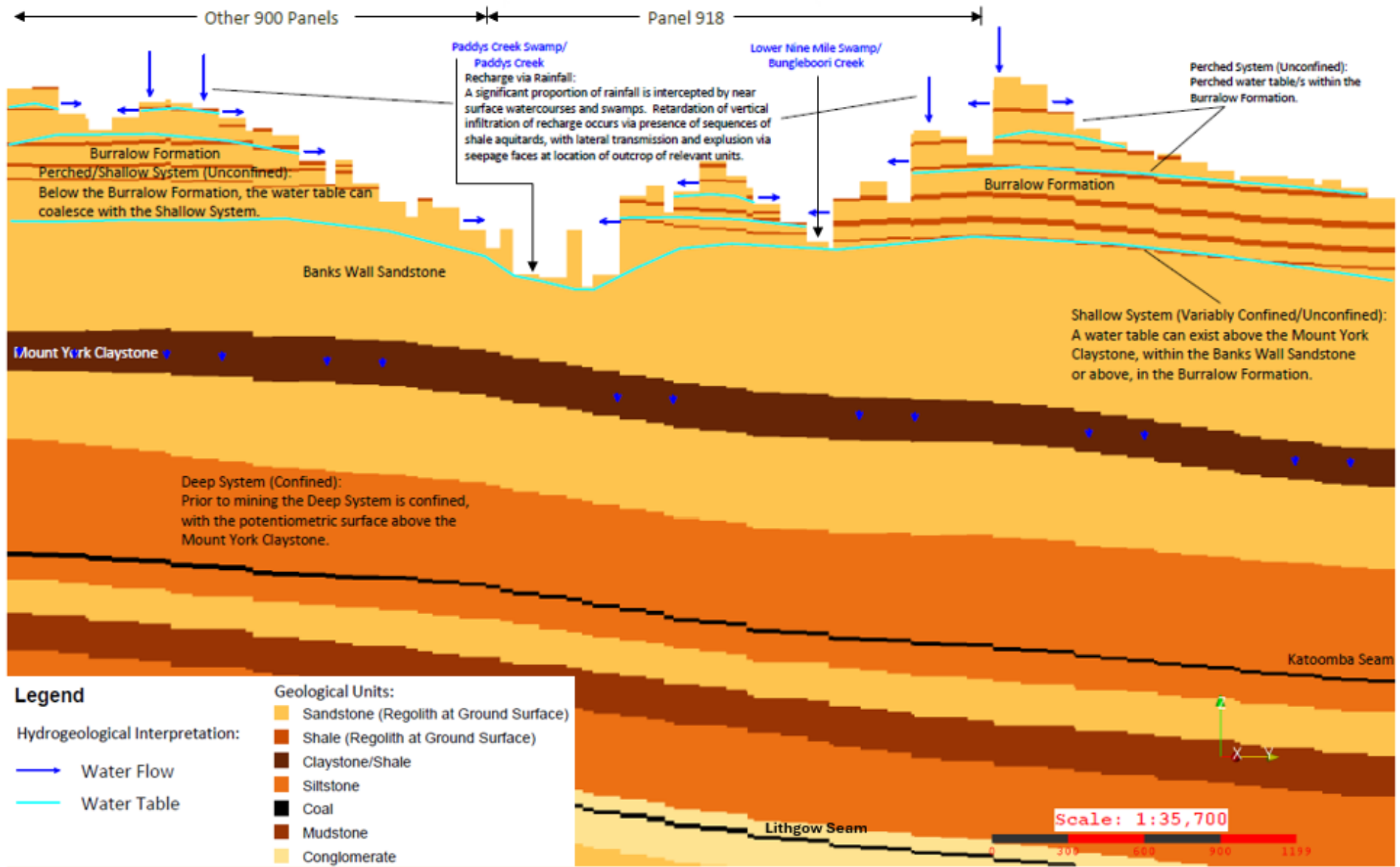


Figure 3.6 Conceptual hydrogeological model (JBS&G, 2026)

## 3.3.2 Groundwater levels

### 3.3.2.1 Vibrating wire piezometers

Piezometric head data for CLRP18 and CLRP27 are shown in Appendix C. The locations of these VWP's are presented in Figure 2.3. CLRP41R was installed in December 2025, therefore limited data are available for reporting.

Piezometric pressure generally ranges from 10 m to 60 m above monitoring point elevation, with little response to rainfall. Piezometers with elevated pressure are generally located within deeper strata, which likely reflects the limited local seepage recharge areas and the confined nature of the regional aquifers.

Monitoring data at VWP's indicates that there is a downward vertical hydraulic gradient across the strata from the Banks Wall Sandstone to the Illawarra Coal Measures.

CLRP18 has not experienced any underground mining within 200 m. CLRP18 Piezo #2 had a logger malfunction from February 2021 and was repaired in November 2024. Review of groundwater pressure at CLRP18 by EMM in the Annual Groundwater Monitoring Report 2024 (EMM, 2025) identified drop in piezometric pressure due to mining below the Mount York Claystone (Piezo #1).

Mining of Panel 906 occurred within 400 m of CLRP27 in February 2022. Review of groundwater pressure at CLRP27 by EMM (2023) identified response in piezometers installed below the Mount York Claystone attributable to mining. A slight drop in piezometric pressure of approximately 0.5 m was observed in the piezometer immediately above the Mount York Claystone at CLRP27. EMM (2023) attributed this slight drawdown to mining. Groundwater elevations recovered in April 2022 and remain above pre-mining elevations.

The change in piezometric pressure at CLRP18 and CLRP27 did not exceed triggers in the trigger action response plan in the site wide Clarence Colliery WMP (GHD, 2025). Changes in piezometric pressure below the Mount York Claystone due to mining are expected and are consistent with previously undermined groundwater monitoring locations.

### 3.3.2.2 Standpipe monitoring bores

The location of the bores is presented in Figure 2.3. Groundwater levels at standpipe monitoring bores are shown in Appendix C. The groundwater level hydrograph is plotted with the CRD curve. There are no groundwater quality data for these standpipes.

The hydrograph for Pagoda Swamp monitoring bores (PG1 and PG2) indicates that since February 2020 groundwater levels at PG1 and PG2 are approximately at ground level. PG1 was undermined by panel extraction in September 2022 and PG2 was undermined by panel extraction in October 2022. Mining continued 800 to 900 m south-west of PG1 and PG2 in January and February 2024. Visual review of groundwater level hydrographs for PG1 and PG2 does not indicate any change to groundwater levels since undermining in September 2022 and October 2022 and nearby mining in 2024. Muted response to rainfall was also observed when compared to CRD.

Groundwater depth at Paddys Swamp East (PSE1) is generally up to 1.1 m bgl. In August 2022, active mining occurred approximately 200 m to the east of PSE1 and in September 2024 PSE1 was undermined. Visual review of the groundwater level hydrograph shows quick response to rainfall, with water levels at PSE1 rising immediately are rain. Groundwater levels at PSE1 have shown a pronounced response to rainfall events with groundwater levels fluctuating up to approximately 1 m, while reflecting daily CRD trends.

CSP1 (BSE1), CSP2 (BSE2), CSP4 (PHS1) and CSP5 (PHS2) are standpipe piezometers logging water levels since August 2022 at Bungleboori South East Swamp (BSE) and Paddys Creek Hanging Swamp (PHS). CSP34, CSP35, and CSP36 are newly installed standpipe piezometers that were installed in May 2025. CSP34 is an additional bore at Bungleboori South East Swamp and CSP35 and CSP36 are new bores at Paddys Creek Hanging Swamp.

CSP1 (BSE1) is installed within the upstream section of Lower Nine Mile Swamp, within the Bungleboori Creek system and CSP2 (BSE2) is installed within the downstream section of Lower Nine Mile Swamp, as shown in Figure 2.3. During 2024, active first workings associated with Panel 918 took place, as close as approximately 500 m southwest of BSE1 and BSE2. The upstream piezometer, CSP1 (BSE1), indicates that groundwater levels fluctuated around ground level while the downstream piezometer, CSP2 (BSE2) experienced overland flow (groundwater elevation above ground level) from the beginning of monitoring (August 2022) until the groundwater level decreased to below ground level in November 2024. Visual review of the groundwater level hydrographs shows some indication of influence from rainfall at both sites, including a decline in groundwater in April 2024 consistent with declining CRD at CSP1 (BSE1) and potential delay recharge from April 2024 resulting in a groundwater level increase at CSP2 (BSE2) between August and September 2024. The lack of appeared rainfall influence in early stages of monitoring may have been due to severe drought conditions, which may have resulted in depressed groundwater levels. Given both bores proximity to mining, the piezometer will be closely watched for potential mining impact. CSP34 was installed at Bungleboori South East Swamp May 2025, and there are insufficient data to determine rainfall or mining impact groundwater trends at this location.

Paddys Creek Hanging Swamp bores, CSP4 (PHS1) and CSP5 (PHS2) are installed in downstream and upstream sections of Paddys Creek Hanging Swamp respectively and have been monitoring groundwater levels since August 2022. CSP4 (PHS1) has generally recorded groundwater between approximately 0.04 m bgl and 0.18 m bgl. Groundwater levels at CSP5 (PHS2) have fluctuated between 0.15 m bgl and 0.35 m bgl. CSP5 (PHS2) is located upstream of CSP4 (PHS1) and is also upgradient of the main drainage line and would be expected to be influenced by climatic conditions, however, this assertion is presently inconclusive. Continued monitoring is recommended to determine if there are any relationship between rainfall trends and groundwater levels at CSP4 (PHS1) and CSP5 (PHS2). Active first workings occurred 300 m south of CSP4 (PHS1) and 400 m south of CSP5 (PHS2) in September 2024 and within 50 m east of CSP4 (PHS1) and 100 m east of CSP5 (PHS2) in March 2024. No mining impact was observed with water levels continuing to show stable trends consistent with daily CRD. CSP35 and CSP36 were installed at Paddys Creek Hanging Swamp in May 2025, and there are insufficient data to determine rainfall or mining impact groundwater trends at these locations.

### 3.3.3 Groundwater users

#### **NSW bore database search**

A search of the NSW groundwater bore database (WaterNSW, 2025) was undertaken to identify registered bores within a 5 km radius of Clarence Colliery mining lease areas. The search identified 274 bores, with the majority (138 bores) being registered as monitoring bores. There is one bore within the Extraction Plan Area – a monitoring bore (GW-117384) with no water level data. The remaining bores were registered for stock and/or domestic use (81 bores), test bore (eight bores), industrial use (nine bores), groundwater exploration (five bores), mining or dewatering (four bores), recreation and/or conservation of water or power generation (three bores), irrigation (two bores), general use (two bores) and one bore being registered for horticulture. There were 21 bores with unknown registered use. Bore details are summarised in Appendix D and locations are shown in Figure 3.7.

The majority of bores registered for stock and/or domestic use are located in the vicinity of the township of Clarence. These bores extract groundwater from the sandstone strata that is overlying the Katoomba Seam, in particular the Banks Wall Sandstone. The Banks Wall Sandstone in the vicinity of these bores is referred to as the Clarence Aquifer. These bores have reported yields typically less than 1 litre per second (L/s).

#### **Groundwater dependent ecosystems and riparian vegetation**

NPSS and NPHS, together THPSS, occurring within the Extraction Plan Area have been mapped by RPS (refer to Figure 2.2). They are listed as an endangered ecological community under the Environment Protection and Biodiversity Conservation Act 1999. The swamps are also listed as endangered under the NSW Biodiversity Conservation Act 2016.

THPSS, including the NPSS and NPHS, are assemblages of flora and fauna that have developed over thousands of years (Goldney et al., 2010). THPSS have been mapped as being shrub swamps or hanging swamps. Shrub swamps (NPSS) form at the base of valleys underlined by Narrabeen Group strata that are subject to temporary to permanent waterlogging from groundwater, surface water runoff and rainfall. Hanging swamps (NPHS) form on the sides of valleys where perched groundwater discharges and are subject to infrequent waterlogging from perched groundwater, surface water runoff and rainfall.

THPSS formation is reliant on natural landforms which retard surface and subsurface flows, such that material accumulates upstream of that point, in time resulting in the accumulation of up to many metres of peat (IESC, 2014). However, some NPSS do not even have peat layers (Goldney et al., 2010). As peat accumulates, the capacity of the swamp to hold water increases.

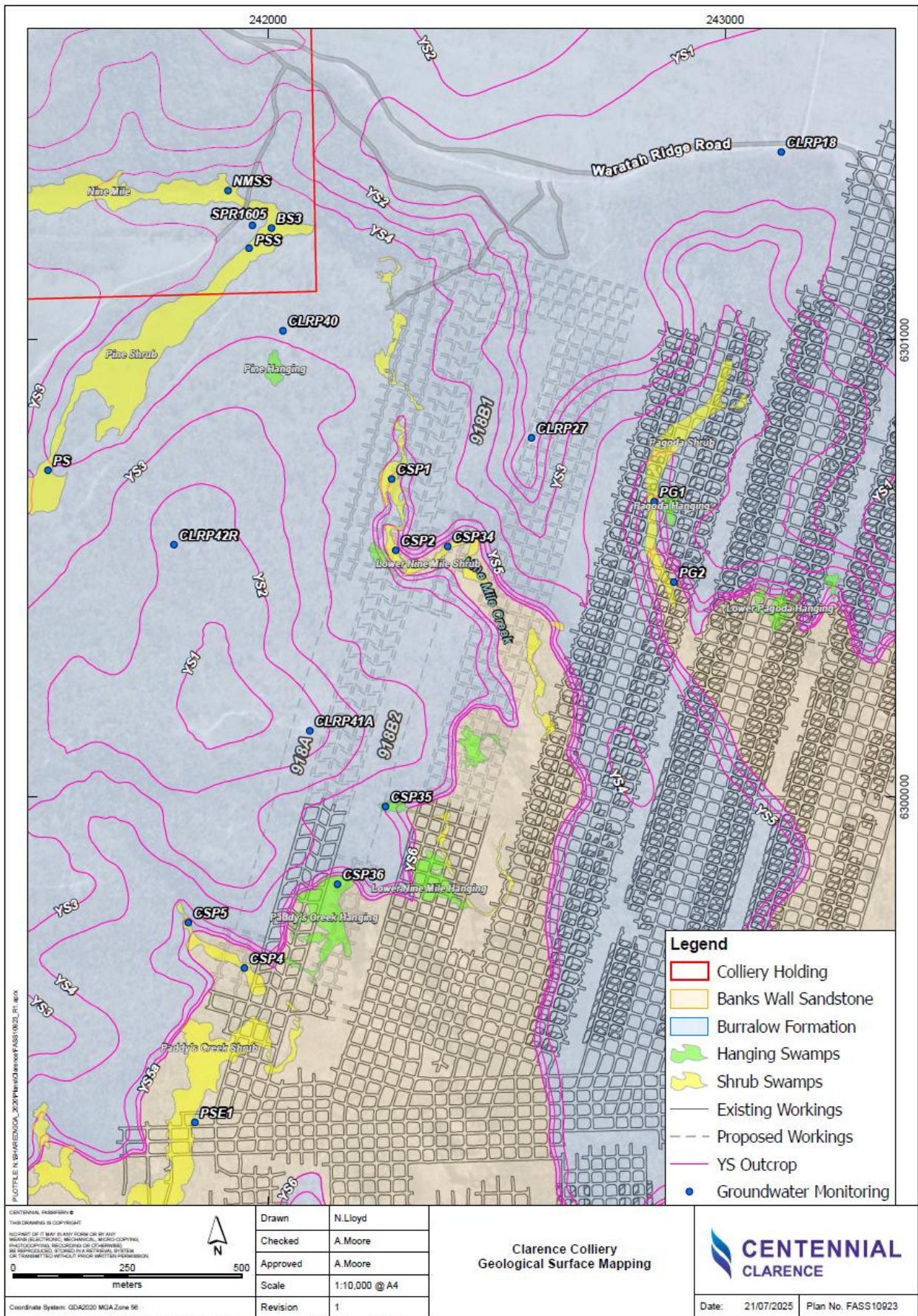
Essential conditions for formation and survival of THPSS are (IESC, 2014):

- Impeded vertical drainage at the floor of the underlying rock.
- Waterlogged, anoxic conditions and low temperatures, which reduce vegetation decomposition rates.
- Organic matter accumulation much faster than the rate of decomposition, with acidic conditions an advantage.

The formation of THPSS is reliant on the presence of claystone beds within the Burrell Formation. Groundwater is retained in the Burrell Formation instead of infiltrating through to the underlying formations due to the presence of claystone beds. There are seven claystone beds in the Burrell Formation (YS1 to YS6, including YS5a). Figure 3.8 provides a plan view of the relationship between Burrell Formation aquitard outcropping and swamp location. This plan indicates that aquitards YS5, YS5a and YS6 are critical for groundwater supply to the swamps within the study area. THPSS are located on the Burrell Formation adjacent to the outcropping aquitard, or are located on the Banks Wall Sandstone and are supported by the upslope expression of groundwater.

An overview of the typical setting of hanging swamps and shrub swamps and their interaction with groundwater at Clarence Colliery is provided in Figure 2.5. Mapping of THPSS in the vicinity of the Extraction Plan Area is shown in Figure 2.1.





**Figure 3.8** Clarence Colliery surface geology mapping, showing relationship between Buralow Formation aquitards and swamp location (supplied: Clarence Colliery, 16/09/25)

## 4. Impact assessment criteria

### 4.1 Surface water

#### 4.1.1 Water quality

As presented in Section 3.2.1, there are more than 24 months' (24 data points over a 2-year period) of monitoring data across most surface water quality monitoring locations. However, since the monitoring suite has been expanded over time, these recently implemented parameters have less data.

The Australian and New Zealand Environment and Conservation Council Water Quality Guidelines (ANZECC, 2000) and the more recent Australian New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018) default guideline values (DGVs) are noted in Table 4.1. DGVs for NSW upland rivers and for a species protection level of 99% have been adopted for this WMP.

To determine the trigger values for the water monitoring locations on Bungleboori and Paddys Creek, 90<sup>th</sup> percentiles were taken from the monitoring locations and compared to the DGV. The highest 90<sup>th</sup> percentile value for each parameter is noted in Table 4.1, noting that the 90<sup>th</sup> percentile concentrations of the monitoring locations were relatively similar to each other.

Total iron and total manganese have only recently started to be monitored. For total iron the range of concentrations vary considerably over time but the range of values were relatively similar between sites. Total manganese was also similar between monitoring locations. For total manganese and total iron the 90<sup>th</sup> percentile of the monitoring location samples combined was used in Table 4.1.

The comparison of DGVs to the 90<sup>th</sup> percentiles indicate that DGVs are typically higher than the 90<sup>th</sup> percentile values, with the exception of total iron and the 10<sup>th</sup> percentile of pH. Therefore, excluding total iron and the lower range value for pH, the DGVs were mainly taken for trigger values.

The trigger values for water quality for the monitoring locations on Bungleboori Creek and Paddys Creek are shown in Table 4.1.

*Table 4.1 Surface water quality trigger values – Bungleboori Creek and Paddys Creek*

Parameter	Units	DGV	90 <sup>th</sup> percentile	Trigger value
EC	Microsiemens per centimetre (µS/cm)	350	81	350
pH	pH units	6.5–8.0	4.5-7.1	4.5-8.0
Turbidity	Nephelometric turbidity unit (NTU)	25	6.72	25
Total manganese *	mg/L	1.2	0.024	1.2
Total iron *	mg/L	0.14	0.72	0.72

Note: Total iron and total manganese DGVs were derived from ANZG (2018); other parameter DGVs were derived from ANZECC (2000) as updated DGVs are not available at this time.

\* Total iron and total manganese 90<sup>th</sup> percentile values were taken from comparing data from all monitoring locations.

#### 4.1.2 Water flow

As shown in Section 3.2.2, all streamflow monitoring locations have periods of low or no flow. The exception is Bungleboori Creek D/S, where only two monitoring events have occurred. As periods of low or no flow occur naturally, no trigger values for streamflow are proposed.

A review of water flow monitoring will be undertaken in the event that subsidence monitoring indicates that subsidence is greater than predicted. It is noted that numerical modelling carried out by JBS&G (2026) predicts a negligible (less than 5%) change in groundwater contribution to surface water for both Bungleboori Creek and Paddys Creek (Section 2.2.3) and height of fracturing is not expected to extend above the Mount York Claystone (Section 2.2.3.1) from the inclusion of 918 Panel Extraction. Therefore, losses to surface water flows as a result of mining are not predicted.

## 4.2 Groundwater

### 4.2.1 Groundwater levels

Groundwater trigger levels in the swamp piezometers and shallow strata were calculated by JBS&G (2026), based on review of historical groundwater elevations and the numerical groundwater model predictions.

Groundwater level trigger values are not required for VWPs as they generally monitor groundwater elevations below the Mount York Claystone and therefore do not monitor for impacts on environmental receptors (JBS&G, 2026).

Groundwater level trigger values for the standpipe piezometers within the Extraction Plan Area are summarised in Table 4.2.

**Table 4.2** Groundwater level trigger values

Location	Reduced Level (RL) surface (m AHD)	Bore depth (m bgl)	Groundwater trigger level* (m bgl)
PG1	1032	1.30	0.40
PG2	1036	1.64	0.45
PSE1	1035	1.95	1.00
CSP1 (BSE1)	1045.14	1.88	0.40
CSP2 (BSE2)	1039.95	1.10	0.35
CSP4 (PHS2)	1062.36	0.90	0.70
CSP5 (PHS1)	1048.76	1.88	0.45
CSP34	1035.58	0.63	0.55
CSP35	1050.85	1.11	0.45
CSP36	1048.80	0.81	0.50
<b>Springvale Bores</b>			
PS	1080.65	1.32	0.40
PSS	1066.56	1.19	1.00

Notes to table:

m AHD: metres Australian Height Datum.

m bgl: metres below ground level.

\* Groundwater level trigger values have been calculated by JBS&G (2025) based on review of groundwater elevation observations, climatic data and numerical groundwater model predictions.

## 4.3 Performance criteria

Water resources performance criteria for extraction of panel 918 have been developed with reference to Schedule 3, Condition 5 of development consent DA504-00. Achieving the stipulated performance criteria has been ranked as “Likely” or “Not likely”.

### 4.3.1 Watercourses

Bungleboori Creek and Paddys Creek are to be managed for water quality and flow volume. Criteria for these aspects are provided in Table 4.3.

Table 4.3 Watercourse criteria – Bungleboori Creek and Paddys Creek

Aspect	DA504-00 Schedule 3, Section 5	Criteria	Performance criteria achieved	Relevant monitoring program
Watercourse quality	The Applicant must ensure that the development does not result in any: <ul style="list-style-type: none"> <li>– Reduction in surface flows and groundwater baseflow to upland swamps (NPSS) and wetlands.</li> <li>– Reduction in surface flows and groundwater baseflow to waterbodies including Marrangaroo Creek, Farmers Creek, Dargans Creek, Wolgan River, Dumbano Creek, Bungleboori Creek, and Wollangambe River.</li> </ul>	Within or below trigger values in Table 4.1.	Likely – based on predictions of JBS&G (2026)	Section 2.1.1 and Section 2.1.2
Watercourse flow		Creek flow rates and relationships with rainfall are consistent with historical baseline results.	Likely – based on predictions of JBS&G (2026)	Section 2.1.1 and 2.1.2

### 4.3.2 Stream health

To manage stream health, criteria have been developed based on geomorphic condition and waterway stability. The criteria are applicable to the watercourse stability of potentially impacted reaches of Bungleboori Creek and Paddys Creek. Table 4.4 presents the criteria for stream health.

Table 4.4 Stream health criteria

Aspect	DA504-00 Schedule 3, Section 5	Criteria	Performance criteria achieved	Relevant monitoring program
<b>Geomorphic condition and watercourse stability</b>				
Incisional processes and instabilities Waterway bed condition	The Applicant must ensure that the development does not result in any: <ul style="list-style-type: none"> <li>– Reduction in surface flows and groundwater baseflow to upland swamps (NPSS) and wetlands.</li> <li>– Reduction in surface flows and groundwater baseflow to waterbodies including Marrangaroo Creek, Farmers Creek, Dargans Creek, Wolgan River, Dumbano Creek, Bungleboori Creek, and Wollangambe River.</li> </ul>	Occurrence of erosional processes does not occur as a result of subsidence.	Likely – based on predictions of SCT (2026)	Section 2.1.4
Waterway cross sectional area		Change in cross sectional area does not vary beyond the predictions of the subsidence modelling undertaken as part of impact assessment.	Likely – based on predictions of SCT (2026)	
Stream gradient		Change in stream gradient does not vary beyond the predictions of the subsidence modelling undertaken as part of impact assessment.	Likely – based on predictions of SCT (2026)	

Aspect	DA504-00 Schedule 3, Section 5	Criteria	Performance criteria achieved	Relevant monitoring program
<b>Watercourse subsidence</b>				
3 <sup>rd</sup> order and above streams GDEs	The Applicant must ensure that the development does not result in any: <ul style="list-style-type: none"> <li>– Reduction in surface flows and groundwater baseflow to upland swamps (NPSS) and wetlands.</li> <li>– Reduction in surface flows and groundwater baseflow to waterbodies including Marrangaroo Creek, Farmers Creek, Dargans Creek, Wolgan River, Dumbano Creek, Bungleboori Creek, and Wollangambe River.</li> </ul>	No connective cracking between the surface, or the base of the alluvium, and the underground workings. No subsidence impact or environmental consequence greater than minor.	Likely – based on predictions of SCT (2026) and JBS&G (2026)	Section 2.1.4
1 <sup>st</sup> and 2 <sup>nd</sup> order streams		No subsidence impact or environmental consequences greater than predicted by impact assessment. No connective cracking between the surface and the underground workings.	Likely – based on predictions of SCT (2026) and JBS&G (2026)	

Note to table:

- Classification of streams in accordance with Strahler stream order system.

### 4.3.3 Groundwater environment

Table 4.5 below presents the groundwater environment management criteria for the 918 panel.

*Table 4.5 Groundwater environment criteria*

Aspect	DA504-00 Schedule 3, Section 5	Criteria	Performance criteria achieved	Relevant monitoring program
Groundwater level	The Applicant must ensure that the development does not result in any: <ul style="list-style-type: none"> <li>– Significant inflows to mine workings.</li> <li>– Reduction in pumping yield in privately-owned groundwater bores.</li> <li>– Reduction in surface flows and groundwater baseflow to upland swamps (NPSS) and wetlands.</li> </ul>	Above trigger values provided in Table 4.2. No complaints regarding groundwater access.	Likely – based on predictions of JBS&G (2026)	Section 2.2.1 and Section 2.2.2
Groundwater quality		No complaints regarding groundwater quality in the vicinity of the Extraction Plan Area.	Likely – based on predictions of JBS&G (2026)	
Groundwater inflow		Groundwater inflows into the 918 Panel are within 20% of the predicted inflow	Likely – based on predictions of JBS&G (2026)	

## **5. Groundwater model validation program**

### **5.1 Data review**

The groundwater model validation program compares groundwater monitoring results with modelled groundwater level and inflow predictions. Groundwater inflow and level drawdown will be compared to calculated groundwater make of the underground workings and observed groundwater monitoring levels quarterly and at the end of each sub-panel.

Where the validation process identifies variances between monitored and predicted mine groundwater inflows into the 918 Panel of greater than 20% or the hydrogeological model is underestimating or overestimating drawdown in groundwater level, then a recalibration process may be required to be undertaken in consultation with an independent reviewer. A summary of the hydrogeological model validation will be prepared as part of the Annual Review for Clarence Colliery. The groundwater model, developed for the 918 Panel WMP (JBS&G, 2026) has been independently peer reviewed by James Dowdeswell of GHD.

### **5.2 Calculation of groundwater take**

As specified in the site-wide Clarence Colliery WMP (GHD, 2025), the results of the site water balance will be reported in the Annual Review for Clarence Colliery. The water balance will include the calculation of groundwater take from the fractured and porous rock water sources in accordance with the methodology outlined in Section 2.2.2.

## 6. Risks and mitigation plan

### 6.1 Trigger action response plans

Trigger action response plans (TARPs) are provided in Appendix E for:

- Watercourses
- Groundwater environment
- Stream health

#### 6.1.1 Compensatory water supply

A TARP has been developed for the provision of compensatory water in accordance with development consent DA504-00 conditions (refer Appendix E). As discussed in the TARP in Appendix E, if trigger values are exceeded, an investigation is launched to identify the cause of the exceedance. This investigation includes review of surrounding monitoring data, mining progression, monitoring methodology and rainfall data. As discussed in Appendix E, in the event that the investigation into the trigger identifies that change in water level or quality is due to mining related activities, NSW DCCEE, NPWS and any potentially affected landholders will be notified as soon as practicable.

Consultation will be undertaken with potentially affected landholders and NSW DCCEE to identify if compensatory water supply is required, in accordance with the TARP included in Appendix E. For groundwater users, compensatory water supply may include:

- Lower the production pump intake (provided there is capacity in the bore).
- Installation of a deeper production bore to replace or supplement the bore.
- Provision of an alternate water supply, e.g., tankering supply to the landholder.

#### 6.1.2 Subsidence remediation

As discussed in the TARP in Appendix E, if subsidence impacts are greater than predicted and result in watercourse instabilities, then mitigation measures would be considered for implementation. Suitably qualified consultants would be engaged, and consultation would be undertaken with NSW DCCEE, NPWS and relevant landholders in order to identify the most appropriate mitigation measures.

Any constructed mitigation measures would be inspected bi-monthly in conjunction with the annual watercourse and stability monitoring (including stream and flow path inspections) where required.

The Extraction Plan proposes a mining technique where the extraction voids can be modified on a sub-panel by sub-panel basis, making it conducive to adaptive management. In the event that subsidence impacts are greater than predicted, the mine design of future sub-panels will be reviewed, and changes may be made to reduce future subsidence impacts. Following completion of each sub-panel, Clarence will review subsidence performance and available environmental monitoring data to determine any exceedances of predictions. Any exceedances will trigger a review of the mine design as set out in the 918 Panels Subsidence Monitoring Program.

### 6.2 Management plan review

This Extraction Plan WMP will be reviewed as a result of:

- Any significant change to water management practices.
- Continual exceedance of trigger values.

A review of this WMP will be undertaken by a suitably qualified person and, where necessary, will consider consultation with the appropriate local and state government authorities. The Clarence Environment and Community Coordinator will schedule and coordinate any necessary review of this Extraction Plan WMP as set out above.

A summary of management actions and mitigation measures is given in Table 6.1. It is also the responsibility of the Clarence Environment and Community Coordinator to budget, schedule and manage all tasks set out in Table 6.1 and coordinate the necessary investigations in the event of trigger exceedances and/or anomalous data.

**Table 6.1** Summary of management actions and mitigation measures

Required action	Frequency
Undertake groundwater monitoring in accordance with Section 2.2.	Continuous logging of groundwater levels with data downloaded and reviewed every two months. Monitoring will cease three years after mining and the monitoring location will be remediated. Monitoring will continue at locations where impacts to groundwater level or quality are identified.
Undertake surface water quality monitoring in accordance with Section 2.1.1 and Section 2.1.2.	Monthly Monitoring will cease three years after mining. Monitoring will continue where water quality impacts have been identified that are attributable to mining.
Undertake surface water flow monitoring in accordance with Section 2.1.1 and Section 2.1.2.	Monthly Monitoring will cease three years after mining. Monitoring will continue where surface water flow impacts have been identified that are attributable to mining.
Stream stability monitoring specified in Section 2.1.3.	Inspections conducted Pre and Post second workings extraction and in the event that subsidence is greater than predicted, as identified by subsidence monitoring.
Undertake daily monitoring of underground water transfers specified in Section 2.2.2.	Daily, review daily data quarterly and at the end of mining of each sub-panel.
Respond to exceedances of trigger values in accordance with the TARP presented in Appendix E.	Ongoing.
Undertake an annual review and report on groundwater monitoring data as presented in Section 5.	Annually.
Compare hydrogeological model predictions with monitoring data every two years and re-calibrate the hydrogeological model as required as presented in Section 5.	Biennially (once every two years).
Calculate annual groundwater take from the fractured and porous rock groundwater sources.	Annually.

## 6.3 Reporting

Outcomes from the monitoring programs will be reported annually through the Annual Review. This reporting will cover outcomes such as results of surface water and groundwater monitoring and assessment of monitoring results against relevant criteria.

As outlined in Section 6.1, incident management and reporting will be undertaken in accordance with the relevant TARP (refer to Appendix E).

## 7. Limitations

This report has been prepared by GHD for Clarence Colliery Pty Ltd and may only be used and relied on by Clarence Colliery Pty Ltd for the purpose agreed between GHD and the Clarence Colliery Pty Ltd as set out in Section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Clarence Colliery Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the date of preparation of the Report. GHD has no responsibility or obligation to update this Report to account for events or changes occurring subsequent to the date that the Report was prepared. Where this Report is relied on or used without obtaining this further advice from GHD, to the maximum extent permitted by law, GHD disclaims all liability and responsibility to any person in connection with, arising from or in respect of this Report whether such liability arises in contract, tort (including negligence) or under statute.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Clarence Colliery Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services, and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

## 8. References

- ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australia and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.
- ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Governments and Australian state and territory governments, available from <http://www.waterquality.gov.au/anz-guidelines/>
- Centennial Coal (2026) *Clarence Colliery 2025 Annual Review*
- DILW (2018) *Continuous water monitoring network*, Department of Industry – Lands and Water. Available from <http://allwaterdata.water.nsw.gov.au/water.stm>
- DPI (2012a) NSW Aquifer Interference Policy: NSW Government policy for the licensing and assessment of aquifer interference activities, NSW Department of Primary Industries.
- DPI (2012b) Risk assessment guidelines for groundwater dependent ecosystems: Volume 1 – The conceptual framework, NSW Department of Primary Industries, Office of Water.
- EMM (2023) *Groundwater Subsidence Management Status Report (SMSR) 1 March 2023 to 30 June 2023*, prepared by EMM Consulting for Clarence Colliery Pty Ltd.
- EMM (2025) *Annual Groundwater Monitoring Report 2024*, prepared by EMM Consulting for Clarence Colliery Pty Ltd.
- GHD (2023) *Bungleboori and Paddys Creek Stability Assessment Review – 918/920 Panel Area*, prepared by GHD Pty Ltd for Clarence Colliery Pty Ltd.
- GHD (2025) *Clarence Colliery MP-2041 Water Management Plan*, prepared by GHD Pty Ltd for Clarence Colliery Pty Ltd.
- GHD (2025a) *918 Watercourse Stability and Geomorphological Assessment*, prepared by GHD Pty Ltd for Clarence Colliery Pty Ltd.
- GHD (2026) *Independent peer review of the Clarence Colliery 918 Panel Numerical Groundwater Model*, prepared by GHD Pty Ltd for Clarence Colliery Pty Ltd.
- Goldney D. (2010). *Determining whether or not a significant impact has occurred on Temperate Highland Peat Swamps on Sandstone within the Angus Place Mine lease on the Newnes Plateau*, report prepared for Department of the Environment, Water, Heritage and the Arts (DEWHA), Cenwest Environmental Services
- IESC. (2014). *Temperate Highland Peat Swamps on Sandstone: longwall mining engineering design – subsidence prediction, buffer distances and mine design options*. Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development. Report commissioned by the Department of the Environment
- IESC (2023) *Information Guidelines Explanatory Note: Subsidence associated with underground coal mining*, Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development, Commonwealth of Australia.
- JBS&G (2026) *Extraction Plan for 918 Panel: Groundwater Assessment*, prepared by JBS&G Australia Pty Ltd for Clarence Colliery Pty Ltd.
- JBS&G (2026a) *Extraction Plan for 918: Surface Water Assessment*, prepared by JBS&G Australia Pty Ltd for Clarence Colliery Pty Ltd.
- MSEC (2026) *Clarence Colliery – 918 Panel Subsidence Predictions and Impact Assessment Report*, reference MSEC1393.
- RPS (2026) *Biodiversity Management Plan 918-920 Panels*, prepared by RPS APP Consulting Pty Ltd.
- Rutherford et al. (2000) *The Rehabilitation Manual for Australian Streams. Volume 1*. Prepared by Rutherford et al.
- SCT (2026) *Geotechnical, subsidence and caving assessment for 918 Panel, Centennial Coal*, reference CLR5894, prepared by SCT Operations Pty Ltd.

NSW DCCEEW (2025) *Sharing and Enabling Environmental Data (SEED) Portal* – accessed 25 November 2025.  
WaterNSW (2025) *NSW Water Register*, site accessed: <https://realtimedata.waternsw.com.au/water.stm>

# Appendices

# **Appendix A**

**Correspondence with regulators**

**From:** [Christopher M. Armit](#)  
**To:**  
**Subject:** FW: Clarence Colliery - 918 Panel EP - SCT Geotechnical Response + MSEC Subsidence Predictions and Impact assessment  
**Date:** Friday, 20 February 2026 4:21:48 AM  
**Attachments:** [image002.png](#)  
[image009.png](#)  
[image010.png](#)  
[image011.png](#)  
[image012.png](#)  
[image013.png](#)

---

Final IEAPM Consultation on GW monitoring locations to add to IEAPM consult for WMP.

Regards

**Christopher M. Armit**  
Approvals Coordinator



p: +61 (0) 2 4935 8965

**Centennial | Fassifern**  
100 Miller Road | Fassifern | NSW | 2283 | Australia  
[centennialcoal.com.au](http://centennialcoal.com.au)

---

**Attention:**

This message and any files transmitted with it are confidential and intended solely for the use of those persons to whom the message is addressed. If you have received this message in error please notify the sender immediately and then delete this message. Any unauthorised form of reproduction of this message or any files transmitted with it is strictly prohibited. Any views or opinions presented in this message are solely those of the author and do not necessarily represent those of Centennial Coal Company Pty Limited. The recipient should check this message and any attachments for the presence of viruses. Centennial Coal Company Pty Limited accepts no liability for any damage caused by any virus transmitted by this message.

---

**From:** Karl Fetterplace <Karl.Fetterplace@dpi.nsw.gov.au>  
**Sent:** Tuesday, 11 November 2025 5:35 PM  
**To:** Christopher M. Armit <Christopher.M.Armit@centennialcoal.com.au>  
**Cc:** arthur.lam <arthur.lam@dpi.nsw.gov.au>; Peter Corbett <Peter.Corbett@centennialcoal.com.au>; Dennis Wallace <Dennis.Wallace@centennialcoal.com.au>; Matt Ribas <matt.ribas@centennialcoal.com.au>; Ron Bush <Ron.Bush@centennialcoal.com.au>  
**Subject:** Re: Clarence Colliery - 918 Panel EP - SCT Geotechnical Response + MSEC Subsidence Predictions and Impact assessment

Hi Chris,

Thank you for sending that information through, I've forwarded to the Panel.

Apologies for the delay in getting back to you with the Panel's comments in relation to GW & ecological monitoring. Please see below & note this is a first pass, high level review of the impending proposal, to check for any obvious potential showstoppers at this early stage.

Please also note the Panel considers you should focus primarily on its subsidence advice

for now, as that could have impacts on the other matters like GW & ecology.

I'll leave with the Panel to review and will then be in touch regarding a meeting.

Regards,

Karl

### **GW comments**

We have reviewed the latest GW monitoring locations against the available access trails and agree that no more useful locations can conveniently be installed without substantial landscape impacts.

Centennial should ensure there is sufficient data and assessment in the EP to provide a high degree of confidence that the Mt York Claystone aquitard will remain intact above the LW918 panels and that the regional water table and perched groundwater supporting swamps in the Burrellow Formation and Banks Wall sandstone above the Mt York Claystone will not be impacted.

### **Ecological comments**

1. As the habitat types for LWs 918 and 920 areas are analogous to those in the 700 and other 900 extraction areas, and no subsidence related changes have been detected in these areas, it is reasonable for faunal monitoring to focus on Habitat 1, the Temperate Highland Peat Swamps. The BMP however does not provide a map of the locations for monitoring of Blue Mountains Water Skink and Giant Dragonfly in the swamps.
2. The Springvale monitoring is showing how hard it is to gauge changes in populations of skinks, because the populations are small. The eDNA method being suggested for Metropolitan can at least demonstrate presence/absence and could be considered by the company perhaps as an alternative to the current methods such as trapping. It could be combined with monitoring of aquatic fauna at some sites as on the attached mark-up of the aquatic monitoring plan.
3. The BMP does not provide the monitoring method for the flora locations. In its August 2024 Advice Attachment A, the Panel asked for further justification for the use of the BAM plots. Can the company advise if this method is required by the Commonwealth under the EPBC approval.
4. Given the prediction of negligible subsidence, the monitoring of species associated with the pagodas and rocky environments (eg Broad-Headed Snake) should not be required.

**Sent:** Tuesday, November 11, 2025 4:52 PM

**To:** Karl Fetterplace <[Karl.Fetterplace@dpie.nsw.gov.au](mailto:Karl.Fetterplace@dpie.nsw.gov.au)>

**Cc:** Arthur Lam <[arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)>; Peter Corbett

<[Peter.Corbett@centennialcoal.com.au](mailto:Peter.Corbett@centennialcoal.com.au)>; Dennis Wallace

<[Dennis.Wallace@centennialcoal.com.au](mailto:Dennis.Wallace@centennialcoal.com.au)>; Matt Ribas

<[matt.ribas@centennialcoal.com.au](mailto:matt.ribas@centennialcoal.com.au)>; Ron Bush <[Ron.Bush@centennialcoal.com.au](mailto:Ron.Bush@centennialcoal.com.au)>

**Subject:** Clarence Colliery - 918 Panel EP - SCT Geotechnical Response + MSEC Subsidence Predictions and Impact assessment

Hi Karl (and Arthur),

Please find attached a letter from SCT responding to the technical matters raised regarding their 918 Panel Geotechnical and Subsidence report by the mining panel (provided within your email below - 8 October 2025).

I've also sent through a one drive email link to MSEC's Clarence Colliery 918 Panel Subsidence predictions and impact assessment report for the panel's review and comment.

As per the below invitation, we'd be happy to meet with the Panel prior to Christmas, ideally after the mining panel has reviewed the MSEC report and collated a secondary response if required to SCT's letter to gain any further feedback prior to 918 Panel Extraction Plan lodgement on the planning portal early in the new year. Any advice on further GW and Biodiversity monitoring proposed by the mining panel would also be appreciated.

Kind regards,

Chris

Regards

**Christopher M. Armit**

Approvals Coordinator



p: +61 (0) 2 4935 8965

**Centennial | Fassifern**

100 Miller Road | Fassifern | NSW | 2283 | Australia

[centennialcoal.com.au](http://centennialcoal.com.au)

---

**Attention:**

This message and any files transmitted with it are confidential and intended solely for the use of those persons to whom the message is addressed. If you have received this message in error please notify the sender immediately and then delete this message. Any unauthorised form of reproduction of this message or any files transmitted with it is strictly prohibited. Any views or opinions presented in this message are solely those of the author and do not necessarily represent those of Centennial Coal Company Pty Limited. The recipient should check this message and any attachments for the presence of viruses. Centennial Coal

**From:** Karl Fetterplace <[Karl.Fetterplace@dpie.nsw.gov.au](mailto:Karl.Fetterplace@dpie.nsw.gov.au)>  
**Sent:** Wednesday, 8 October 2025 2:55 PM  
**To:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Cc:** Ron Bush <[Ron.Bush@centennialcoal.com.au](mailto:Ron.Bush@centennialcoal.com.au)>; Matt Ribas <[matt.ribas@centennialcoal.com.au](mailto:matt.ribas@centennialcoal.com.au)>; Peter Corbett <[Peter.Corbett@centennialcoal.com.au](mailto:Peter.Corbett@centennialcoal.com.au)>; Arthur Lam <[arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)>  
**Subject:** Re: Clarence 918 EP meeting - GW and Biodiversity monitoring locations/type/frequencies feedback request

Hi Chris,

The Panel has provided comments on subsidence below, with a view to having another preliminary meeting with Centennial to explore these matters. Depending on the timing of comments re GW & ecology monitoring, any meeting could cover these aspects too, however I note that these matters (at least the GW anyhow - due to panel member availability) would be up to approx 2 weeks away.

Once you've reviewed the comments please advise if you'd like to meet with the Panel to discuss further, and whether you'd like to meet re subsidence, or wait until the other comments have been received.

Regards,

Karl

-----

The Panel raises the following matters at this stage pertaining to the report *SCT Operations – CLR5894 – 22 July 2025*. They have a focus on mine stability in the long term and its implications for achieving the subsidence related performance

measures. Other matters could arise when the Panel convenes.

1. It is acknowledged (p27.) that Bieniawski (1992) recommends “.....a FOS {factor of safety} of 2 for pillars in retreat panels and mains”. The report then goes on to state that *Bieniawski (1992) also notes that “for longwall mining, using the ALPS method developed at the Pennsylvanian State University by Mark and Bieniawski (1986), the recommended factor of safety is 1.3”*. The subsequent *Table 3: Pillar Design FOS Assessment* reports outcomes in term of FOS based on the Mark-Bieniawski pillar strength formula and the UNSW pillar design methodology. After secondary extraction, the FOS range from 1.2 to 1.7 based on the Mark-Bieniawski formula, and 1.3 to 2.1 based on the UNSW formula. Queries:

1. The ALPS methodology is understood by the Panel to have been developed for the purpose of providing functional gateroads to support longwall mining operations and, as such, is based on a database of roadway (gateroad) conditions. It was not designed for the purpose of providing a long term stable interpanel pillar system, where experience reflects in many cases that wider interpanel pillars are required. What are the implications of this for the outcomes of the Pillar Design FOS Assessment (Table 3)?
  2. Has any correlation been derived between the FOS derived using the Mark-Bieniawski Formula and the probability of pillar stability in the long term?
  3. If no specific correlation has been derived between the FOS using the Mark-Bieniawski Formula and the probability of pillar stability in the long term, should one revert to a minimum FOS of 2 as per Bieniawski (1992)?
  4. Acknowledging that the presence of stone in the upper portion of the coal pillars could increase pillar stability, what engineering basis is there for accepting a UNSW FOS as low as 1.3 in this situation when the UNSW design methodology would otherwise recommend a minimum FOS of 2.1 for long term stability?
1. Faults are projected to transect 918A Panel and 918B2 panel in the zone of double abutment loading (p29).
1. The developers of the UNSW Pillar Design Methodology do not recommend its application to geological disturbed areas and these situations were excluded from the database used to develop the methodology (Salamon et al., 1996), (Galvin et al., 1998). How has this factor been taken into consideration in the estimates of FOS in the methodologies that have found application to the design? In other words, how have FOS been discounted to account for the impact of geologically disturbances?
  2. It is concluded that “*With a geometric load minimum FOS of 1.2 and model load minimum FOS>1.6, it is recommended to have an appropriate support design to maintain pillar integrity at this location*”. What type and design of support is available (or envisaged could be developed) that will be immune to

corrosion and degradation in the long term, so as to maintain permanent pillar integrity?

- Galvin, J. M., Hebblewhite, B. K., Salamon, M. D. G., & Lin, B. B. (1998). Establishing the Strength of Rectangular and Irregular Pillars. ACARP End of Grant Report C5024. Brisbane: Australian Coal Association Research Program (ACARP).
- Salamon, M. D. G., Galvin, J. M., Hocking, G., & Anderson, I. (1996). Coal Pillar Strength from Back-Calculation. Research Report RP 1/96. Sydney: School of Mining Engineering, Uni. New South Wales.

---

**From:** Arthur Lam <[arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)>  
**Sent:** Friday, October 3, 2025 4:35 PM  
**To:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Cc:** Karl Fetterplace <[Karl.Fetterplace@dpie.nsw.gov.au](mailto:Karl.Fetterplace@dpie.nsw.gov.au)>; Ron Bush <[Ron.Bush@centennialcoal.com.au](mailto:Ron.Bush@centennialcoal.com.au)>; Matt Ribas <[matt.ribas@centennialcoal.com.au](mailto:matt.ribas@centennialcoal.com.au)>; Peter Corbett <[Peter.Corbett@centennialcoal.com.au](mailto:Peter.Corbett@centennialcoal.com.au)>  
**Subject:** RE: Clarence 918 EP meeting - GW and Biodiversity monitoring locations/type/frequencies feedback request

Hi Chris,

An update on this:

The GW monitoring location figure and spatial data requested from NPWS are currently with the Panel's groundwater expert for review, however he is currently in the middle of a six-week break.

We have also followed up with the Panel for any comments on the ecology, flora, and aquatic flora monitoring locations provided on 3<sup>rd</sup> July but we have not yet received a response from the Panel's biodiversity expert.

Kind regards,

## Arthur Lam

A/ Senior Advisor – Independent Expert Advisory Panels Secretariat

Major Projects Advisory

### Department of Planning, Housing and Infrastructure

T 02 8229 2811 E [arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)

[dphi.nsw.gov.au](http://dphi.nsw.gov.au)

Level 31, 4PSQ

4 Parramatta Square, 12 Darcy Street

Parramatta NSW 2150

*I work flexibly. Unless it suits you, I don't expect you to read or respond to my emails outside of your normal work hours.*



*The Department of Planning, Housing and Infrastructure acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.*

Please consider the environment before printing this email.

---

**From:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Sent:** Tuesday, 16 September 2025 9:34 AM  
**To:** Arthur Lam <[arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)>  
**Cc:** Karl Fetterplace <[Karl.Fetterplace@dpie.nsw.gov.au](mailto:Karl.Fetterplace@dpie.nsw.gov.au)>; Ron Bush <[Ron.Bush@centennialcoal.com.au](mailto:Ron.Bush@centennialcoal.com.au)>; Matt Ribas <[matt.ribas@centennialcoal.com.au](mailto:matt.ribas@centennialcoal.com.au)>; Peter Corbett <[Peter.Corbett@centennialcoal.com.au](mailto:Peter.Corbett@centennialcoal.com.au)>; Polina Golberg <[polina.golberg@dpie.nsw.gov.au](mailto:polina.golberg@dpie.nsw.gov.au)>  
**Subject:** Clarence 918 EP meeting - GW and Biodiversity monitoring locations/type/frequencies feedback request

Hi Arthur,

Just following up on the actions from the June 2025 IEAPM Clarence 918 Panel EP meeting and subsequent correspondence to assist the IEAPM with making recommendations on additional Groundwater and Biodiversity monitoring requirements for the 918 Panel Extraction Plan.

Is there any feedback (i.e. additional monitoring types/locations/frequencies) on these two aspects that the IEAPM can provide and for Clarence to implement as soon as possible ?

Given the seasonal element to Biodiversity monitoring it would be good to get these recommendations as soon as possible so that they can be incorporated into the Spring 2025 biodiversity monitoring and get baseline monitoring happening. This will also allow us to add the additional monitoring into the appropriate management plans. Planned submission of the 918 Extraction Plan is still targeted for December 2025.

regards,

Chris

Regards

**Christopher M. Armit**  
Approvals Coordinator



p: +61 (0) 2 4935 8965

**Centennial | Fassifern**  
100 Miller Road | Fassifern | NSW | 2283 | Australia  
[centennialcoal.com.au](http://centennialcoal.com.au)

---

**Attention:**

This message and any files transmitted with it are confidential and intended solely for the use of those persons to whom the message is addressed. If you have received this message in error please notify the sender immediately and then delete this message. Any unauthorised form of reproduction of this message or any files transmitted with it is strictly prohibited. Any views or opinions presented in this message are solely those of the author and do not necessarily represent those of Centennial Coal Company Pty Limited. The recipient should check this message and any attachments for the presence of viruses. Centennial Coal Company Pty Limited accepts no liability for any damage caused by any virus transmitted by this message.

---

**From:** Christopher M. Armit  
**Sent:** Friday, 15 August 2025 5:47 AM

**To:** Arthur Lam <[arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)>

**Subject:** FW: 918 EP meeting - GW monitoring locations/type review and feedback

Hi Arthur,

918 Panel GW Monitoring Figure with requested surface contours, swamp locations and roads and access tracks (attached) as requested on your 7 August email below to assist in IEAPM locating additional GW monitoring bores.

CSP34, CSP35 and CSP36 swamp piezometers now installed and recording Standing Water Level data.

Cheers,

Chris

---

**From:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>

**Sent:** Thursday, 7 August 2025 4:39 PM

**To:** Arthur Lam <[arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)>

**Subject:** RE: 918 EP meeting - GW monitoring locations/type review and feedback

Thanks heaps Arthur for chasing it up with John.

I've got our GIS team onto creating a figure with the below features to assist John in decision making on 918 GW monitoring.

Will send the figure through early/mid next week.

John's colleagues at EMM Consulting do the regular GW monitoring for Clarence so know the 918 EP area well and provided us with the original 918 and 920 GW monitoring site locations that have been installed.

The irony is not lost on me given they work for the same company, but if it is efficient to do so I'm more than happy for them to talk together to get resolution to this practical matter if needs be.

Personally don't think additional GW bore sites warrant vegetation disturbance but open to alternative bore sites on existing track ideas. For some context, NPWS is closing and plans to close some access tracks in this area.

We can add that detail into the figure as well to help inform John. I'm also happy to chat to John on the topic if easier as I know the area well.

cheers,

Chris

---

**From:** Arthur Lam <[arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)>  
**Sent:** Thursday, 7 August 2025 2:21 PM  
**To:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Subject:** RE: 918 EP meeting - GW monitoring locations/type review and feedback

Hi Chris,

The Panel's response to the comments provided on their feedback is as follows:

Acknowledging that some shallow standpipes may not be possible in the suggested locations because of access constraints.

Please supply a figure showing topographic contours, existing access tracks and swamp locations to see whether there are any alternative sites that that the Panel believes could be accessed and would be useful for the EP assessment.

Kind regards,

**Arthur Lam**

A/ Senior Advisor – Independent Expert Advisory Panels Secretariat

Major Projects Advisory

**Department of Planning, Housing and Infrastructure**

T 02 8229 2811 E [arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)

[dphi.nsw.gov.au](http://dphi.nsw.gov.au)

Level 31, 4PSQ

4 Parramatta Square, 12 Darcy Street

Parramatta NSW 2150

*I work flexibly. Unless it suits you, I don't expect you to read or respond to my emails outside of your normal work hours.*



*The Department of Planning, Housing and Infrastructure acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.*

Please consider the environment before printing this email.

---

**From:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Sent:** Thursday, 3 July 2025 5:14 AM  
**To:** Arthur Lam <[arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)>  
**Cc:** Peter Corbett <[Peter.Corbett@centennialcoal.com.au](mailto:Peter.Corbett@centennialcoal.com.au)>; Ron Bush <[Ron.Bush@centennialcoal.com.au](mailto:Ron.Bush@centennialcoal.com.au)>  
**Subject:** RE: 918 EP meeting - GW monitoring locations/type review and feedback

Hi Arthur,

Thanks for chasing and gaining the Panel's feedback.

See below responses in cyan for the Panel on proposed and existing GW monitoring for 918 Panel.

I've cc'ed in Peter Corbett so he has your email address (in lieu of Lucie on Maternity leave and Karl on A/L) for the supply of the SCT 918 Panel Geotechnical and Subsidence Assessment report to the panel once it's ready.

This is the other outstanding action to complete from the Clarence Colliery 918 Panel IEAPM June 2 2025 meeting.

Also cc'ed in Ron (my boss) as I'll be on 2 weeks leave from 4 Jul.

cheers,

Chris

Regards

**Christopher M. Armit**

Approvals Coordinator



p: +61 (0) 2 4935 8965

**Centennial | Fassifern**

100 Miller Road | Fassifern | NSW | 2283 | Australia

[centennialcoal.com.au](http://centennialcoal.com.au)

---

**Attention:**

This message and any files transmitted with it are confidential and intended solely for the use of those persons to whom the message is addressed. If you have received this message in error please notify the sender immediately and then delete this message. Any unauthorised form of reproduction of this message or any files transmitted with it is strictly prohibited. Any views or opinions presented in this message are solely those of the author and do not necessarily represent those of Centennial Coal Company Pty Limited. The recipient should check this message and any attachments for the presence of viruses. Centennial Coal Company Pty Limited accepts no liability for any damage caused by any virus transmitted by this message.

Regards

**Christopher M. Armit**

Approvals Coordinator



p: +61 (0) 2 4935 8965

**Centennial | Fassifern**

100 Miller Road | Fassifern | NSW | 2283 | Australia

[centennialcoal.com.au](http://centennialcoal.com.au)

---

**Attention:**

This message and any files transmitted with it are confidential and intended solely for the use of those persons to whom the message is addressed. If you have received this message in error please notify the sender immediately and then delete this message. Any unauthorised form of reproduction of this message or any files transmitted with it is strictly prohibited. Any views or opinions presented in this message are solely those of the author and do not necessarily represent those of Centennial Coal Company Pty Limited. The recipient should check this message and any attachments for the presence of viruses. Centennial Coal Company Pty Limited accepts no liability for any damage caused by any virus transmitted by this message.

---

**From:** Arthur Lam <[arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)>

**Sent:** Monday, June 30, 2025 11:26 AM

**To:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>

**Subject:** FW: 918 EP meeting - GW monitoring locations/type review and feedback

Hi Chris,

The Panel has reviewed the table of GW monitoring locations and the associated map to be included in the EP and have made the following comments:

- Reasonable coverage across the planned 900 area, except for perched GW in the Burrell Formation in valley side/ridgeline areas and perhaps another shallow monitoring location in the south.
  - Good coverage for the swamp (perched) groundwater in the Quaternary alluvial/colluvial sediments

Note that CSP 34, 35 & 36 are proposed swamp standpipes & should be installed ASAP – [Agreed on ASAP install of CSP34, CSP35 and CSP36 swamp, standpipe piezometers.](#)

[These sites have been approved by NPWS/BCD and were recently installed and are now gathering data. Charts of the Standing Water Level data will be provided in the 918 Panel Extraction Plan.](#)

- Would be useful to pair the swamp piezometers at each site CSP 34, 35 & 36 (if there is suitable access) with a shallow piezometer into the underlying perched GW in the Burrell Formation (ie first water cut in the underlying/adjacent bedrock probably no deeper than 10-15m) - [the CSP34, CSP35 and CSP36 sites are >400m away from any nearby existing access tracks so would not be practical to install without a decent amount of clearing of native vegetation within a SCA to allow the safe access of a drill rig and support vehicles. Please confirm from this further information if these proposed, shallow drilled holes are still deemed required.](#)
- Shallow aquifer (i.e. regional water table) monitoring coverage is reasonable, although an extra site at below Paddys Creek hanging swamp near the creek line would be very useful – [similar feedback as above. If still deemed required, please provide coordinates or indication of the proposed location of this bore site. We can supply a figure with topographical contours and existing access tracks if this assists in decision making/appreciation of landform in these additional drilling sites.](#)
  - Note that SPR1605 and SPR1606 standpipes are more likely to be shallow monitoring locations rather than perched, and the CLR41A standpipe could be shallow rather than perched
- Deep aquifer coverage is reasonable, although the panel was under the understanding that there was another VWP at the central CLRP41 site.
  - Please confirm this - [The Panel's understanding is correct, there is the deep CLRP41 VWP at this site. Data previously provided to IEAPM for CLRP41 was provided in July 2024 RFI response.](#)

[As you can see the July 2024 VWP data was insufficient and from an update on this bore the VWP data, no piezometer channels are working.](#)

[Because of this I removed it as a relevant borehole / data source in the recently provided GW Monitoring Location table.](#)

For some additional monitoring context at this CLRP41 monitoring site - there is a deep (to Katoomba seam), telemetered, borehole extensometer (CLRP41E), as well as the existing, open standpipe piezometer CLRP41A and a real time GNSS (subsidence survey) unit which should provide good data on subsidence in this area.

If you have any comments or questions you would like to relay back to the panel regarding the above, please don't hesitate to reach out to me.

Kind regards,

## **Arthur Lam**

Advisor – Independent Expert Advisory Panels Secretariat

Major Projects Advisory

**Department of Planning, Housing and Infrastructure**

T 02 8229 2811 E [arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)

[dphi.nsw.gov.au](http://dphi.nsw.gov.au)

Level 31, 4PSQ

4 Parramatta Square, 12 Darcy Street

Parramatta NSW 2150

*I work flexibly. Unless it suits you, I don't expect you to read or respond to my emails outside of your normal work hours.*



*The Department of Planning, Housing and Infrastructure acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.*

Please consider the environment before printing this email.

---

**From:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Sent:** Monday, 30 June 2025 10:17 AM  
**To:** Arthur Lam <[arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)>  
**Subject:** RE: 918 EP meeting - GW monitoring locations/type review and feedback

No worries Arthur, there's a lot of sickness going around – hope you're better.

Thanks for following up. Anything you need to know for the Clarence 918 Panel EP project, drop me a line.

In terms of the next EP project on the Clarence Colliery horizon – it's the 701, 718-724 Panel Extraction Plan.

Polina was going to touch base with Jesse when Jesse's back from sick leave, hopefully this week and let us know on final confirmation if a mining panel was required for this project.

If it is confirmed that a mining panel is required, more than keen to meet with the panel and take them through the preliminary project and also provide an Environmental Monitoring Program for their review and feedback so any additional monitoring can be commenced.

cheers,

Chris

0409 070 233

Regards

**Christopher M. Armit**  
Approvals Coordinator



p: +61 (0) 2 4935 8965

**Centennial | Fassifern**  
100 Miller Road | Fassifern | NSW | 2283 | Australia  
[centennialcoal.com.au](http://centennialcoal.com.au)

---

**Attention:**

This message and any files transmitted with it are confidential and intended solely for the use of those persons to whom the message is addressed. If you have received this message in error please notify the sender immediately and then delete this message. Any unauthorised form of reproduction of this message or any files transmitted with it is strictly prohibited. Any views or opinions presented in this message are solely those of the author and do not necessarily represent those of Centennial Coal Company Pty Limited. The recipient should check this message and any attachments for the presence of viruses. Centennial Coal Company Pty Limited accepts no liability for any damage caused by any virus transmitted by this message.

---

**From:** Arthur Lam <[arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)>  
**Sent:** Monday, June 30, 2025 9:36 AM  
**To:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Subject:** RE: 918 EP meeting - GW monitoring locations/type review and feedback

Hi Chris,

Apologies as I was off sick on Friday.

Yes, I will be your main point of contact for the IEAPM Secretariat.

Lucie has informed me that the material was received before she left. I will email you the panel's response once I have received it.

Kind regards,

**Arthur Lam**

Advisor – Independent Expert Advisory Panels Secretariat

Major Projects Advisory

**Department of Planning, Housing and Infrastructure**

T 02 8229 2811 E [arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)

[dphi.nsw.gov.au](http://dphi.nsw.gov.au)

Level 31, 4PSQ

4 Parramatta Square, 12 Darcy Street

Parramatta NSW 2150

*I work flexibly. Unless it suits you, I don't expect you to read or respond to my emails outside of your normal work hours.*



*The Department of Planning, Housing and Infrastructure acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.*

Please consider the environment before printing this email.

---

**From:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Sent:** Friday, 27 June 2025 1:45 PM  
**To:** Arthur Lam <[arthur.lam@dpie.nsw.gov.au](mailto:arthur.lam@dpie.nsw.gov.au)>  
**Subject:** FW: 918 EP meeting - GW monitoring locations/type review and feedback

Hi Arthur,

I received a maternity leave out of office from Lucie.

Did you get a hand over with Lucie on the Clarence 918 Panel Extraction Plan, are you my best point of contact for the IEAPM Secretariat ? – see below email trail.

Kind regards,

Chris

Regards

**Christopher M. Armit**

Approvals Coordinator



p: +61 (0) 2 4935 8965

**Centennial | Fassifern**

100 Miller Road | Fassifern | NSW | 2283 | Australia

[centennialcoal.com.au](http://centennialcoal.com.au)

---

**Attention:**

This message and any files transmitted with it are confidential and intended solely for the use of those persons to whom the message is addressed. If you have received this message in error please notify the sender immediately and then delete this message. Any unauthorised form of reproduction of this message or any files transmitted with it is strictly prohibited. Any views or opinions presented in this message are solely those of the author and do not necessarily represent those of Centennial Coal Company Pty Limited. The recipient should check this message and any attachments for the presence of viruses. Centennial Coal Company Pty Limited accepts no liability for any damage caused by any virus transmitted by this message.

---

**From:** Christopher M. Armit

**Sent:** Friday, June 27, 2025 1:21 PM

**To:** Lucie Clifton <[lucie.clifton@dpie.nsw.gov.au](mailto:lucie.clifton@dpie.nsw.gov.au)>

**Cc:** Peter Corbett <[Peter.Corbett@centennialcoal.com.au](mailto:Peter.Corbett@centennialcoal.com.au)>

**Subject:** RE: 918 EP meeting - GW monitoring locations/type review and feedback

Hi Lucie,

Just checking you received this material ok and if John had any questions.

Happy to discuss it with him if it assists in expediting any extra monitoring requirements he may want.

regards,

Chris

---

**From:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>

**Sent:** Thursday, June 19, 2025 12:23 PM

**To:** Lucie Clifton <[Lucie.Clifton@dpie.nsw.gov.au](mailto:Lucie.Clifton@dpie.nsw.gov.au)>

**Cc:** Peter Corbett <[Peter.Corbett@centennialcoal.com.au](mailto:Peter.Corbett@centennialcoal.com.au)>

**Subject:** RE: 918 EP meeting - GW monitoring locations/type review and feedback

Hi Lucie,

As discussed in the 2 June meeting with John on groundwater monitoring adequacy, please find attached the 918 Panel Groundwater Location Figure and 918 Groundwater Monitoring Table for his review and feedback.

As mentioned in the meeting, if extra monitoring is required, early feedback would be appreciated to enable the implementation (approvals, procurement etc.) of this monitoring.

regards,

Chris

---

**From:** Lucie Clifton <[Lucie.Clifton@dpie.nsw.gov.au](mailto:Lucie.Clifton@dpie.nsw.gov.au)>

**Sent:** Tuesday, June 3, 2025 1:47 PM

**To:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>

**Cc:** Peter Corbett <[Peter.Corbett@centennialcoal.com.au](mailto:Peter.Corbett@centennialcoal.com.au)>

**Subject:** Re: 918 EP meeting

No problem Chris

I'll point out - the geology and groundwater draft report and a draft application were the things the Panel agreed to look at prior to submission so best to focus on them.

Thanks

**Lucie Clifton**

**Senior Advisor**, Independent Expert Advisory Panel for Mining (IEAPM), Major Projects Advisory  
**Department of Planning, Housing and Infrastructure**

T 02 9274 6402 | E [Lucie.Clifton@dpie.nsw.gov.au](mailto:Lucie.Clifton@dpie.nsw.gov.au)

Level 16, 4PSQ, 12 Darcy Street, Parramatta, NSW, 2150 | Locked Bag 5022

[www.dpie.nsw.gov.au](http://www.dpie.nsw.gov.au)

*Monday-Thursday*



---

**From:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Sent:** Tuesday, June 03, 2025 12:54 PM  
**To:** Lucie Clifton <[Lucie.Clifton@dpie.nsw.gov.au](mailto:Lucie.Clifton@dpie.nsw.gov.au)>  
**Cc:** Peter Corbett <[Peter.Corbett@centennialcoal.com.au](mailto:Peter.Corbett@centennialcoal.com.au)>  
**Subject:** RE: 918 EP meeting

Hey Lucie,

No worries, apologies out in the field today.

I reckon Pete Corbett will be able to provide you with a copy of the slide pack.

The other points might take a little longer – keep you posted.

regards,

Chris

Regards

**Christopher M. Armit**  
Approvals Coordinator



p: +61 (0) 2 4935 8965

**Centennial | Fassifern**  
100 Miller Road | Fassifern | NSW | 2283 | Australia  
[centennialcoal.com.au](http://centennialcoal.com.au)

---

**Attention:**

This message and any files transmitted with it are confidential and intended solely for the use of those persons to whom the message is addressed. If you have received this message in error please notify the sender immediately and then delete this

message. Any unauthorised form of reproduction of this message or any files transmitted with it is strictly prohibited. Any views or opinions presented in this message are solely those of the author and do not necessarily represent those of Centennial Coal Company Pty Limited. The recipient should check this message and any attachments for the presence of viruses. Centennial Coal Company Pty Limited accepts no liability for any damage caused by any virus transmitted by this message.

---

**From:** Lucie Clifton <[Lucie.Clifton@dpie.nsw.gov.au](mailto:Lucie.Clifton@dpie.nsw.gov.au)>  
**Sent:** Tuesday, June 3, 2025 10:26 AM  
**To:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Subject:** Re: 918 EP meeting

Hi Chris

Thanks for assembling your side of things. It was a beneficial discussion.

Just a few things I took note that the Panel asked for, (either for future submission or beforehand):

- Presentation slide pack
- Triassic sandstone monitoring
- Cross lateral maps
- Geographical cross sections map
- Lineaments to be addressed as per IEAPM Interim Advice
- Geology and groundwater draft report

Are you able to source and send through anything relevant to review right now?  
(specifically the slide pack)

Thanks

**Lucie Clifton**

**Senior Advisor**, Independent Expert Advisory Panel for Mining (IEAPM), Major Projects Advisory  
**Department of Planning, Housing and Infrastructure**

T 02 9274 6402 | E [Lucie.Clifton@dpie.nsw.gov.au](mailto:Lucie.Clifton@dpie.nsw.gov.au)  
Level 16, 4PSQ, 12 Darcy Street, Parramatta, NSW, 2150 | Locked Bag 5022  
[www.dpie.nsw.gov.au](http://www.dpie.nsw.gov.au)

*Monday-Thursday*



---

**From:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Sent:** Monday, June 2, 2025 8:13 PM  
**To:** Lucie Clifton <[Lucie.Clifton@dpie.nsw.gov.au](mailto:Lucie.Clifton@dpie.nsw.gov.au)>  
**Subject:** RE: 918 EP meeting

Thanks Lucie for making today's meeting happen, appreciated.

Kind regards,

Chris

Regards

**Christopher M. Armit**  
Approvals Coordinator



p: +61 (0) 2 4935 8965

**Centennial | Fassifern**  
100 Miller Road | Fassifern | NSW | 2283 | Australia  
[centennialcoal.com.au](http://centennialcoal.com.au)

---

**Attention:**

This message and any files transmitted with it are confidential and intended solely for the use of those persons to whom the message is addressed. If you have received this message in error please notify the sender immediately and then delete this message. Any unauthorised form of reproduction of this message or any files transmitted with it is strictly prohibited. Any views or opinions presented in this message are solely those of the author and do not necessarily represent those of Centennial Coal Company Pty Limited. The recipient should check this message and any attachments for the presence of viruses. Centennial Coal Company Pty Limited accepts no liability for any damage caused by any virus transmitted by this message.

---

**From:** Lucie Clifton <[Lucie.Clifton@dpie.nsw.gov.au](mailto:Lucie.Clifton@dpie.nsw.gov.au)>  
**Sent:** Tuesday, May 27, 2025 4:22 PM  
**To:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Subject:** Re: 918 EP meeting

Hi Chris

Checking we're looking good for next Monday?

Thanks

**Lucie Clifton**

**Senior Advisor**, Independent Expert Advisory Panel for Mining (IEAPM), Major Projects Advisory  
**Department of Planning, Housing and Infrastructure**

T 02 9274 6402 | E [Lucie.Clifton@dpie.nsw.gov.au](mailto:Lucie.Clifton@dpie.nsw.gov.au)

Level 16, 4PSQ, 12 Darcy Street, Parramatta, NSW, 2150 | Locked Bag 5022

[www.dpie.nsw.gov.au](http://www.dpie.nsw.gov.au)

*Monday-Thursday*



---

**From:** Christopher M. Armit <[Christopher.M.Armit@centennialcoal.com.au](mailto:Christopher.M.Armit@centennialcoal.com.au)>  
**Sent:** Monday, April 7, 2025 11:27 AM  
**To:** Lucie Clifton <[Lucie.Clifton@dpie.nsw.gov.au](mailto:Lucie.Clifton@dpie.nsw.gov.au)>  
**Subject:** 918 EP meeting

Hi Lucie,

Happy to move the meeting back given the main players in the mine subsidence engineering community will be out with the mine subsidence technology society annual conference. Apologies, I forgot to mention it.

cheers,

Chris

Regards

**Christopher M. Armit**  
Approvals Coordinator



p: +61 (0) 2 4935 8965

**Centennial | Fassifern**  
100 Miller Road | Fassifern | NSW | 2283 | Australia

[centennialcoal.com.au](http://centennialcoal.com.au)

---

**Attention:**

This message and any files transmitted with it are confidential and intended solely for the use of those persons to whom the message is addressed. If you have received this message in error please notify the sender immediately and then delete this message. Any unauthorised form of reproduction of this message or any files transmitted with it is strictly prohibited. Any views or opinions presented in this message are solely those of the author and do not necessarily represent those of Centennial Coal Company Pty Limited. The recipient should check this message and any attachments for the presence of viruses. Centennial Coal Company Pty Limited accepts no liability for any damage caused by any virus transmitted by this message.

20 March 2026

WaterNSW ref: D2026/13108

Christopher Armit  
Approvals Coordinator  
Centennial Coal

### **Clarence Colliery 918 Panel Extraction Plan – Advice to Proponent**

Dear Christopher

WaterNSW appreciates the opportunity to review the Clarence Colliery 918 Panel Extraction Plan (EP) and provide comments. We note that Clarence Colliery is located partially within the Sydney Drinking Water Catchment (SDWC).

WaterNSW is concerned about the change in mining methods to Panel and Pillar Partial Extraction (PPPE) via Shortwall techniques for the proposed 918 Panel EP and more broadly across the Clarence mining area. Large sections of Clarence's consent area and mining leases fall within the SDWC; the expansion of higher subsidence risk extraction methods, like Shortwall mining, presents an increased risk to Sydney's drinking water supply.

A review of the original Environmental Impact Statement (EIS) for DA 504-00 (dated October 2000) shows that the mining method assessed and relied upon for approval did not include PPPE via Shortwall. Section 3.4.3 – Mining Method within the EIS states:

- *"At Clarence Colliery, subsidence is limited by leaving most of the pillars in place to support the overlying strata. This part of the operation is called **second workings and is also known as partial pillar extraction.**"* (page 3-11)
- *"The proposed mining method will be **the same as the current method** except that the proposed development includes areas where full pillar extraction may occur."* (page 3-12)
- When describing Partial Extraction methods, *"In most cases, it is anticipated that at least 50 per cent of the coal would remain in the solid pillars."* (page 3-13)

The EIS does not describe, assess or model PPPE, Shortwall or any other form of partial extraction. It confirms that existing methods—first workings and partial pillar extraction—would continue to be used. The only forms of secondary extraction evaluated were partial pillar extraction and traditional full pillar extraction in limited non-sensitive areas; and Modification 1 (2005) explicitly removed full extraction from the approval, limiting DA 504-00 to first workings and partial extraction only. Accordingly, PPPE via Shortwall mining was not contemplated or assessed under DA 504-00's environmental approval.

It is therefore unclear to WaterNSW how the proposed transition from Partial Pillar Extraction to PPPE via Shortwall is consistent with the current approvals under DA504-00.

The DPIE Modification 7 Assessment Report (dated October 2021), which provides for the preparation of EPs, reinforces this expectation, stating:

*"DA504-00 identifies areas proposed for first workings (bord and pillar mining only) and second workings (**partial pillar extraction**) and **any submitted EPs would need to be consistent with the approved mining method.**"*

While the DA504-00 Consolidated Consent defines "second workings" broadly as "partial extraction methods", the Modification 7 Assessment Report provides the most specific guidance on the method to be implemented via EPs – namely partial pillar extraction, as historically practised at Clarence Colliery and assessed in the EIS.

WaterNSW therefore seeks clarification on how the proposed mining approach aligns with the existing approvals under DA 504-00, rather than requiring a Consent Modification prior to assessment and approval.

If you have any further questions, please contact David Bretreger via [environmental.assessments@waterNSW.com.au](mailto:environmental.assessments@waterNSW.com.au).

Yours sincerely,

A handwritten signature in black ink that reads "Kate Masters". The signature is written in a cursive style with a horizontal line underlining the name.

**Kate Masters**  
**a/Source Water Protection Manager**



Mr Christopher Armit  
Approvals Coordinator  
Centennial Clarence Colliery  
100 Miller Street  
Fassifern NSW 2283

Dear Mr Armit

Thank you for your request via the NSW Planning Portal dated 30 March 2026 to the Conservation Programs, Heritage and Regulation Group (CPHR) and National Parks and Wildlife Service (NPWS) of the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) requesting advice on the Clarence Colliery 918 Panel Extraction Plan and supporting sub-plans.

NSW DCCEEW has reviewed the plans and associated documentation and provide our detailed comments at Attachment B, and a consolidated summary of recommendations at Attachment A.

In summary, DCCEEW does not support approval of the Extraction Plan in its current form. While we recognise efforts to reduce potential impacts, significant concerns remain regarding the proposed introduction of shortwall mining, potential subsidence impacts, risks to water resources and groundwater-dependent ecosystems, and the adequacy of subsidence, groundwater and biodiversity monitoring and modelling.

In particular, DCCEEW considers that further work is required to demonstrate that the extraction plan is the appropriate approval pathway for the proposed change in mining method, to redesign the extraction area to avoid sensitive environmental features within the Gardens of Stone State Conservation Area, and to address demonstrated subsidence exceedances and modelling uncertainties through independent expert review.

DCCEEW also considers current groundwater and biodiversity monitoring frameworks to be inadequate to establish robust baselines or to ensure early detection and management of impacts to threatened ecological communities, swamps, streams and associated fauna. Implementation of independent audit recommendations and a robust before-after-control-impact (BACI) framework should be completed.

If you have any further questions about our advice, please contact Mr Daniel Granger, Senior Project Officer, National Parks and Wildlife Service, on 8837 6336 or [mining.gossc@environment.nsw.gov.au](mailto:mining.gossc@environment.nsw.gov.au).

Yours sincerely

A handwritten signature in black ink, appearing to read 'D. Crust'.

David Crust  
**Director Blue Mountains**  
**NSW National Parks and Wildlife Service**

17 April 2026

CC: Gabriel Wardenburg, DPHI

Enclosure

1. Attachment A – DCCEEW Summary of Recommendations
2. Attachment B – DCCEEW detailed comments Clarence Colliery 918 extraction plan

## Attachment A

# DCCEEW's Summary of Recommendations

## Clarence Colliery 918 Extraction Plan

---

BAM	Biodiversity Assessment Method
BC Act	<i>Biodiversity Conservation Act 2016</i>
BCS	Biodiversity, Conservation and Science Group
BMP	Biodiversity Management Plan
CEEC	Critically Endangered Ecological Community
DPHI	Department of Planning, Housing and Infrastructure
EEC	Endangered Ecological Community
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
GoS SCA	Gardens of Stone State Conservation Area
NPSS	Newnes Plateau Shrub Swaps
NPWS	National Parks and Wildlife Service
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
THPSS	Temperate Highlands Peat Swamp on Sandstone (as EPBC listed)

## Recommendations

- 1.1 Provide evidence of an extraction plan being the appropriate approval pathway for this mine layout that includes a change in mining method.
- 2.1 Amend the extraction plan area to avoid secondary extraction using the shortwall technique under:
  - Paddy's Creek Hanging Swamp;
  - Identified major lineaments; and
  - other highly sensitive environments on Gardens of Stone State Conservation Area
- 3.1 Refer the subsidence predictions for the proposed 918 shortwalls, along with more recent records of subsidence exceedances, to the Independent Expert Advisory Panel for Mining for independent assessment.
- 3.2 Revise subsidence assessments for the 918 panels to incorporate the recent subsidence exceedance of 93mm measured on the surface subsidence monitoring line ("D line") because of the extraction of panels 908, 910 and 906.
- 3.3 Further investigate the more recent subsidence exceedances along D line before any approval of the extraction plan for the 918 panels.
- 4.1 Amend the extraction plan area to avoid any secondary extraction under Paddy's Creek Hanging Swamp.

- 5.1 Seek advice from the Independent Expert Advisory Panel for Mining regarding the potential impacts of the proposed extraction on water resources, especially in relation to concerns of inadequate monitoring and subjective monitoring interpretations
- 6.1 Implement the recommendations of the Independent Auditor (MCW Environmental 2021)
- 6.2 Provide:
  - a. the baseline period/dates for all swamp or stream monitoring sites or aquifer monitoring bores affected/potentially affected by mining 918
  - b. all reference swamp(s), stream(s) or bore(s) proposed for comparison of stream flows or aquifer levels after mining of 918 occurs, and
  - c. a before-after control-impact (BACI) assessment of past impacts, and a BACI design to enable objective assessment of impact to swamps, streams and bores above shortwalls 918.
- 7.1 Apply the monitoring methods listed in Apx Table 16 of the Biodiversity Management Plan as the primary monitoring program for the project, not just if there is a 'condition RED'.
- 8.1 Only use eDNA monitoring to supplement the other fauna survey methods listed in Apx Table 16 of the Biodiversity Management Plan.
- 9.1 Add more biodiversity monitoring sites in Newnes Plateau shrub and hanging swamps
- 9.2 Apply the monitoring techniques listed in Table 16 to biodiversity monitoring sites
- 9.3 Include the locations, methods used, and monitoring history of all reference / control sites in the Biodiversity Management Plan.
- 10.1 Provide detail of intended methods to compare baseline datasets to monitoring datasets.
- 10.2 Include biodiversity performance measures, triggers, and actions in the TARP that directly relate to biodiversity monitoring.

## Attachment B

### NSW DCCEEW detailed comments

#### Clarence Colliery 918 extraction plan

Mining of coal at Clarence Colliery has been occurring for almost 50 years: In 1976, Blaxland Shire Council (now Lithgow City Council) approved an underground mining operation in the CCL 705 area of Clarence Colliery operations. The in-perpetuity approval permits partial and total extraction mining methods. Some seams in this area remain to be extracted.

In 1994, Lithgow City Council granted a second in-perpetuity development consent for ML 1353 and ML 1354 authorising longwall mining and some areas of partial extraction. Some seams in this area remain to be extracted.

In 2005, the NSW Minister for Planning approved the development of ML 1583 using partial extraction mining methods (DA 504-00). The 918/920 panels are in ML 1583. DA 504-00 is due to expire on 31 December 2026. DCCEEW is aware that an application has been lodged to extend mining operations under DA 504-00 to 31 December 2031 (modification 11). We are also aware of the proposal to consolidate all development applications for mining at Clarence Colliery (SSD-107894972).

It is noted that Clarence Colliery is proposing to introduce an entirely new form of mining for the 918 Panels which involves shortwall mining. The proposed method of shortwall mining has not previously been used in Australia (IESC 2023) and has not previously been tested on the Newnes Plateau.

---

#### 1. Evidence of appropriate approval pathway should be provided

In our advice on 9 February 2024, NSW DCCEEW recommended consultation with DPPI on the appropriate approval pathway given the change in mining method is inconsistent with the approval conditions required as part of MOD7 to DA504-00.

The Panel and Pillar Partial Extraction (PPPE) method using shortwall mining techniques as currently proposed is not consistent with the 'partial pillar extraction' method identified under the MOD 7 assessment report for DA504-00 (DPPI, 2021) (page 8). The change in mining method has been outlined by Clarence Colliery's own subsidence modelling reports as justification to why additional subsidence modelling is required (Zhang, 2023).

The consultation Clarence Colliery has performed for this extraction plan is outlined in Appendix 3 of the Extraction Plan Report. While Clarence has outlined the consultation process with NSW DPPI (then NSW Department of Planning and Environment) including presentations and emails, there is no evidence that this includes discussion of the appropriate approval pathway or reasoning why NSW DPPI considers the proposed Panel and Pillar Partial Extraction method the same as the approved Partial Pillar Extraction method.

#### Recommendation

- 1.1 Provide evidence of an extraction plan being the appropriate approval pathway for this mine layout that includes a change in mining method.

## 2. The secondary extraction area should avoid sensitive landscape features

The proposed 918 panels will undermine sensitive landscape features including:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* listed temperate highland peat swamps on sandstone, which includes the Newnes Plateau hanging swamps (listed as endangered under the NSW *Biodiversity Conservation Act 2016*).
- tributary creeks
- other highly sensitive environments on Gardens of Stone State Conservation Area

The extraction plan should be redesigned to avoid any secondary extraction under sensitive landscape features.

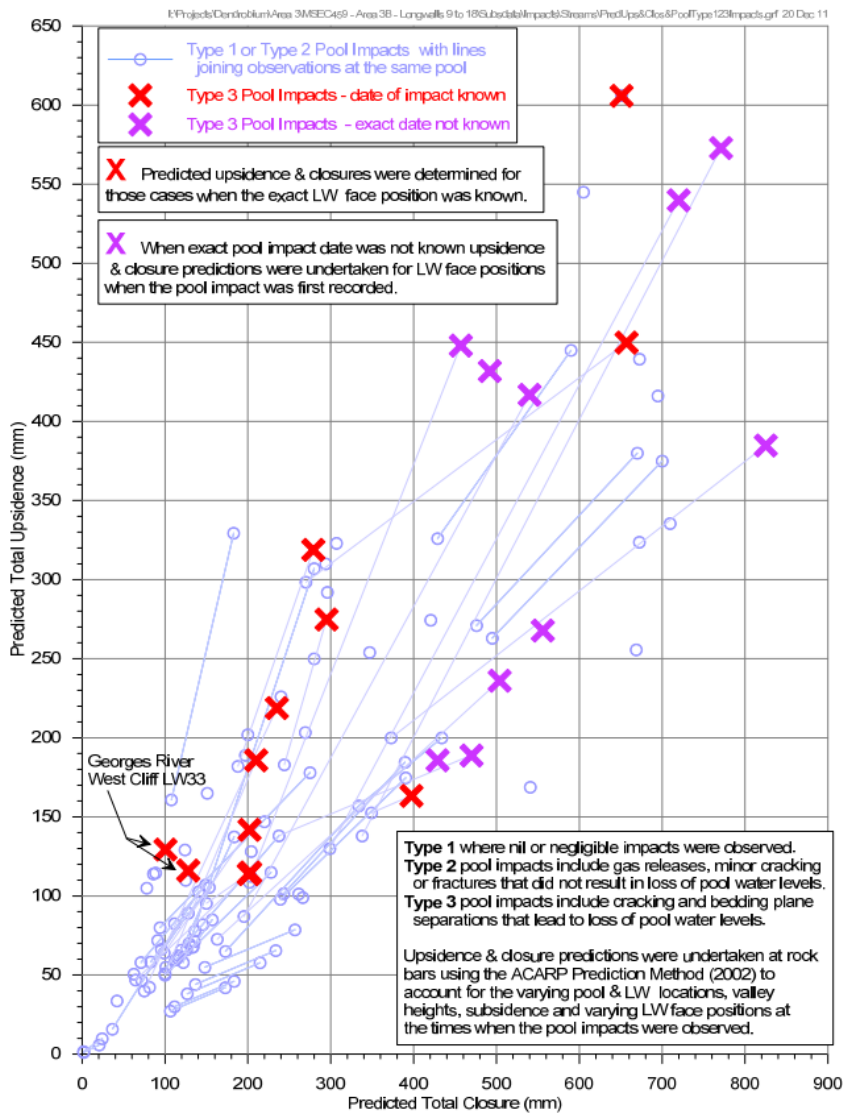
NSW DCCEEW note that the panels are proposed to be extracted using the shortwall mining technique. The IESC (2023) defines shortwall mining as a variation on bord and pillar mining that is a form of miniwall or longwall but uses a continuous miner to cut the coal on extraction across the shortwall face.

The modified design for panel 918 now has three sub panels known as 918A, 918B1 & 918B2. The proposed mining will effectively create an underground void 75m to 83m wide, up to 2.3m in height and extend for distances (lengths) between 0.438km and 0.823km.

For there to be no subsidence (or minimal subsidence) using this technique, the rock above the void will have to span the full width (i.e. up to 83m) and distance of the longwall (up to ~1km) and remain stable in-perpetuity – and even if it did, then there is still potential for subsidence to exceed the approved threshold of 100mm subsidence for DA 504-000. It is noted that the most recent report by SCT (2026) has identified maximum subsidence of 193mm across panels 906-910 which is almost double the allowable subsidence under DA 504-000 (despite using a more conservative mining extraction technique than the shortwalls proposed for the 918 panels).

The Gardens of Stone State Conservation Area (GoS SCA) was reserved on 6 May 2022 after the NSW Government made a landmark commitment to strengthen protection of this iconic landscape within the Western Blue Mountains. The GoS SCA has significant natural and cultural values important to the people of NSW, including Newnes Plateau shrub swamps, threatened and scientifically significant terrestrial and aquatic ecosystems, geological formations, major streams of Bungleboori Creek and Paddy's Creek, and important archaeological sites and Wiradjuri cultural values. GoS SCA adjoins the Maiyingu Marragu Aboriginal Place and the Greater Blue Mountains World Heritage Area.

NSW DCCEEW considers that the information provided in the extraction plan on the shortwall mining technique does not adequately consider risk of subsidence interactions with geological structures, and the effects of non-conventional subsidence on the incised drainage lines associated with Bungleboori and Paddy's Creeks. It is noted that SCT (2026) have estimated valley closure of 110mm in the vicinity of Pagoda Swamp because of the 906-910 panels (which are a more conservative extraction technique than the shortwall mining technique proposed for the 918 panels). This puts closure levels close to those responsible for impacts (complete pool drainage) in the southern coalfield (MSEC 2013) – see Figure 1.



**Fig. 5.10 Case Studies from the Southern Coalfield showing the Predicted Total Upsidence and Predicted Total Closure at the Times when Impacts were First Observed**

**Figure 1. Upsidence and valley closure levels associated with Type 3 pool impacts (complete pool drainage) in the southern coalfields. Source: MSEC (2013)**

There is no knowledge base on the threshold levels of subsidence required to promote/activate impacts associated with geological structures using the proposed shortwall extraction technique. SCT (2026) identify several faults transecting Panel 918 and the interaction of subsidence with lineaments has previously been identified (e.g. MSEC 2019) as causing serious impacts up to ~2km from previous longwall mining<sup>1</sup> on the Newnes Plateau. Based on our review of the information provided, NSW DCCEEW believe that the likely subsidence impacts present a significant risk to the important and iconic landscape features in the extraction plan area.

NSW DCCEEW recommend that the proposed extraction area be amended to avoid secondary extraction under sensitive and significant landscape features including temperate highland peat swamps on sandstone (which includes Newnes Plateau shrub swamps and Newnes Plateau hanging swamps). It is also recommended that secondary extraction using the shortwall technique

<sup>1</sup> The impacts occurred when the longwalls were mined beneath the Deanes Creek lineament zone at distances between 1.5 km and 2.25 km from the swamps (MSEC 2019).

does not occur under the major lineaments identified by SCT (2026) and JBSG (2026), since these lineaments connect to the swamps and streams in this area of the Newnes Plateau. This could be done by implementing methods similar to the 'adaptive management techniques' as described by Centennial in the extraction plan report or by reverting to bord and pillar operations.

Modification of the extraction area to avoid these significant values will still allow for extraction of coal, whilst ensuring greater certainty of in-perpetuity protection of natural values and compliance with the DA 504-000 conditions approval, which require that extraction will not result in more than 100mm subsidence and have negligible environmental consequences.

### **Recommendation**

2.1 Amend the extraction plan area to avoid secondary extraction using the shortwall technique under:

- Paddy's Creek Hanging Swamp;
- Identified major lineaments; and
- other highly sensitive environments on Gardens of Stone State Conservation Area

## **3. NSW DEECCW lacks confidence in subsidence predictions**

NSW DEECCW is concerned that the extraction plan understates the potential impacts of the proposed 918 shortwalls on the GoS SCA and its natural assets. Impacts may be understated due to:

- a. Untested extraction technique
- b. Subsidence exceedances at Clarence Colliery, and
- c. Interaction of subsidence with lineaments

### **a. Untested extraction technique**

The proposed method of shortwall mining has not been tested in the Newnes Plateau. The Independent Expert Scientific Committee on Unconventional Gas Development and Large Coal Mining Development (IESC 2023) defines shortwall mining as:

*"A variation on bord and pillar mining that is a form of miniwall or longwall but uses a continuous miner to cut the coal on extraction across the shortwall face. It is not currently used in Australia but there are shortwall projects under development".*

The untested nature of shortwall mining in Australia, and particularly on the Newnes Plateau, means that there may be unpredictable impacts.

### **b. Subsidence exceedances at Clarence Colliery**

Schedule 3, condition 1 of the development consent for Clarence Colliery (DA 504-00) sets a subsidence limit of 100mm.

There have been subsidence exceedances at Clarence Colliery in areas where the more conservative bord and pillar extraction method is used.

DCCEEW/NPWS previously identified that Clarence Colliery has experienced multiple cases of subsidence greater than 100mm, for example:

- At the junction of 609 and 609B panels, the 609 and 609B area was flooded in 2010-2011 and subsidence increased sharply to approximately 100mm, before stabilizing at 115mm from 2014 onwards. The surface subsidence monitoring line (the “D Line”) was decommissioned in late 2018.
- 612 Panel was extracted in early 2006. 600 Area flooded (2010-2011): approximately 20mm of additional subsidence over 612 Panel. Survey fluctuations over the last decade indicate a maximum of 110mm of subsidence.
- Section 4.3.1 of SCT (2023) identified that the secondary extraction of 906 panel increased maximum subsidence along D line from 104mm to 131mm. The extraction plan main report does not identify that these exceedances have occurred. In addition, the subsidence assessments supporting the extraction plan do not appear to have included up to-date information about these subsidence exceedances in their subsidence calculations and predictions.

More recently, SCT (2026) has identified maximum subsidence of 193mm across panels 906-910 which is almost double the allowable subsidence under the DA 504-000 approval (and which occurred using a more conservative mining extraction technique than the shortwalls proposed for the 918 panels).

SCT (2026) additionally identified that:

- In October 2021 when both 910 and 908 panels had been mined, subsidence survey data from 900D line indicated maximum subsidence of 147mm.
- By July 2022, a further subsidence survey of 900D line conducted showed subsidence had increased from 147mm to 158mm.
- The secondary extraction of 906 Panel after 910 and 908 Panels has increased maximum subsidence along D Line from 147mm to 193mm.
- Extrapolation of the subsidence trough along the location of the Pagoda Swamp infers Pagoda Swamp was likely to experience subsidence of approximately 100-130mm (a breach of the DA 504-000 Approval)
- Modelled valley closure of 110mm in the vicinity of Pagoda Swamp as a result of the 906-910 panels.

Importantly, the recent high subsidence exceedances (maximum subsidence of 193mm across panels 906-910 - breaching the DA 504-000 Approval) have not been notified to NPWS/DCCEEW or placed on the DPHI Major Project website for the Clarence Colliery Mine.

### **c. Interaction of subsidence with lineaments**

Centennial Coal have presented evidence that directly undermining lineaments in the strata overlying Lithgow Coal seam can cause changes to standing water levels in swamps overlying the lineaments (Centennial Coal 2016, 2019).

This is discussed by the IESC when reviewing the Angus Place Mine extension project (2020), who stated:

- Mining-induced ground movements associated with lineaments (especially those of Types 1 and 2) have impacted swamps. The ability to reliably quantify these potential impacts is crucial, especially as the interaction of subsidence and lineaments can cause nonconventional ground movements that exceed conventional subsidence movements.

- Lineaments are noted to influence and often exacerbate subsidence-related movements and increase impacts to temperate highland peat swamps on sandstone (which include Newnes Plateau shrub swamps and Newnes Plateau hanging swamps) where they intersect a swamp or its recharge source.
- The previous IESC advice noted that these features should be better represented in the groundwater model (IESC 2014).
- Clearer explanation of the implementation of lineaments in the current groundwater model and in the uncertainty analysis is still needed, especially for the characterisation of the different types of lineaments.
- Swamps located above lineaments should be assessed for both long-term and temporary impacts up to at least 2,250m from the nearest longwall.
- Similarly, risks of these impacts should also be assessed where lineaments (especially Types 1 and 2) that may interact with mining-induced ground movements coincide with aquifers (e.g. the Buralow Formation, McHugh 2014) supplying groundwater to THPSS, including hanging swamps.

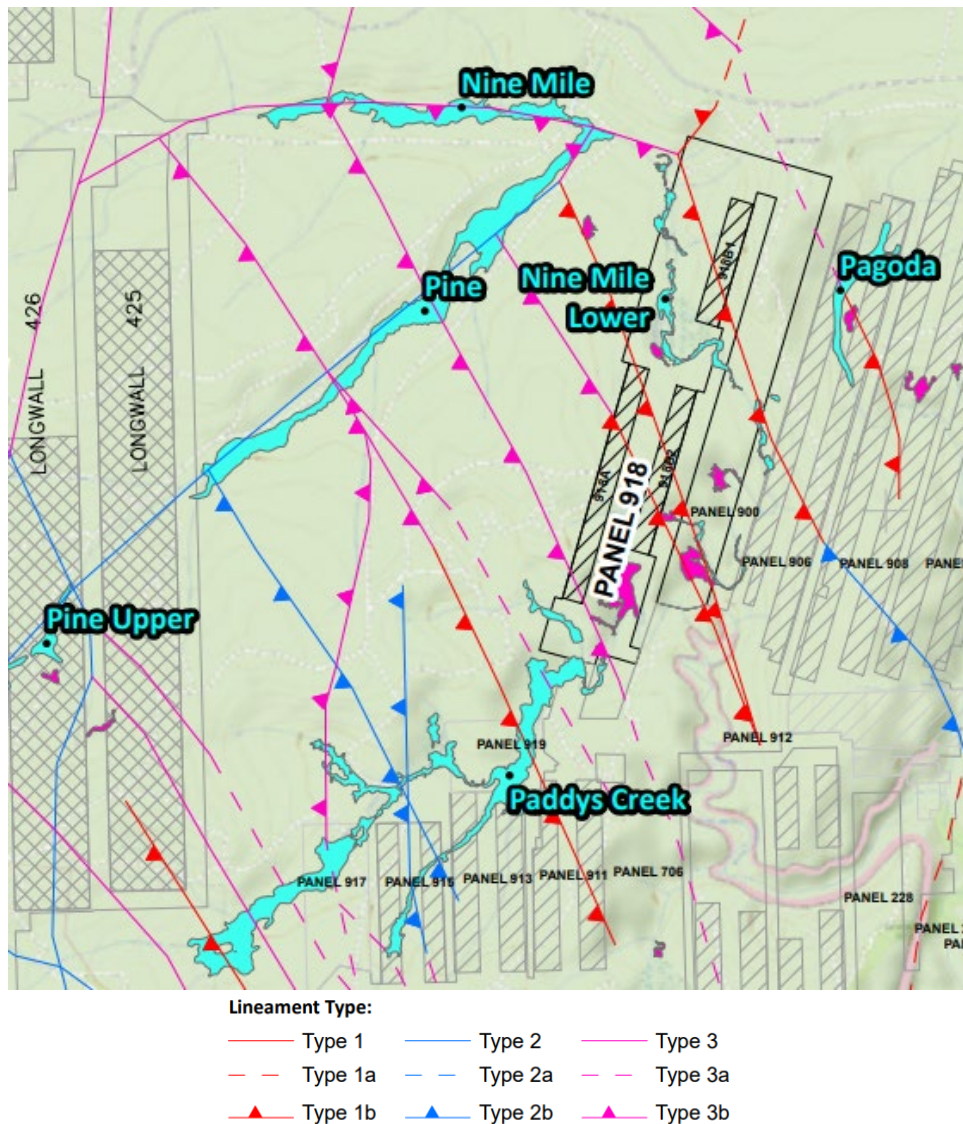
Section 3.2.5 of the original 918 & 920 extraction plan suggested that there were no type 1 lineaments projected or predicted within the proposed 918 and 920 panel workings. The predicted type 2 lineament was expected to be evident as in-seam structure and to penetrate the overlying strata to the surface. The extraction plan concluded that this was expected to affect seam level mining conditions but was not predicted to result in anomalous subsidence effects, due to very small ground movements associated with the proposed mining method.

Figure 13 of SCT (2026) now shows several projected faults transecting the 918 panel. SCT (2026) specifically stated that:

*Two 1-2m faults with major washout are located at the mining horizon and correlate with the location of Pagoda Swamp. It is likely that the faults form the lineament that the surface drainage and Pagoda Samp are located on.*

The JBS&G (2026) report identifies Type 1b lineaments traversing Panels 918A, 918B1 & 918B2 (see Figure 2 ). JBS&G (2026) define Type 1b lineaments as:

*projected faults associated with major washout infill with seam to surface connectivity.*



**Figure 2. Type 1b lineaments traversing Panels 918A, 918B1 & 918B2. Source: JBS&G 2026.**

Major lineaments in the proposed extraction area are also clearly linked/associated with Pine Swamp, the Lower Nine Mile swamps/Bungleboori Creek and the Paddys Creek Swamps/Paddys Creek.

NSW DEECW considers that further investigation and review of subsidence predictions by independent experts is required.

In addition, the extraction plan for 918 should not be approved before the subsidence exceedances identified in SCT (2023) and SCT (2026) have been thoroughly investigated by DPHI and the Expert Advisory Panel for Mining.

### **Recommendations**

- 3.1 Refer the subsidence predictions for the proposed 918 shortwalls, along with more recent records of subsidence exceedances, to the Independent Expert Advisory Panel for Mining for independent assessment.

- 3.2 Revise subsidence assessments for the 918 panels to incorporate the recent subsidence exceedance of 93mm measured on the surface subsidence monitoring line (“D line”) because of the extraction of panels 908, 910 and 906.
- 3.3 Further investigate the more recent subsidence exceedances along D line before any approval of the extraction plan for the 918 panels.

#### 4. Controlled action determination

In our advice of 9 February 2024, NSW DCCEEW recommended that the proposed extraction plan for 918-920 be referred to the Commonwealth DCCEEW to determine whether it is a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This was due to the shortwall mining method being a new mining technique that will potentially impact Matters of National Environmental Significance, including temperate highland swamps on sandstone, Blue Mountains water skink, and the adjoining Greater Blue Mountains World Heritage Area.

Subsequent to this recommendation and Centennial's referral of the 918 & 920 proposal to the Commonwealth, on 30 October 2024 the Department of Climate Change, Energy, the Environment and Water (department), delegate for the Minister for the Environment and Water (Minister), determined the secondary extraction of coal from panels 918 and 920 using panel and partial pillar extraction at the Clarence Colliery, near Lithgow, (EPBC 2024/09856) (proposed action), is a controlled action under the EPBC Act and the controlling provisions were sections:

- a. Listed threatened species and communities (sections 18 and 18A)
- b. A water resource, in relation to unconventional gas development and large coal mining development (sections 24D and 24E).

The relevant impacts of the proposed action were to be assessed by preliminary documentation under Part 8, Division 4 of the EPBC Act.

As part of the reasoning for deciding the controlled action under the EPBC Act, the Commonwealth DCCEEW considered:

*advice from OWS and GA which raised concerns about the conclusions reached in relation to the impacts to water resources and groundwater dependent ecosystems (GDEs), the adequacy of the monitoring design and the adaptive management response proposed to identify and avoid significant impacts to GDEs, including:*

- *cumulative subsidence effects from nearby extraction panels,*
- *groundwater model complexity, adequacy of available data to constrain the model, and difficulty identifying the parameters controlling model responses, and appropriateness of a regional scale model for a swamp-scale assessment,*
- *the tendency of the groundwater model to overpredict groundwater levels at bores associated with shrub swamps,*
- *insufficient testing of geological, hydrogeological and numerical groundwater simulation assumptions in representing the PPPE method in the model,*

- *poor communication of results in terms of choice of metrics, graphs and maps, swamp water requirements and relevant impact thresholds to support the contention of negligible impacts to swamps,*
- *lack of alignment between proposed monitoring subsidence and fracture height sites and areas predicted to have the greatest subsidence,*
- *loose commitments to actions when triggers are exceeded, including the possibility of continuing mining if the 100 mm vertical subsidence limit is exceeded or fracturing extends into the Mount York Claystone.*

And

- *PPPE is referred to as a new mining method, not currently practised in Australia. This means there would not be local monitoring data from other sites to validate the model results and provide confidence that the model is reflecting all the relevant parameters,*
- *the Lithgow Environment Group submission suggests that partial extraction methods may have contributed to significant impacts on swamps in other areas,*
- *previous instances of subsidence underprediction in relation to Centennial Coal projects (e.g. at Airly Mine) and inconsistencies in maximum subsidence reported for the nearby 906/908/910 panels.*

On 14 November 2025 a variation to Clarence Colliery panels 918 and 920 (EPBC Act referral 2024/09856) was accepted by the Commonwealth DCCEEW that was stated to be:

**Varied proposed action**

<b>varied proposal</b>	To undertake secondary extraction of coal from panel 918 using panel and partial pillar extraction at the Clarence Colliery, near Lithgow, NSW (See EPBC Act referral 2024/09856 and request to vary the proposal to take the action dated 20 October 2025).
<b>variation</b>	The varied action differs from the original proposed action by reducing the extent of the extraction, including: <ul style="list-style-type: none"> <li>• removing all second workings associated with panel 920</li> <li>• removing second workings in panel 918 beneath sensitive water-dependent ecosystems and some cliff features</li> <li>• reducing the widths of subpanels 918A and 918B2 from 85 m to 75 m and subpanel 918B1 from 85 m to 83 m.</li> </ul>

It is noted that the wording of the variation relating to removing second workings in panel 918 beneath sensitive water-dependent ecosystems is misleading since second workings in panel 918B2 are still proposed underneath Paddys Creek Hanging Swamp (see Figure 3).

Additionally, Paddys Creek Hanging Swamp has only recently had a piezometer installed (CSP35; data record starts on 28/05/2025) and therefore does not have adequate baseline data to be able to assess mining impacts.

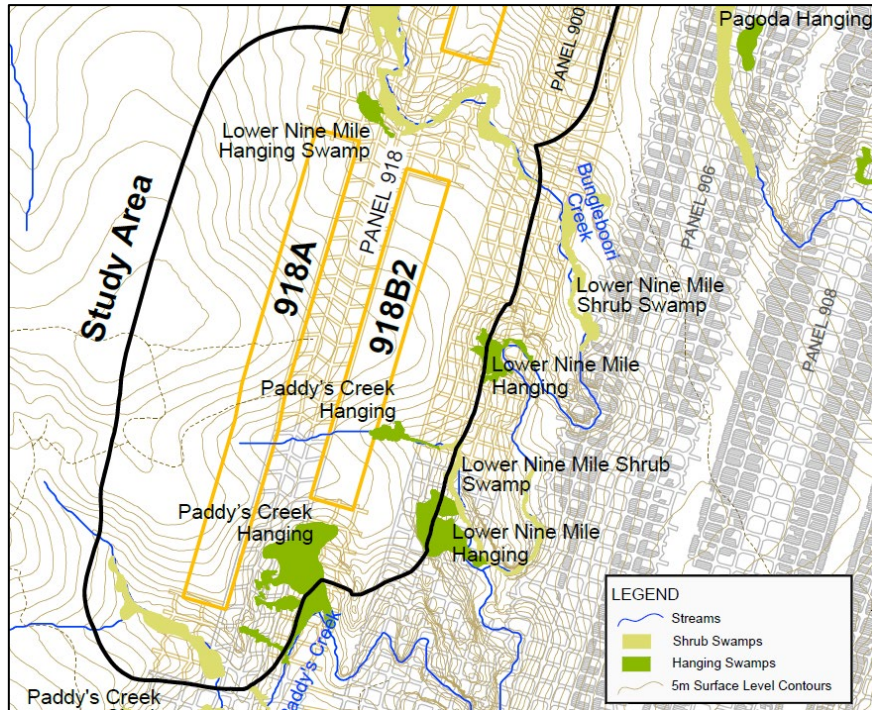


Figure 3. Location of swamps relative to Panels 918B2 and 918A. Source: MSEC (2026).

## Recommendation

- 4.1 Amend the extraction plan area to avoid any secondary extraction under Paddy's Creek Hanging Swamp.

## 5. NSW DCCEEW lacks confidence in groundwater modelling

The extraction plan for Panels 918 & 920 were accompanied by a groundwater model report (JBS&G 2023) which had not been validated. While significant efforts have been made to develop and revise the groundwater model, the calibration of modelled groundwater to real (observed) groundwater levels remains poor, for example:

- The groundwater model does not adequately model the Buralow aquifers that support the Newnes Plateau shrub swamps and hanging swamps. Only dedicated piezometers measuring the Buralow Formation aquifers can do this and Centennial Coal appear to have only two such monitoring bores (CLRP41A & CLRP41R measuring the Buralow Formation at ~55m) in the vicinity of the 918 panels.
- Other relevant bores in the area that should be incorporated into groundwater modelling are:
  - CLRP27R (shallowest bore is Piezo #5 measuring the Banks Wall Sandstone at 90m)
  - CLRP40 (standpipe measuring the Banks Wall Sandstone at 70m)
- There are no piezometers directly monitoring the Buralow aquifers that feed the swamps in the Bungleboori and Paddys Creek catchments<sup>2</sup> (including Paddy's Creek Hanging Swamp).

<sup>2</sup> McHugh (2018) has previously identified the various aquifers that feed into these swamps with seven such identified aquitards in total (YS6, YS5a, YS5, YS4, YS3, YS2 and YS1). It is unclear which, if any, of these

According to the Panel 918 Extraction Plan groundwater model report (JBS&G 2026):

*recalibration of the model for the immediately previous version of the model considered 10,846 parameters and 31,948 observations (JBS&G, 2025ab); and*

*the current version of the model (this report) considered 11,354 parameters and 26,712 observations.*

The latest version of the groundwater model therefore considers 5,236 (or 16%) fewer direct observations but has a 508 (or 5%) increase in the number of modelled parameters. This model has still not been validated and GHD's (2026) peer review identifies several weaknesses with the modelling approach that have not been adequately addressed. In addition, the legend for Figure 4.7 (p131 of JBS&G 2026) suggests that the model assumes either '*non-goafing*' or '*limited goafing*' of Panels 918A, 918B1 & 918B2. This appears inconsistent with the description of the shortwall mining technique where significant goafing could be expected to occur. As noted above, the proposed mining will effectively create an underground void 75m to 83m wide, up to 2.3m in height and extend for distances (lengths) between 0.438km and 0.823km. For no goafing to occur, the strata above the void would have to span this void in perpetuity.

NSW DCCEEW's comments on the previous iteration of the groundwater model (DOC24/357218, Date 9 May 2014) were that:

- Based on JSB&G's Figure 4.28, the model appears to overestimate observed aquifer levels with discrepancies in modelled and observed levels at times being >50m. Since other areas of the extraction plan suggest that the Burrellow Formation is ~50m thick in this area, this could potentially mean that the modelled water level could either be in the Burrellow formation or outside of the Burrellow formation. As such it provides very limited value in assessing the potential (modelled) impact of the proposed mining at Clarence on aquifers within the Burrellow Formation (or elsewhere in the modelling domain).
- There has been no systematic assessment of exactly where the disagreements between modelled and observed aquifer levels occur. The legend for Figure 4.28 simply cites groups of piezometers (Group 1, 2 & 3) but originally did not provide a spatial location to see how many of these are directly related to Clarence workings or whether any may already have been impacted by earlier mining, either at Clarence or elsewhere on the Newnes Plateau.
- Data provided to NPWS (*PiezometerGroupings\_GroundwaterModel.csv*), indicates that approximately 129 piezometers have been "omitted" from JBS&G's groundwater model. No explanation has been provided for excluding these piezometers, even though some (e.g. CLRP33) appear to be relatively close to the proposed extraction of 918 and 920 panels. The selective inclusion and exclusion of piezometers in the groundwater model needs to be investigated and justified prior to any approval being given to narrow longwall panels 918 & 920.
- Many proposed piezometers are yet to be installed, and others have inadequate baseline data to characterise the 'natural' behaviour of the aquifers.

These issues with the modelling were not addressed/discussed in the new Panel 918 Extraction Plan.

Instead, JBS&G (2026) presented a figure (Figure 4.24 p173) on the Steady-State Observed (Weighted) versus Modelled Heads (mAHD) and a figure (Figure 4.25 p174) on the Observed (Weighted) versus Modelled Heads (mAHD). JBS&G (2026) used Figure 4.24 to suggest a good model calibration, however, when this Figure is compared to the previous presentation (JBS&G 2023) of observed versus modelled data, Figure 4.24 (of JBS&G 2026) clearly excludes a very

---

aquifers are monitored by CLRP41A & CLRP41R, which will likely be directly impacted if/when panel 918A is extracted.

large number of relevant head observations. JBS&G (2026) also did not provide a clear explanation of the “weighting” applied to the observed data points that were included.

In contrast, Figure 4.25 (of JBS&G 2026) shows the Observed (Weighted) versus Modelled Heads (mAHD) for a much larger number of observations. Based on JBS&G’s Figure 4.25, the model still underestimates observed aquifer levels with discrepancies in modelled and observed levels at times being >50m (and in some cases approaching 200m). There has still been no systematic assessment or reporting of exactly where the significant disagreements between modelled and observed aquifer levels occur.

JBS&G (2026) also did not identify which piezometers were included/excluded from the most recent version of the model. The selective inclusion and exclusion of piezometers in the groundwater model can affect modelling outcomes and needs to be fully investigated and justified prior to any approval being given to Panels 918A, 918B1 & 918B2.

As a result of these concerns, NSW DCCEEW has low confidence in the groundwater model used to assess the groundwater impacts for the proposed extraction of Panel 918.

In our previous response on the Extraction Plan for Panels 918 & 920 (DOC24/676691 dated 22 August 2024), NSW DEECCW also noted that the obvious declines in aquifer levels at CLRP 18 and 22 occurred during the extraction of panels 908 and 910. In contrast, there was no decline in the CLRP22 aquifer levels (used here as a reference piezometer) which were generally rising at these times. We also noted that:

- The Gospers Mountain fire burnt through the Newnes Plateau in December 2019 and any effects of the fire on aquifer levels should be reflected across all piezometers.
- The effects of cumulative rainfall deficit should also be reflected across all piezometers.

SCT (2026) discussed the behaviour of CLRP22 (but not CLRP18), concluding:

*A multi-piezometer string is installed in Borehole CLRP22 midway along the 910 panel (as shown on Figure 11), the first panel extracted. Figure 22 shows the piezometric profile measured in Borehole CLRP22 over the period of mining these panels. Figure 23 shows the piezometric pressure in Borehole CLRP22 plotted as a function of time.*

*Depressurisation at the top of the Burra Moko Head Sandstone is evident at 105m above the Katoomba seam.*

*A drop in head pressure in the upper Burra Moko Head Sandstone is observed in April 2020 when 910 Panel extraction was mid-panel and just before commencement of mining in 908 panel.*

*There is further reduction in pressure in the upper Burra Moko Head Sandstone as 908 Panel mines up to the piezometer.*

It is important to note that under the DA 504-000 Approval Water Resources Impact Assessment Criteria 5.

*The Applicant must ensure that the development does not result in any:*

*(a) significant inflows to mine workings;*

*(b) reduction in pumping yield in privately-owned groundwater bores;*

*(c) reduction in surface flows and groundwater baseflow to upland swamps (Newnes Plateau Shrub Swamps) and wetlands; and*

*(d) reduction in surface flows and groundwater baseflow to waterbodies including Marrangaroo Creek, Farmers Creek, Dargans Creek, Wolgan River, Dumbano Creek, Bungleboori Creek, and Wollangambe River (excluding reduction in flows associated with the proposed water transfer scheme), to the satisfaction of the Planning Secretary.*

In a recent review of mining impacts on Marrangaroo Creek Swamp (Krogh 2026) it was noted that:

*In many areas above previous Springvale Mine longwalls it is not only the lower aquifers in the Permian and Triassic strata that are being impacted, but also the upper Triassic strata of the Banks Wall Sandstone and Buralow Formation. These upper strata are often hydrologically connected to the endangered Newnes Plateau shrub and hanging swamp communities (e.g. see McHugh 2014, 2018; Krogh et al. 2022) and are also important in providing baseflow to the streams of the area. More recently, significant declines in aquifer levels have occurred for a large number of piezometers monitoring the Banks Wall Sandstone and Buralow Formation, especially those located directly above or within 600m of the longwalls (e.g. SPR1808, SPR1301, SPR1211, WB12101 and WB32101, PHS, SPR38, SPR37 and SPR64).*

Advice should be sought from the Independent Expert Advisory Panel for Mining regarding the observed aquifer impacts from earlier Clarence mining and the potential impacts of the proposed extraction of 918 shortwall panels on swamps, wetlands, aquifers and water resources.

## **Recommendation**

- 5.1 Seek advice from the Independent Expert Advisory Panel for Mining regarding the potential impacts of the proposed extraction on water resources, especially in relation to concerns of inadequate monitoring and subjective monitoring interpretations.

## **6. Current monitoring for the 918 panel area is inadequate**

Current monitoring for the 918 panel area is unlikely to set an adequate baseline to enable monitoring against the consent conditions for DA 504-000. NSW DCCEEW notes that:

- The MCW Environmental (2021) independent audit of Clarence Colliery concluded that impact criteria for surface flows and groundwater baseflow to waterbodies including Marrangaroo Creek, Farmers Creek, Dargans Creek, Wolgan River, Dumbano Creek, Bungleboori Creek, and Wollangambe River have not been quantified.
- Centennial Coal has extremely limited groundwater monitoring of the Buralow aquifers in the vicinity of the 918 panels to enable assessment of impacts to the Buralow aquifers, especially those that feed the swamps.
- Several piezometers near the 918 panels are compromised (i.e. no longer functional or yielding unreliable data).
- Adequate baseline information for important surface assets is either absent or lacking in temporal frequency and extent.
- There is no identified or ongoing monitoring of Blue Mountains water skink or giant dragonfly populations in the hanging swamp above the 918B2 shortwall panel, to enable assessment of potential impacts (if any) to these species.

## **Recommendations**

6.1 Implement the recommendations of the Independent Auditor (MCW Environmental 2021)

6.2 Provide:

- a. the baseline period/dates for all swamp or stream monitoring sites or aquifer monitoring bores affected/potentially affected by mining 918
- b. all reference swamp(s), stream(s) or bore(s) proposed for comparison of stream flows or aquifer levels after mining of 918 occurs, and
- c. a before-after control-impact (BACI) assessment of past impacts, and a BACI design to enable objective assessment of impact to swamps, streams and bores above shortwalls 918.

## **7. The fauna monitoring program requires revision**

Section 5.3.1 of the Clarence Colliery 918 Panel Biodiversity Management Plan states that more direct methods, including aural-visual herpetofauna searches and trapping for Blue Mountain water skink will only be used if an exceedance triggers 'condition RED' in the trigger, action, response plan (TARP).

Section 13.3 of Appendix A details ongoing annual monitoring for Clarence. Methods used to monitor fauna are outlined in Apx Table 16. It is not clear whether there is an intent to continue this annual monitoring.

Monitoring of fauna should primarily use the methods listed in Apx Table 16. This should be used as standard, not just if there is a 'condition RED' exceedance in the trigger, action, response plan.

### **Recommendation**

7.1 Apply the monitoring methods listed in Apx Table 16 of the Biodiversity Management Plan as the primary monitoring program for the project, not just if there is a 'condition RED'.

## **8. eDNA monitoring cannot replace other fauna survey methods**

The Biodiversity Management Plan indicates an intent to rely primarily on eDNA monitoring for fauna species such as Blue Mountains water skink and giant dragonfly.

Development consent DA 504-00 requires the biodiversity management plan to provide for adaptive management of mining with a focus on threatened species, populations and their habitats. eDNA monitoring will not provide the population data needed to satisfy this condition.

While eDNA may be useful for determining presence and absence of species, it cannot be used to monitor population changes. eDNA monitoring will not be adequate to determine whether biodiversity triggers have been exceeded.

eDNA can supplement more 'traditional' monitoring but cannot replace it.

### **Recommendations**

8.1 Only use eDNA monitoring to supplement the other fauna survey methods listed in Apx Table 16 of the Biodiversity Management Plan.

## 9. Additional biodiversity monitoring sites are needed

Figure 6 of the Biodiversity Management Plan indicates that there are few proposed biodiversity monitoring sites located in Newnes Plateau shrub and hanging swamps.

There is only one biodiversity monitoring site in Lower Nine Mile shrub swamp, and one Blue Mountains water skink site in Paddy's Creek shrub swamp. There are 4 proposed eDNA sites located across Paddy's Creek and Lower Nine Mile shrub swamps, and in one hanging swamp.

Reference / control sites are mentioned in section 5 of the Biodiversity Management Plan but not identified.

DCCEEW considers the proposed sites will not provide adequate data for monitoring threatened species populations.

### Recommendations

- 9.1 Add more biodiversity monitoring sites in Newnes Plateau shrub and hanging swamps
- 9.2 Apply the monitoring techniques listed in Table 16 to biodiversity monitoring sites
- 9.3 include the locations, methods used, and monitoring history of all reference / control sites in the Biodiversity Management Plan.

## 10. Include measurable, quantifiable triggers in the biodiversity TARP

The biodiversity trigger, action, response plan (TARP) lacks measurable and quantifiable triggers, instead relying on groundwater and surface water triggers.

Monitoring of sensitive biodiversity features, particularly those associated with temperate highland swamps on sandstone, also requires specific biodiversity triggers.

At present, the biodiversity TARP only includes one measurable trigger,

*Red Level Trigger for threatened biodiversity if a statistical change ( $p < 0.05$ ) is identified by biodiversity monitoring that is greater than negligible and the change is found to be caused by subsidence.*

There is no detail regarding what methods will be used to compare baseline datasets to monitoring datasets. Appendix 3, Section 13.3.1.2 of the Biodiversity Management Plan states that ongoing annual fauna monitoring is used to estimate species diversity and calculate yearly comparisons 'where possible'. Annual monitoring should directly inform the TARP. Clear triggers and actions need to be based on actual flora and fauna monitoring.

This should include clear performance indicators and impact thresholds that can be determined through analysis of quantitative data collected as part of the monitoring program. Additional high-level information should be provided explaining how each method will be used to monitor specific performance indicators.

### Recommendations

- 10.1 Provide detail of intended methods to compare baseline datasets to monitoring datasets.
- 10.2 Include biodiversity performance measures, triggers, and actions in the TARP that directly relate to biodiversity monitoring.

## References

Centennial Coal (2016). *Springvale Mine Extraction Plan Longwall 419 – Preamble*. July 2016.

Centennial Coal (2019) *Angus Place Mine Extension Project Amendment Report*. 6 December 2019.

DPIE (2021). Clarence Colliery Modification 7 - Addition of Extraction Plan condition. State Significant Development Modification Assessment (DA504-00 MOD 7). NSW Department of Planning, Industry and Environment. October 2021.

GHD (2026). Independent peer review of the Clarence Colliery 918 Panel Numerical Groundwater Model. Letter to Centennial Coal 20 February 2026.

IESC (2020). Advice to decision maker on coal mining project IESC 2020-113: Angus Place Mine Extension Project (EPBC 2013/6889 and SSD 5602) – Expansion.

<https://iesc.environment.gov.au/system/files/iesc-advice-angus-place-2020-113.pdf>

IESC (2023) *Information Guidelines Explanatory Note: Subsidence associated with underground coal mining*. Commonwealth of Australia, 2023.

JBS&G (2023) *Clarence Colliery Pty Ltd 918-920 Extraction Plan Groundwater Model Report 15 November 2023* JBS&G61645-149994/R01Rev0

JBS&G (2026) Extraction Plan for 918 Panel: Groundwater Assessment Report JBS&G 68229 | 171726 (R01Rev0) 13 February 2026

Krogh, M. (2026). *An Assessment of the Hydrological Status of Marrangaroo Creek Swamp and Nearby Hanging Swamps, Gardens of Stone State Conservation Area, Newnes Plateau NSW*. Report to NSW National Parks and Wildlife Service, February 2026. pp. 1-76. Environmental Data Analysis Pty Ltd

McHugh, E.A. 2018. The Geology of the Hanging Swamps within Angus Place and Springvale Collieries Preliminary Report. E.A. McHugh Geological and Petrographic Services June, 2018.

MCW Environmental (2021). *Independent Environmental Audit 2020 Clarence Colliery*. January 2021

MSEC (2013). West Cliff Colliery – Longwalls 37 and 38 Subsidence Predictions and Impact Assessments for the Natural Features and Surface Infrastructure in Support of the Extraction Plan MSEC JUNE 2013 | REPORT NUMBER: MSEC533 | REVISION B

MSEC (2019). Centennial Coal: Angus Place Colliery – LW1001 to LW1015. Subsidence Predictions and Impact Assessments for the Natural and Built Features due to the Mining of the Proposed LW1001 to LW1015 in Support of the Amended Project. Report Number MSEC1046 Revision A

MSEC (2026). Centennial Coal: Clarence Colliery – 918 Panel Subsidence Predictions and Impact Assessment Report. February 2026 Report Number: MSEC1493 Revision B.

SCT (2023). *High level review of likely subsidence and groundwater impacts from mining 918-920 panels, Clarence Colliery*. SCT Operations Pty Ltd ref CLR5492C

SCT (2026) Geotechnical, subsidence and caving assessment for 918 Panel. CLR5894 19 February 2026.

Zhang, C. (2023). Numerical modelling assessment of mine subsidence related to shortwall extractions. University of New South Wales (UNSW). Report No. 2023CL01. July 2023.

Our ref: OUT26/3628

Chris Armit  
Centennial Coal

Email: [christopher.m.armit@centennialcoal.com.au](mailto:christopher.m.armit@centennialcoal.com.au)

26 March 2026

---

Subject: Clarence Coal (DA504-00) 918 Panel Extraction Plan and associated documents

Dear Chris Armit

I refer to your request for advice sent on 26 February 2026 to the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) Water Group about the above matter.

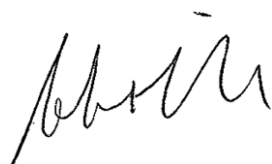
The NSW DCCEEW Water Group has reviewed the documentation submitted for the 918 Panel and makes recommendations to:

- Confirm the availability of water entitlement to account for water take where Water Access Licences are linked to additional mines.
- Confirm if water take is to occur from the Lachlan Fold Belt Metropolitan Groundwater Source.
- Implement standard 6 monthly monitoring of watercourse stability.
- Include details of remedial and preventative actions in the Trigger Action Response Plan.

Please see Attachment A for more detail.

Should you have any further queries in relation to this submission please do not hesitate to contact DCCEEW Water Assessments [water.assessments@dcceew.nsw.gov.au](mailto:water.assessments@dcceew.nsw.gov.au).

Yours sincerely



Rob Brownbill  
Manager, Water Assessments, Planning and Knowledge Division  
Department of Climate Change, Energy, the Environment and Water

## Attachment A

### Detailed advice regarding the request for comment on the Clarence Colliery 918 Panel Extraction Plan and associated documents

---

#### 1.0 Water take and licensing

---

##### 1.1 Recommendation prior to approval

That the proponent confirms the availability of water entitlement to account for water take where Water Access Licences are also linked to other mines.

##### Explanation

The extraction plan refers to two WALs to be used to account for take by the project, WAL 41882 with 1,095 shares and WAL 36479 with 6,623 shares. A review of Departmental records indicate that WAL 36479 which holds the majority of entitlement required by the project is shared with Springvale Coal Mine, as two of the three nominated extraction points for this WAL are owned by Springvale. Further information is requested to confirm the entitlement required by Springvale under this WAL to understand the available entitlement to account for the maximum take of this project. The proponent must demonstrate they have sufficient entitlement to account for maximum project take.

##### 1.2 Recommendation prior to approval

That the proponent:

- Confirms if water take is required from the Lachlan Fold Belt Metropolitan Groundwater Source (LFBMG).
- Quantify maximum annual water take where the take is required from the LFBMG and demonstrate the ability to hold sufficient entitlement.

##### Explanation

The Groundwater Assessment (Appendix 6) provides details such as shares in the source and trading in the Lachlan Fold Belt Metropolitan Groundwater Source. However, there is no reference to water take from this water source. Confirmation is required if water take is to occur from this water source or why this information is relevant to the project.

#### 2.0 Impact monitoring and management

---

##### 2.1 Recommendation prior to approval

That the proponent updates the Trigger Action Response Plan (TARP) to:

- Include standard 6 monthly monitoring for watercourse stability for three years post extraction.
  - Include details of viable preventative and remedial/corrective actions and their implementation, documentation and reporting requirements.
-

## Explanation

The Trigger Action Response Plan's format is supported, however when triggers are reached there is limited detail regarding remediation requirements. In addition, the justification for the monitoring program design and associated TARPs should outline the objectives, timing frequency, and duration of all monitoring activities. This should describe how response triggers will be implemented, documented, and reported.

A standard 6 monthly monitoring of watercourse stability for three years post extraction is to provide better opportunity to detect gradual changes before they progress rather than the proposed annual monitoring. Any remedial measures for stream rehabilitation works should be consistent with the Rehabilitation Manual for Australian Streams (Rutherford et al., 2000).

End Attachment A

---

# **Appendix B**

**Consultation outcomes**

**NSW DCCEEW Water Group (dated 26 March 2026)**

Regulator comment	Regulator explanation	Response														
<p>Confirm the availability of water entitlement to account for water take where Water Access Licences are linked to additional mines.</p>	<p>The extraction plan refers to two WALs to be used to account for take by the project, WAL 41882 with 1,095 shares and WAL 36479 with 6,623 shares. A review of Departmental records indicate that WAL 36479 which holds the majority of entitlement required by the project is shared with Springvale Coal Mine, as two of the three nominated extraction points for this WAL are owned by Springvale. Further information is requested to confirm the entitlement required by Springvale under this WAL to understand the available entitlement to account for the maximum take of this project. The proponent must demonstrate they have sufficient entitlement to account for maximum project take.</p>	<p>Centennial has the following WALs in the Sydney Basin West Groundwater Source listed below:</p> <table border="1" data-bbox="1240 360 2018 568"> <thead> <tr> <th data-bbox="1240 360 1451 403">Site</th> <th data-bbox="1451 360 2018 403">WAL (Centennial Coal (2026))</th> </tr> </thead> <tbody> <tr> <td data-bbox="1240 403 1451 446">Clarence Colliery</td> <td data-bbox="1451 403 2018 446">WAL36479, WAL41882</td> </tr> <tr> <td data-bbox="1240 446 1451 489">Springvale Mine</td> <td data-bbox="1451 446 2018 489">WAL36383, WAL36449, WAL36446, WAL36443</td> </tr> <tr> <td data-bbox="1240 489 1451 568">Angus Place</td> <td data-bbox="1451 489 2018 568">WAL41881, WAL36445, WAL37340, WAL36449, WAL37343</td> </tr> </tbody> </table> <p>With the groundwater licences and take summarised from the Clarence Colliery 2025 Annual Review (Centennial Coal, 2026) below:</p> <table border="1" data-bbox="1240 639 2078 892"> <thead> <tr> <th data-bbox="1240 639 1509 711">Groundwater Source</th> <th data-bbox="1509 639 1794 711">Total WAL volume</th> <th data-bbox="1794 639 2078 711">2024/25 Water Take (ML/annum)</th> </tr> </thead> <tbody> <tr> <td data-bbox="1240 711 1509 892">Sydney Basin West Groundwater Source - Angus Place - Springvale - Clarence</td> <td data-bbox="1509 711 1794 892">24,629 ML/annum</td> <td data-bbox="1794 711 2078 892">21,104.3 ML/annum (-3524.7 ML)</td> </tr> </tbody> </table> <p>The modelled increase from JBS&amp;G (2026) predictions is 0.9 ML/day (328.5 ML/annum). Comparing to the available WALs in the table above, Centennial has sufficient entitlements.</p>	Site	WAL (Centennial Coal (2026))	Clarence Colliery	WAL36479, WAL41882	Springvale Mine	WAL36383, WAL36449, WAL36446, WAL36443	Angus Place	WAL41881, WAL36445, WAL37340, WAL36449, WAL37343	Groundwater Source	Total WAL volume	2024/25 Water Take (ML/annum)	Sydney Basin West Groundwater Source - Angus Place - Springvale - Clarence	24,629 ML/annum	21,104.3 ML/annum (-3524.7 ML)
Site	WAL (Centennial Coal (2026))															
Clarence Colliery	WAL36479, WAL41882															
Springvale Mine	WAL36383, WAL36449, WAL36446, WAL36443															
Angus Place	WAL41881, WAL36445, WAL37340, WAL36449, WAL37343															
Groundwater Source	Total WAL volume	2024/25 Water Take (ML/annum)														
Sydney Basin West Groundwater Source - Angus Place - Springvale - Clarence	24,629 ML/annum	21,104.3 ML/annum (-3524.7 ML)														
<p>That the proponent:</p> <ul style="list-style-type: none"> <li>- Confirms if water take is required from the Lachlan Fold Belt Metropolitan Groundwater Source (LFBMG).</li> <li>- Quantify maximum annual water take where the take is required from the LFBMG and demonstrate the ability to hold sufficient entitlement.</li> </ul>	<p>The Groundwater Assessment (Appendix 6) provides details such as shares in the source and trading in the Lachlan Fold Belt Metropolitan Groundwater Source. However, there is no reference to water take from this water source. Confirmation is required if water take is to occur from this water source or why this information is relevant to the project.</p>	<p>There is no water take predicted from the Lachlan Fold Belt Metropolitan Groundwater Resource or additional WAL required. Refer to the Groundwater Assessment (Appendix 6).</p>														

Regulator comment	Regulator explanation	Response
<p>That the proponent updates the Trigger Action Response Plan (TARP) to:</p> <ul style="list-style-type: none"> <li>– Include standard 6 monthly monitoring for watercourse stability for three years post extraction.</li> <li>– Include details of viable preventative and remedial/corrective actions and their implementation, documentation and reporting requirements.</li> </ul>	<p>The Trigger Action Response Plan's format is supported, however when triggers are reached there is limited detail regarding remediation requirements. In addition, the justification for the monitoring program design and associated TARPs should outline the objectives, timing frequency, and duration of all monitoring activities. This should describe how response triggers will be implemented, documented, and reported.</p> <p>A standard 6 monthly monitoring of watercourse stability for three years post extraction is to provide better opportunity to detect gradual changes before they progress rather than the proposed annual monitoring. Any remedial measures for stream rehabilitation works should be consistent with the Rehabilitation Manual for Australian Streams (Rutherford et al., 2000).</p>	<p>Section 2.1.4 has been updated to specify six monthly watercourse stability monitoring for the three years post second workings extraction.</p> <p>The TARP (Appendix E) has been updated to include objectives, timing frequency, and duration of watercourse stability monitoring.</p> <p>TARP updated to include relevant details of Rehabilitation Manual for Australian Streams (Rutherford et al., 2000).</p>

#### NSW DCCEEW – CPHR and NPWS (dated 17 April 2026)

Regulator comment	Response
Provide evidence of an extraction plan being the appropriate approval pathway for this mine layout that includes a change in mining method.	Not specifically applicable to the 918 WMP. See 918 Panel Extraction Plan main document for response.
Amend the extraction plan area to avoid secondary extraction using the shortwall technique under: <ul style="list-style-type: none"> <li>– Paddy's Creek Hanging Swamp;</li> <li>– Identified major lineaments; and</li> <li>– other highly sensitive environments on Gardens of Stone State Conservation Area</li> </ul>	Not specifically applicable to the 918 WMP. See 918 Panel Extraction Plan main document for response.
Refer the subsidence predictions for the proposed 918 shortwalls, along with more recent records of subsidence exceedances, to the Independent Expert Advisory Panel for Mining for independent assessment.	Not specifically applicable to the 918 WMP. See 918 Panel Extraction Plan main document for response.
Revise subsidence assessments for the 918 panels to incorporate the recent subsidence exceedance of 93 mm measured on the surface subsidence monitoring line ("D line") because of the extraction of panels 908, 910 and 906.	Not specifically applicable to the 918 WMP. See 918 Panel Extraction Plan main document for response.
Further investigate the more recent subsidence exceedances along D line before any approval of the extraction plan for the 918 panels.	Not specifically applicable to the 918 WMP. See 918 Panel Extraction Plan main document for response.
Amend the extraction plan area to avoid any secondary extraction under Paddy's Creek Hanging Swamp.	Not specifically applicable to the 918 WMP. See 918 Panel Extraction Plan main document for response.

Regulator comment	Response
<p>Seek advice from the Independent Expert Advisory Panel for Mining regarding the potential impacts of the proposed extraction on water resources, especially in relation to concerns of inadequate monitoring and subjective monitoring interpretations</p>	<p>Since the submission of the 918 and 920 Panel Extraction Plan in April 2024 and its subsequent Extraction Plan withdrawal and mine design changes the IEAPM has been provided with the SCT geotechnical report, existing and proposed surface and groundwater monitoring and have reviewed the SCT and MSEC subsidence predictions reports culminating in the provision of the December 2025 IEAPM recommendation report to DPHI.</p> <p>See 918 WMP (GHD, 2026) on Burralow Formation groundwater monitoring. Consultation was undertaken with the IEAPM groundwater expert between June 2025 and November 2025 on this issue. On 11 November 2025 the IEAPM provided the below email confirmation on this matter</p> <p>“We have reviewed the latest GW monitoring locations against the available access trails and agree that no more useful locations can conveniently be installed without substantial landscape impacts.”</p> <p>Further opportunity for IEAPM assessment on Water Resources is possible after the submission of the final Extraction Plan to the DPHI.</p>
<p>Implement the recommendations of the Independent Auditor (MCW Environmental 2021)</p>	<p>This recommendation has been addressed through the implementation of actions arising from MCW 2020 Independent Environmental Audit (IEA) and Centennial’s 2021 Action Plan. Actions relevant to this recommendation have been completed and integrated into existing environmental management processes.</p>
<p>Provide:</p> <p>a. the baseline period/dates for all swamp or stream monitoring sites or aquifer monitoring bores affected/potentially affected by mining 918</p> <p>b. all reference swamp(s), stream(s) or bore(s) proposed for comparison of stream flows or aquifer levels after mining of 918 occurs, and</p> <p>c. a before-after control-impact (BACI) assessment of past impacts, and a BACI design to enable objective assessment of impact to swamps, streams and bores above shortwalls 918.</p>	<p>a. On 8 October 2025 NSW DCCEEW and subsequently NPWS requested spatial and environmental monitoring data with the submission of 918 Panel Extraction Plan, and this data has been provided as part of the 918 Extraction Plan 26 February 2026 submission.</p> <p>Baseline period tables for swamp, stream and bore monitoring outlined in Table 3.1 (swamp/stream water quality), Table 3.2 (swamp/stream flow) and Table 2.4 (groundwater).</p> <p>b. Refer to Table 2.1 (streams), Table 2.2 (swamps), Table 2.4 (groundwater) and 918 BMP (RPS, 2026).</p> <p>c. Reporting and assessment of impacts to be contained within the Clarence Colliery Annual Reviews and 4 monthly Subsidence Management Status Reports.</p> <p>See 918 BMP (RPS, 2026) on BACI design.</p>
<p>Apply the monitoring methods listed in Apx Table 16 of the Biodiversity Management Plan as the primary monitoring program for the project, not just if there is a ‘condition RED’.</p>	<p>Not specifically applicable to the 918 WMP. See 918 BMP and 918 Panel Extraction Plan main document for response.</p>
<p>Only use eDNA monitoring to supplement the other fauna survey methods listed in Apx Table 16 of the Biodiversity Management Plan.</p>	<p>Not specifically applicable to the 918 WMP. See 918 BMP and 918 Panel Extraction Plan main document for response.</p>

Regulator comment	Response
<p>Add more biodiversity monitoring sites in Newnes Plateau shrub and hanging swamps</p> <p>9.2 Apply the monitoring techniques listed in Table 16 to biodiversity monitoring sites</p> <p>9.3 include the locations, methods used, and monitoring history of all reference / control sites in the Biodiversity Management Plan.</p>	<p>Not specifically applicable to the 918 WMP. See 918 BMP and 918 Panel Extraction Plan main document for response.</p>
<p>Provide detail of intended methods to compare baseline datasets to monitoring datasets.</p> <p>10.2 Include biodiversity performance measures, triggers, and actions in the TARP that directly relate to biodiversity monitoring</p>	<p>Not specifically applicable to the 918 WMP. See 918 BMP and 918 Panel Extraction Plan main document for response.</p>

### WaterNSW (dated 20 March 2026)

Regulator comment	Response
<p>Large sections of Clarence's consent area and mining leases fall within the SDWC; the expansion of higher subsidence risk extraction methods, like Shortwall mining, presents an increased risk to Sydney's drinking water supply.</p>	<p>As per Figure 3.4, the proposed workings for the 918 Extraction Plan, including Partial Panel and Pillar (using shortwall), are not located within the SDWC.</p> <p>There is no future Panel and Pillar Partial Extraction (using shortwall) proposed within the SDWC within the Clarence Colliery DA504-00 consent area.</p>
<p>Clarification on how the proposed mining approach aligns with the existing approvals under DA 504-00, rather than requiring a Consent Modification prior to assessment and approval.</p>	<p>DA504-00 defines second workings as "Extraction of coal by partial extraction methods".</p> <p>The proposed second workings mining method, Panel and Pillar Partial Extraction (using Shortwall), is a partial extraction method of extracting coal.</p> <p>DA504-00 allows for the approval of second workings via the Extraction Plan process. The withdrawn 918 and 920 Panels Extraction Plan and this draft 918 Panel Extraction Plan (918 EP) has been developed using the DPE (2022) guidelines and have been submitted to DPHI for assessment and determination, in consultation with other regulatory bodies, IEAPM and stakeholders.</p>

# **Appendix C**

## **Baseline Data**

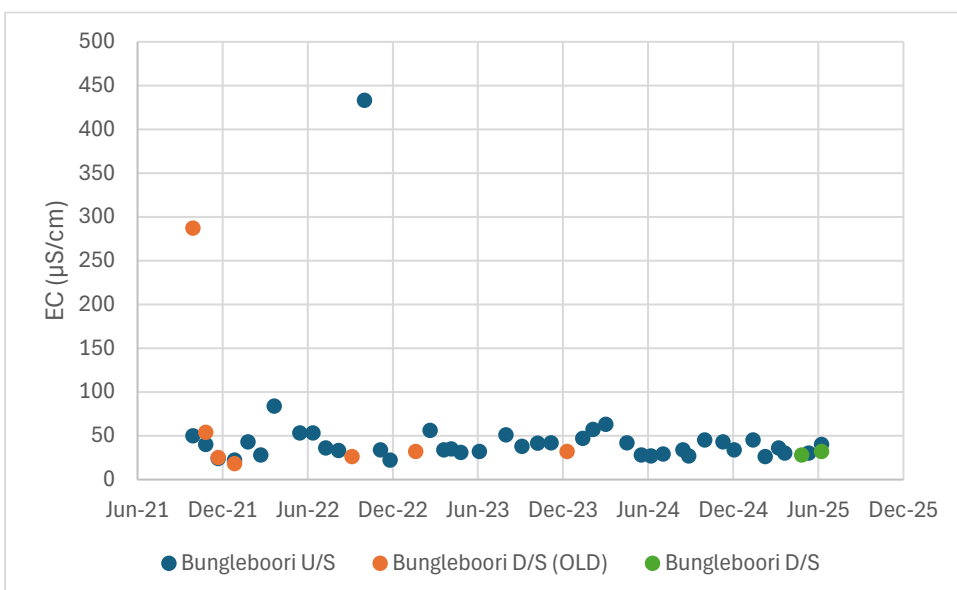
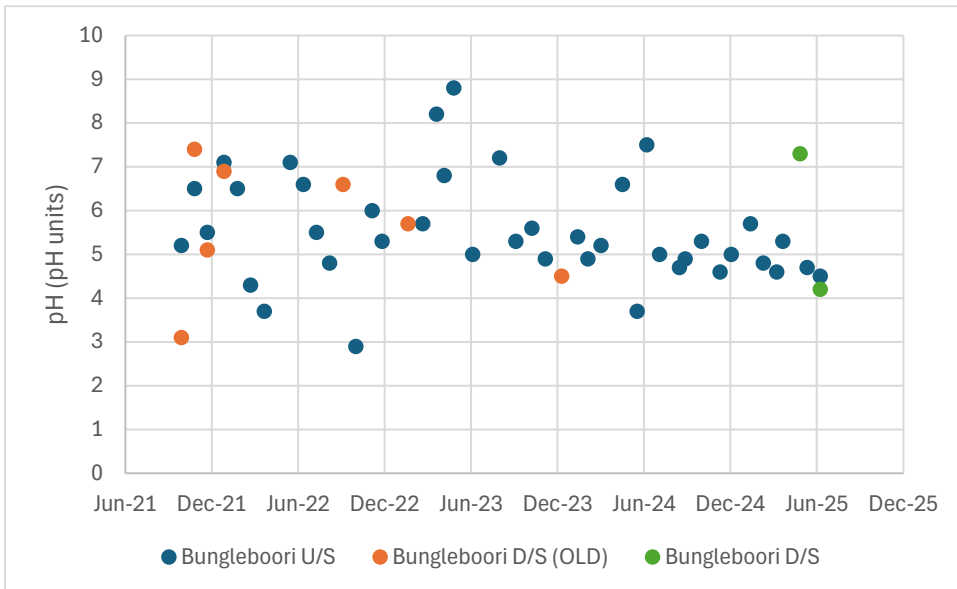
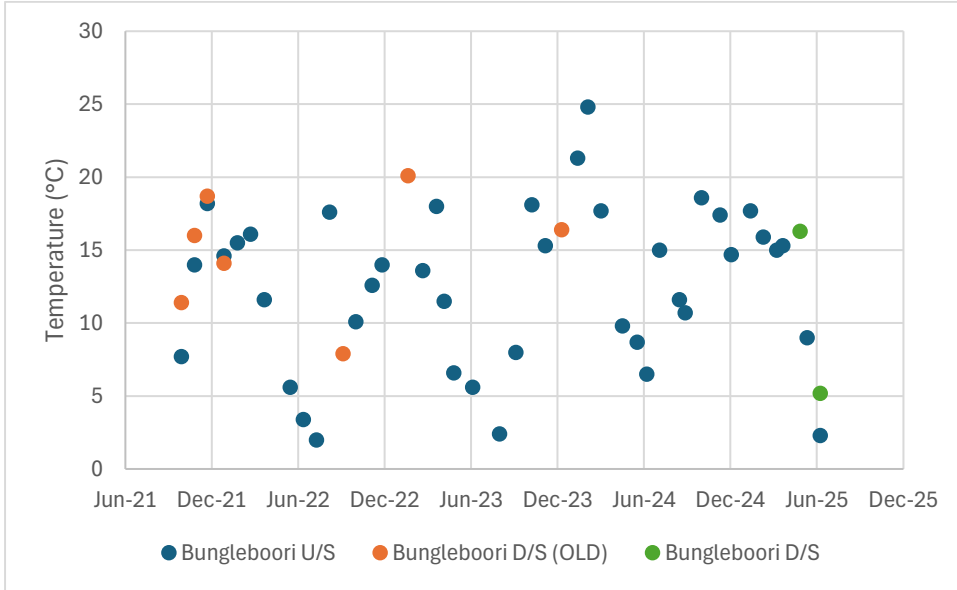
## C-1 Surface water

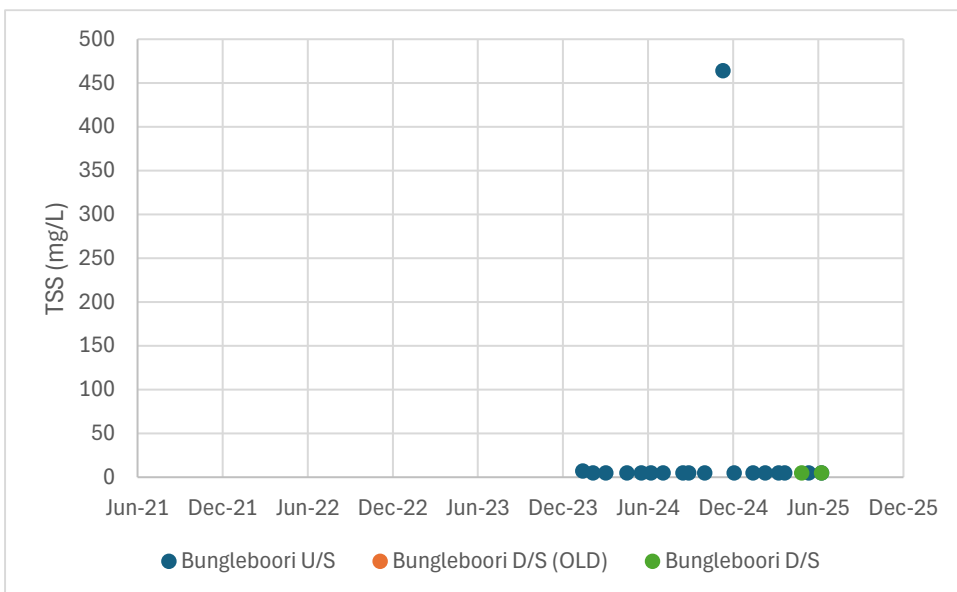
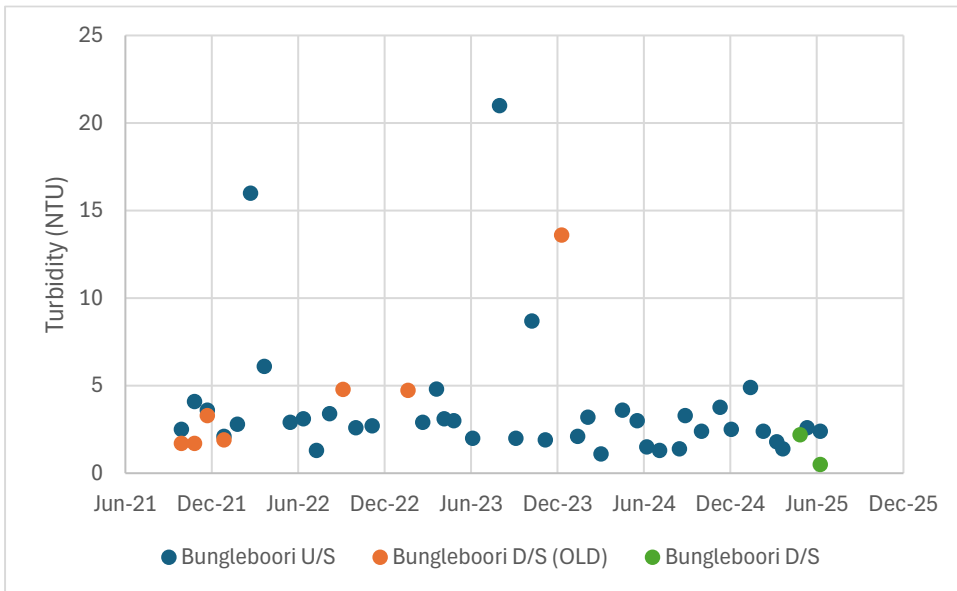
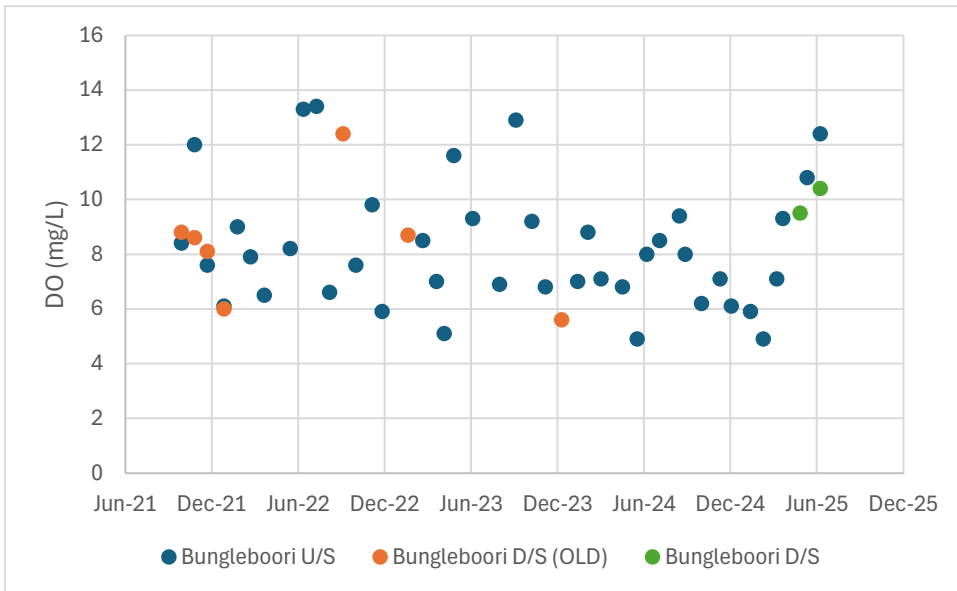
### C-1-1 Bungleboori Creek – water quality and flow

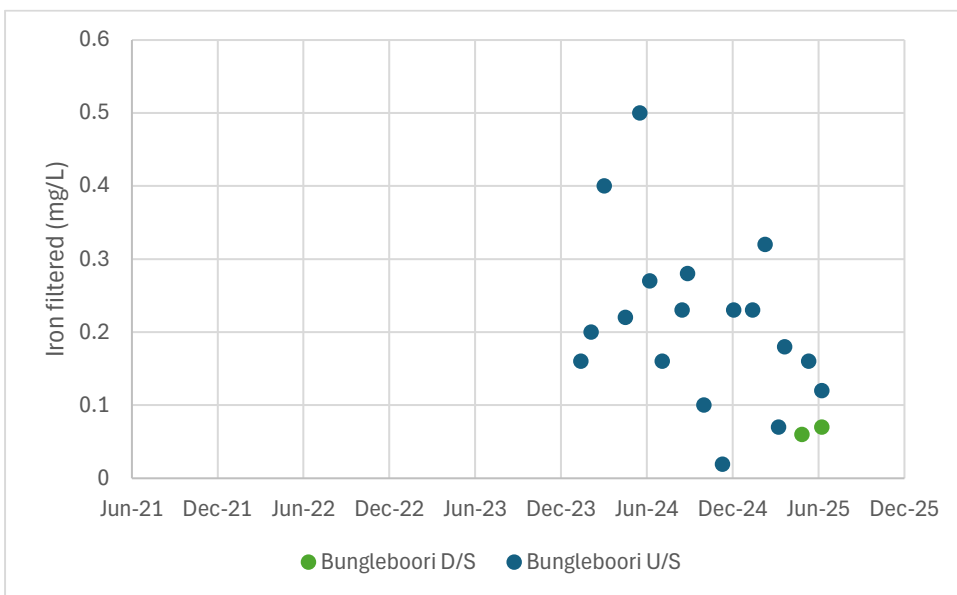
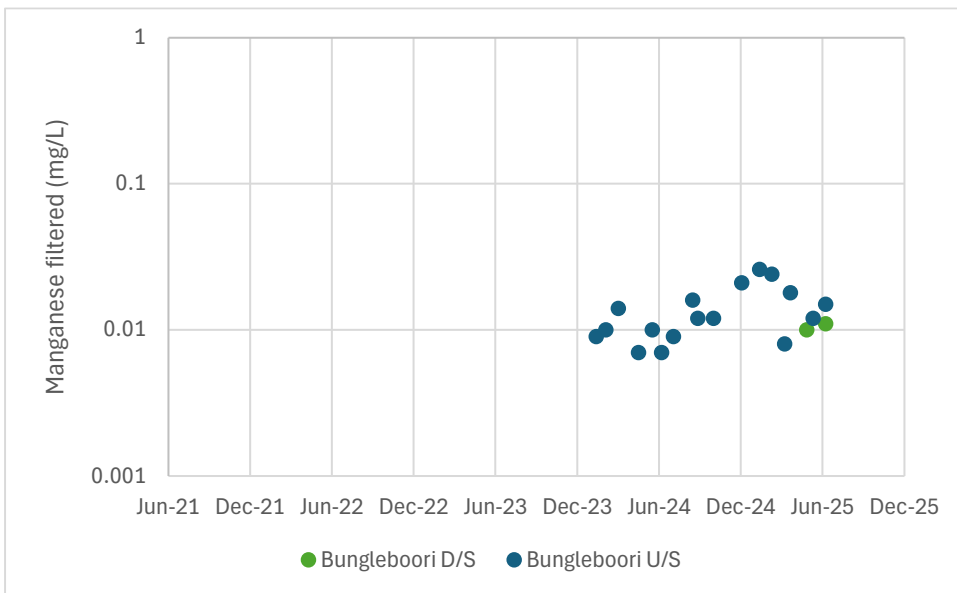
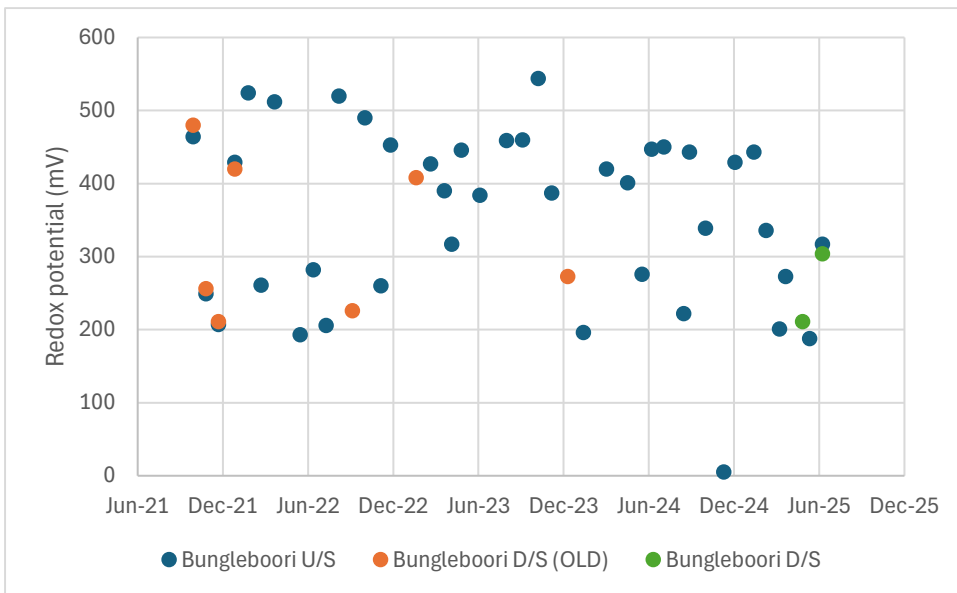
Bungleboori Creek – statistical summary of water quality and flow results

Parameter	Units	Bungleboori Creek U/S		Bungleboori Creek D/S		Bungleboori Creek D/S (OLD)	
		Count	Mean	Count	Mean	Count	Mean
Temperature	°C	41	12.5	2	10.8	7	14.9
pH	pH units	41	5.5	2	5.8	7	5.6
EC	uS/cm	41	49	2	30.0	7	67.7
DO	mg/L	41	8.2	2	10.0	7	8.3
Turbidity	NTU	40	3.7	2	1.4	7	4.5
TSS	mg/L	18	31	2	<5	0	-
TDS	mg/L	0	-	0	-	0	-
Redox potential	mV	40	356	2	258	7	325
Flow rate total	kL/day	22	2287	2	4609	7	5640
Filtered manganese	mg/L	17	0.014	2	0.011	0	-
Total manganese	mg/L	18	0.214	2	0.065	0	-
Filtered iron	mg/L	18	0.022	2	0.011	0	-
Total iron	mg/L	18	0.466	2	0.280	0	-

### Bungleboori Creek quality









Monitoring events	Units	Bungleboori (D/S)	Bungleboori (U/S)
11/11/2022	kL/day	-	941
2/12/2022	kL/day	-	4061
27/01/2023	kL/day	1467	-
27/02/2023	kL/day	-	388
29/03/2023	kL/day	-	-
14/04/2023	kL/day	-	1424
5/05/2023	kL/day	-	-
14/06/2023	kL/day	-	-
11/08/2023	kL/day	-	981
15/09/2023	kL/day	-	883
19/10/2023	kL/day	-	740
17/11/2023	kL/day	-	-
22/12/2023	kL/day	4117	-
25/01/2024	kL/day	-	-
16/02/2024	kL/day	-	-
15/03/2024	kL/day	-	-
30/04/2024	kL/day	-	-
31/05/2024	kL/day	-	2052
21/06/2024	kL/day	-	2497
18/07/2024	kL/day	-	1864
30/08/2024	kL/day	-	-
11/09/2024	kL/day	-	-
16/10/2024	kL/day	-	-
25/11/2024	kL/day	-	-
19/12/2024	kL/day	-	-
29/01/2025	kL/day	-	-
25/02/2025	kL/day	-	-
26/03/2025	kL/day	-	-
8/04/2025	kL/day	-	-
15/05/2025	kL/day	4026	-
27/06/2025	kL/day	5192	-



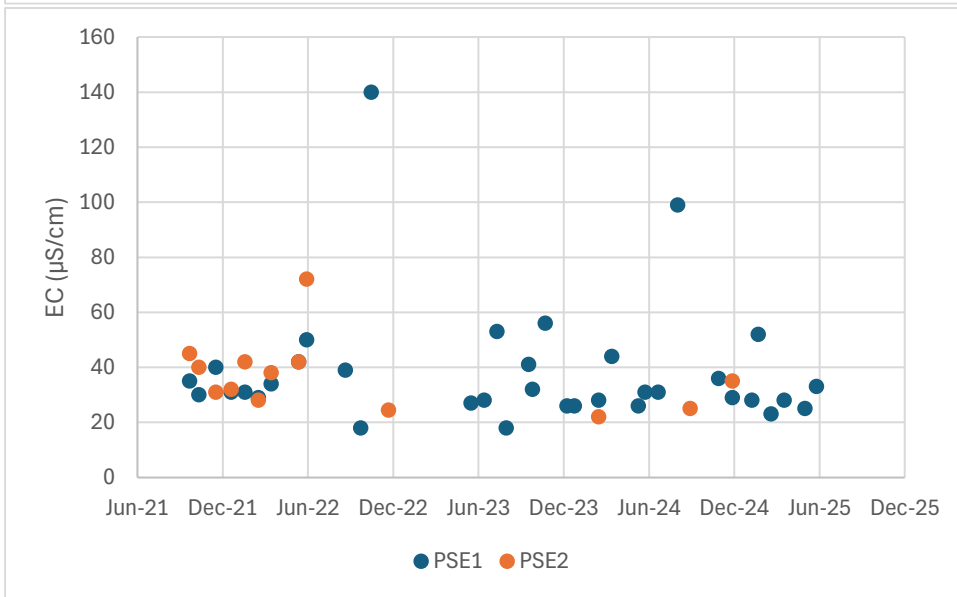
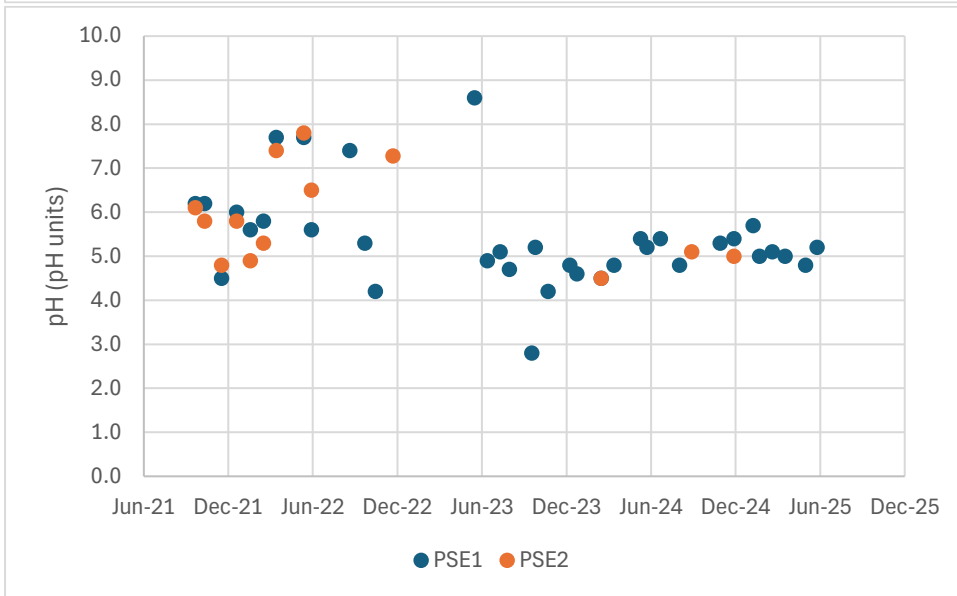
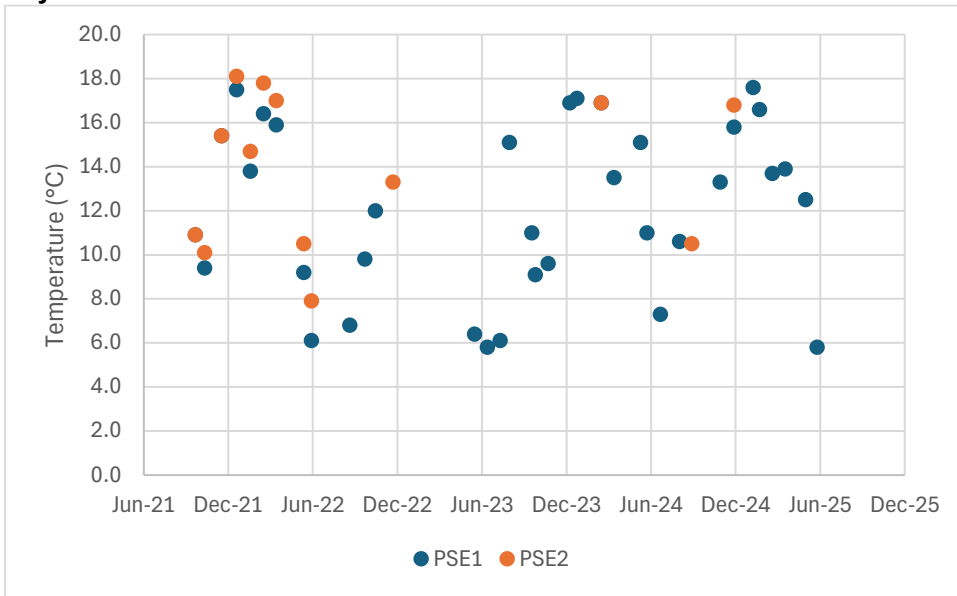
## C-1-2 Paddys Creek east – water quality and flow

### Paddys Creek East Swamps – statistical summary of water quality and flow results

Parameter	Units	PSE1		PSE2	
		Count	Median	Count	Median
Temperature	°C	35	12.1	13	13.8
pH	pH units	35	5.4	13	5.9
EC	µS/cm	35	38	13	37
DO	mg/L	35	8.7	13	7.3
Turbidity	NTU	35	7.1	13	5.5
TSS	mg/L	15	44	3	29
TDS	mg/L	7	27	1	30
Redox potential	mV	35	354	13	329
Flow Rate Total	kL/day	27	2755	4	2780
Mn filt	mg/L	14	0.015	3	0.007
Iron filt	mg/L	15	0.183	3	0.327
Mn Tot	mg/L	15	0.027	3	0.010
Iron Tot	mg/L	15	1.463	3	0.530

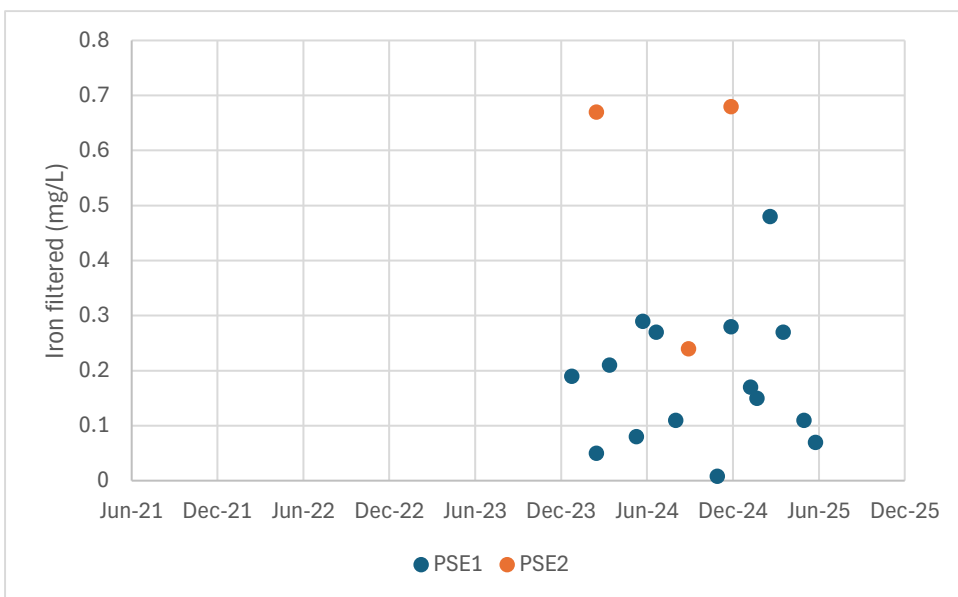
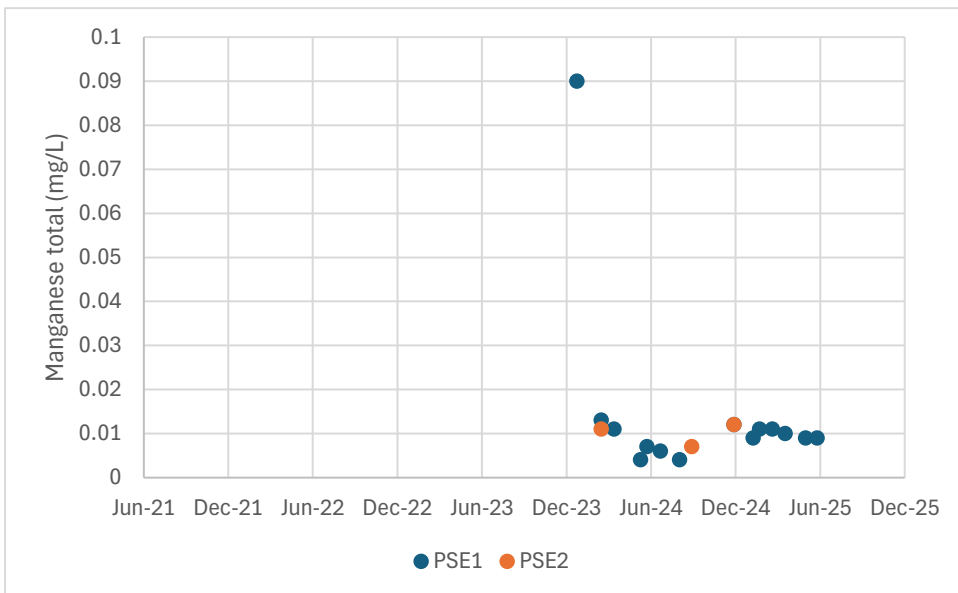
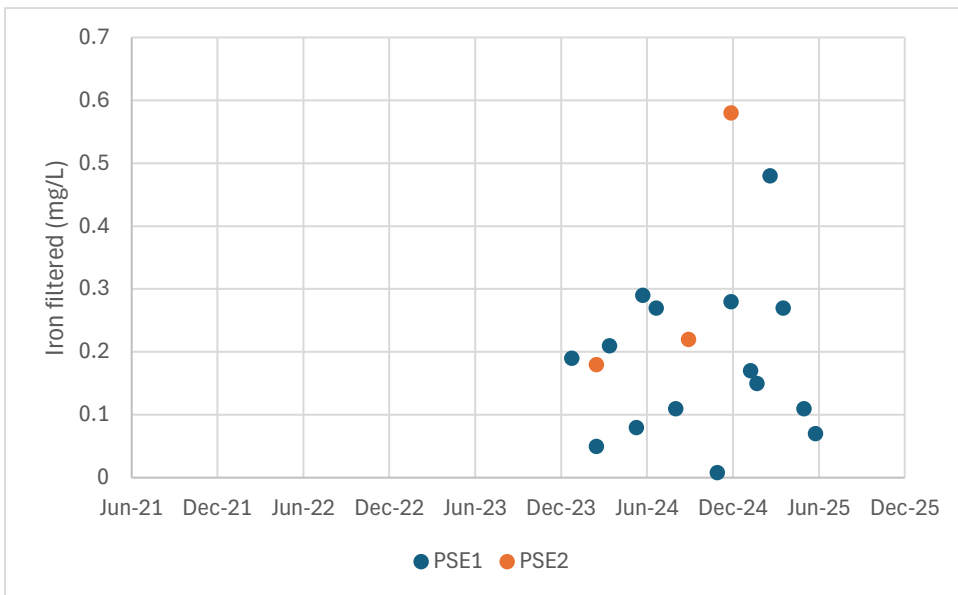
# Paddys Creek East Swamps – Water Quality

## Physicochemical





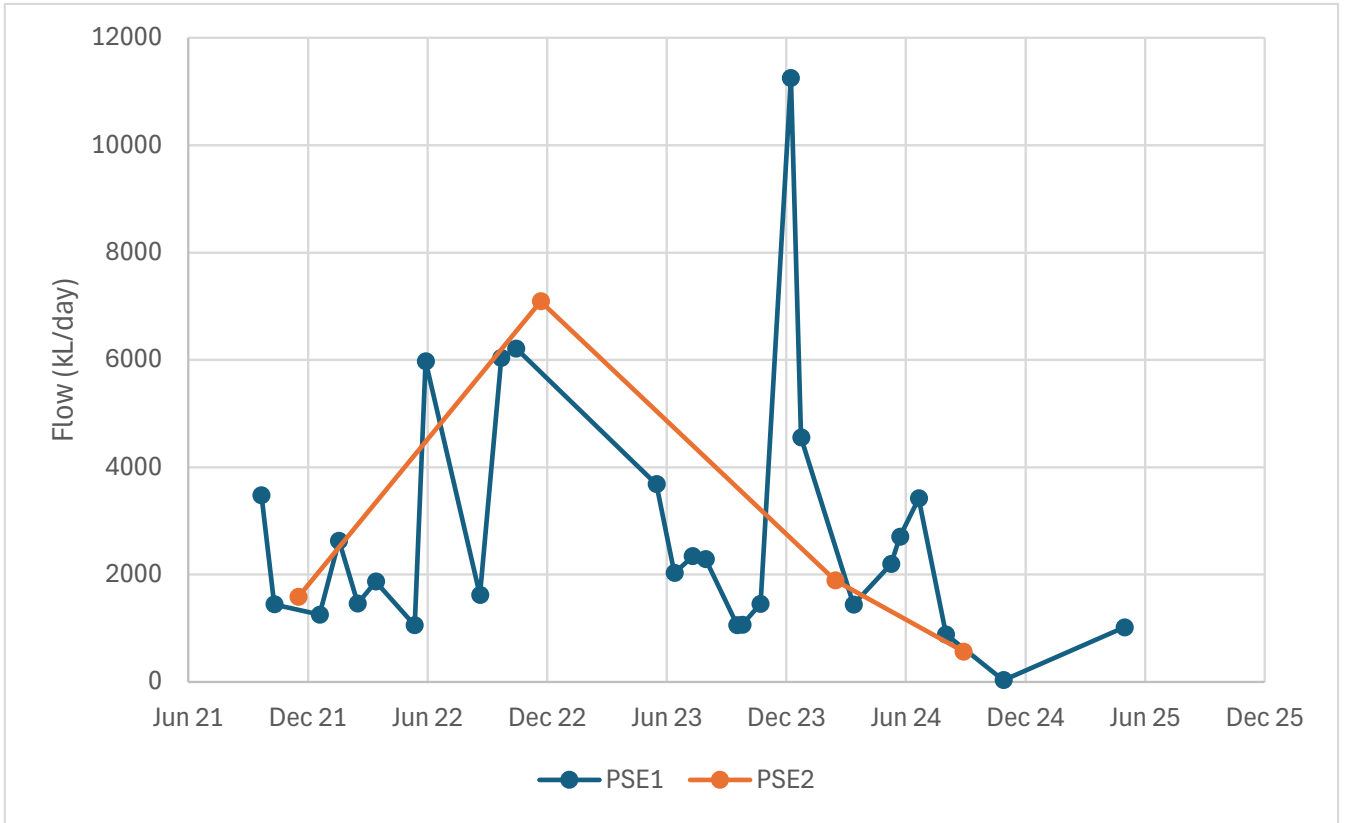




## Swamp flow

Monitoring events	Units	PSE1	PSE2
22/09/2021	kL/day	3473	
12/10/2021	kL/day	1442	
18/11/2021	kL/day		1581
21/12/2021	kL/day	1250	
20/01/2022	kL/day	2627	
18/02/2022	kL/day	1460	
18/03/2022	kL/day	1866	
8/04/2022	kL/day		
17/05/2022	kL/day	1054	
3/06/2022	kL/day	5974	
29/07/2022	kL/day		
26/08/2022	kL/day	1615	
28/09/2022	kL/day	6033	
21/10/2022	kL/day	6209	
28/11/2022	kL/day		7091
16/12/2022	kL/day		
13/01/2023	kL/day		
10/02/2023	kL/day		
10/03/2023	kL/day		
26/05/2023	kL/day	3683	
23/06/2023	kL/day	2025	-
21/07/2023	kL/day	2341	-
10/08/2023	kL/day	2288	-
28/09/2023	kL/day	1052	-
6/10/2023	kL/day	1062	-
3/11/2023	kL/day	1451	-
20/12/2023	kL/day	11251	-
5/01/2024	kL/day	4553	-
27/02/2024	kL/day	-	1886
26/03/2024	kL/day	1439	-
23/05/2024	kL/day	2193	-
6/06/2024	kL/day	2704	-
5/07/2024	kL/day	3418	-
16/08/2024	kL/day	881	-
12/09/2024	kL/day	-	561
13/11/2024	kL/day	30	
13/12/2024	kL/day	-	-
24/01/2025	kL/day	-	-
7/02/2025	kL/day	-	-

Monitoring events	Units	PSE1	PSE2
7/03/2025	kL/day	-	-
4/04/2025	kL/day	-	-
19/05/2025	kL/day	1016	-
13/06/2025	kL/day	-	-

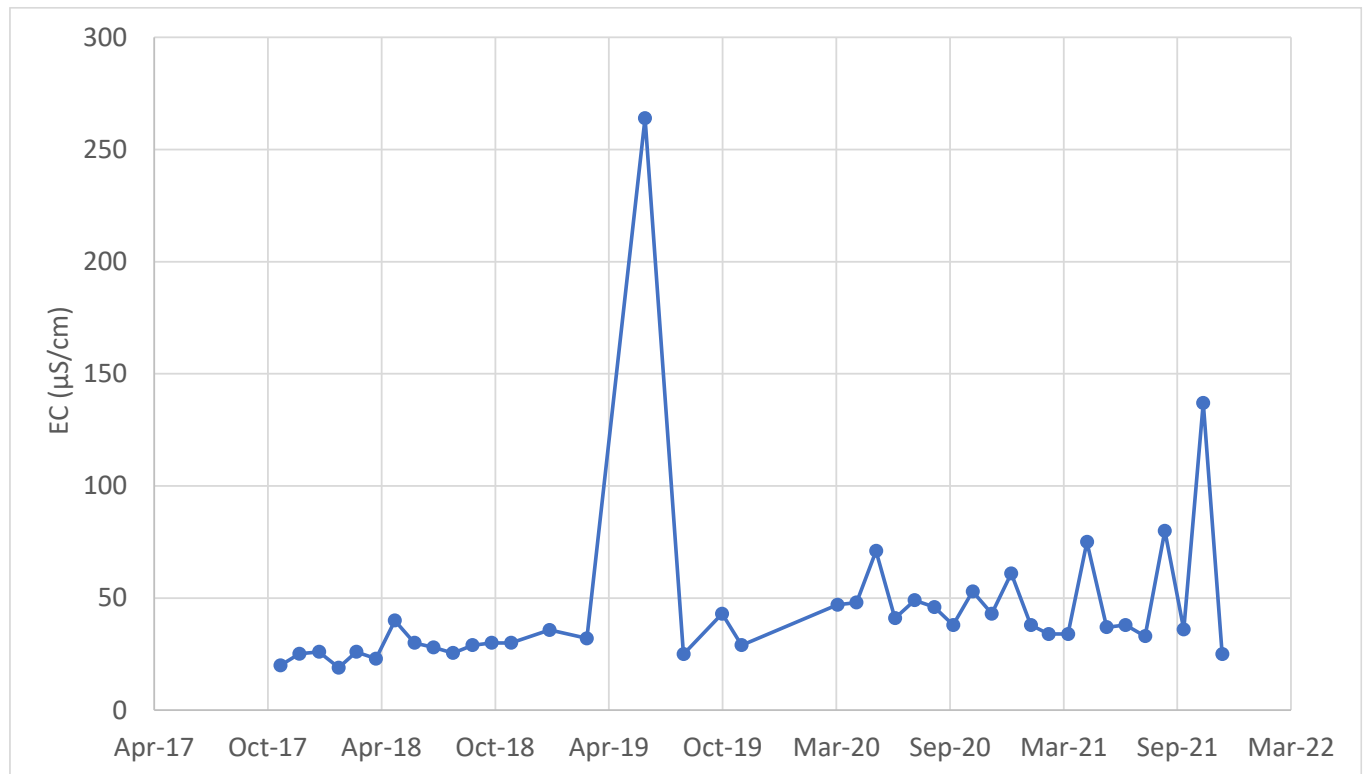


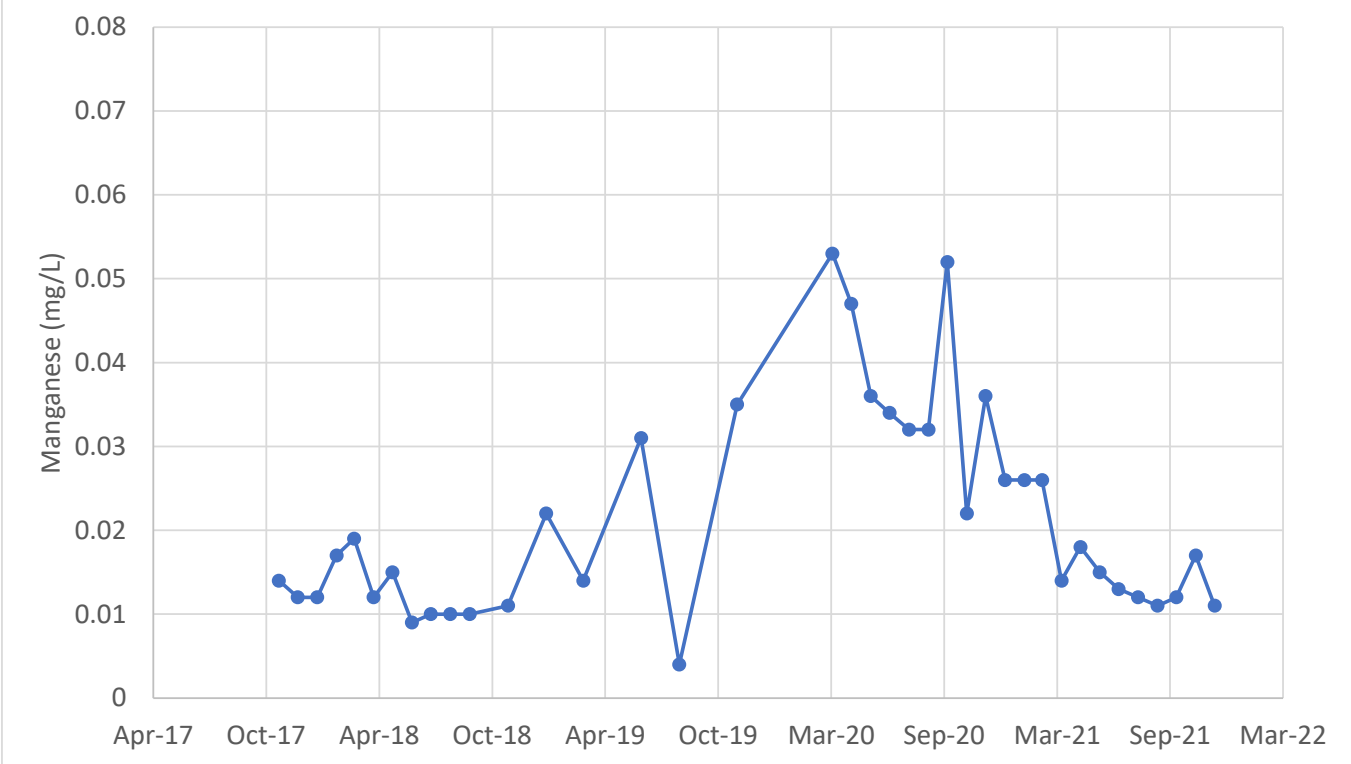
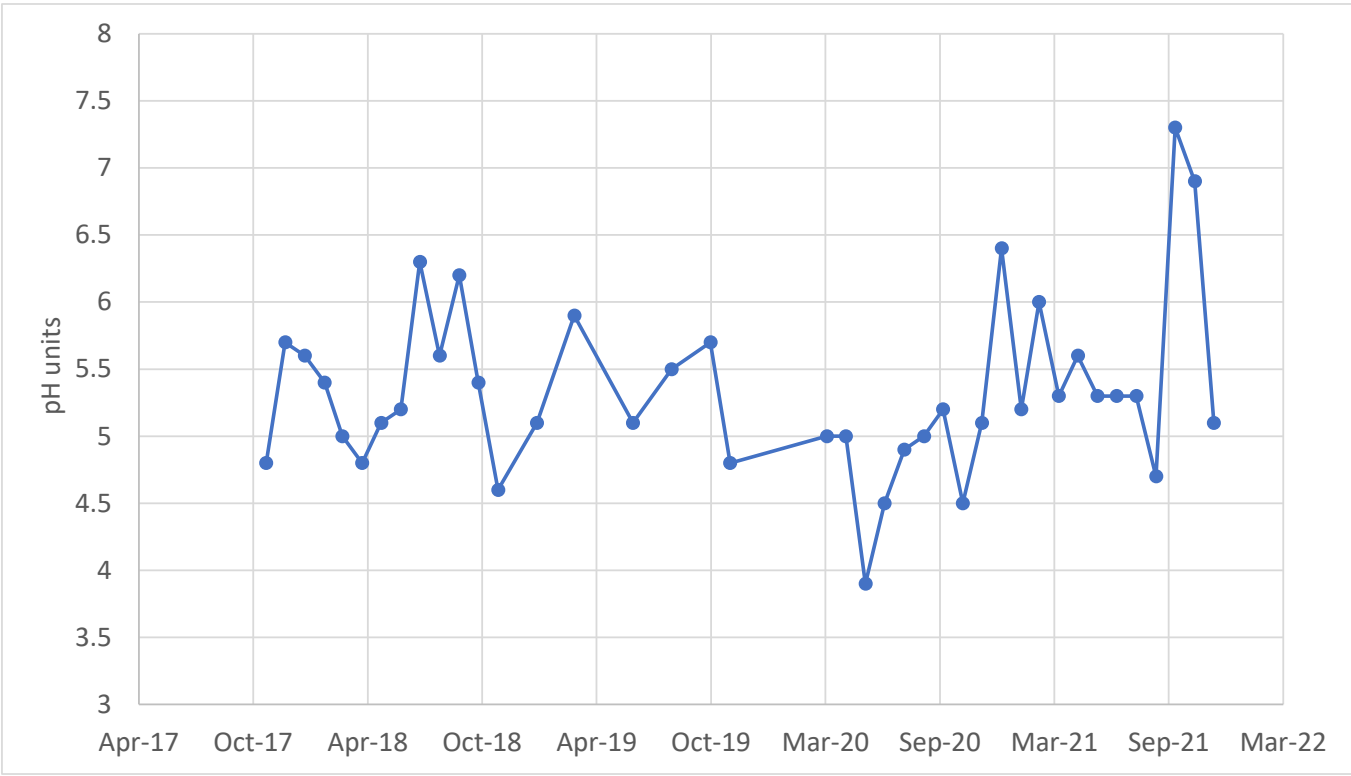
# C-1-3 Paddys Creek – water quality

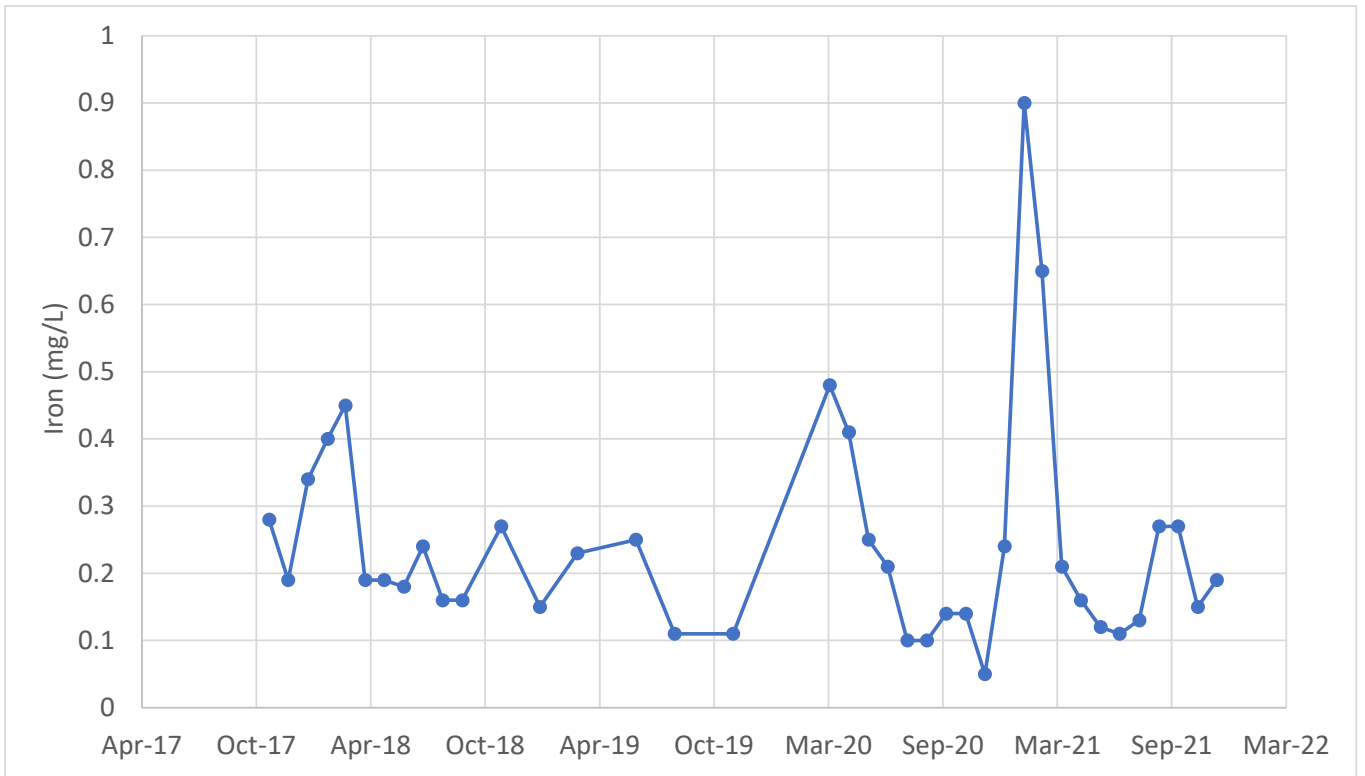
Paddys Creek – statistical summary of water quality results

Parameter	Unit	Count	Mean	Date
EC	µS/cm	46	41	November 2017 – December 2021
pH	pH units	46	5.6	
Mn	mg/L	44	0.02	
Fe	mg/L	44	0.26	

## Paddys Creek – Water Quality





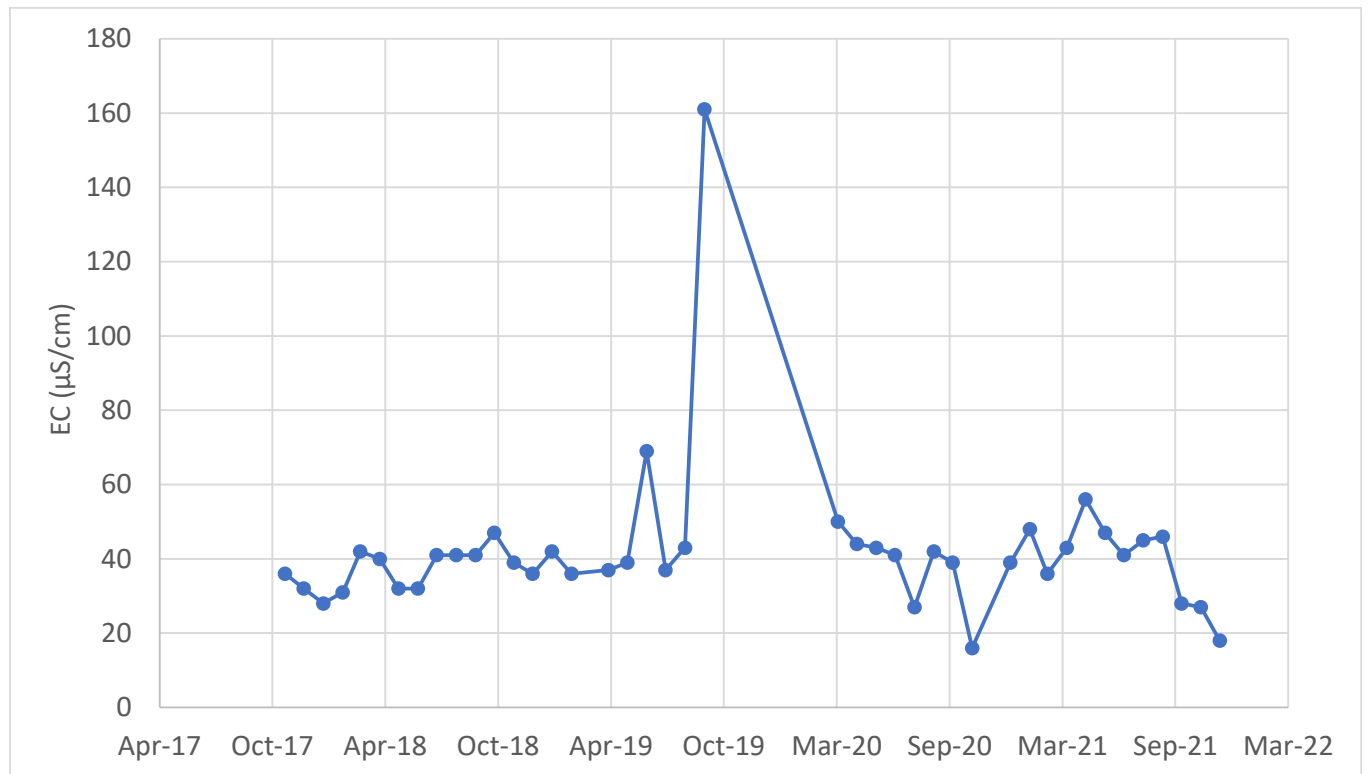


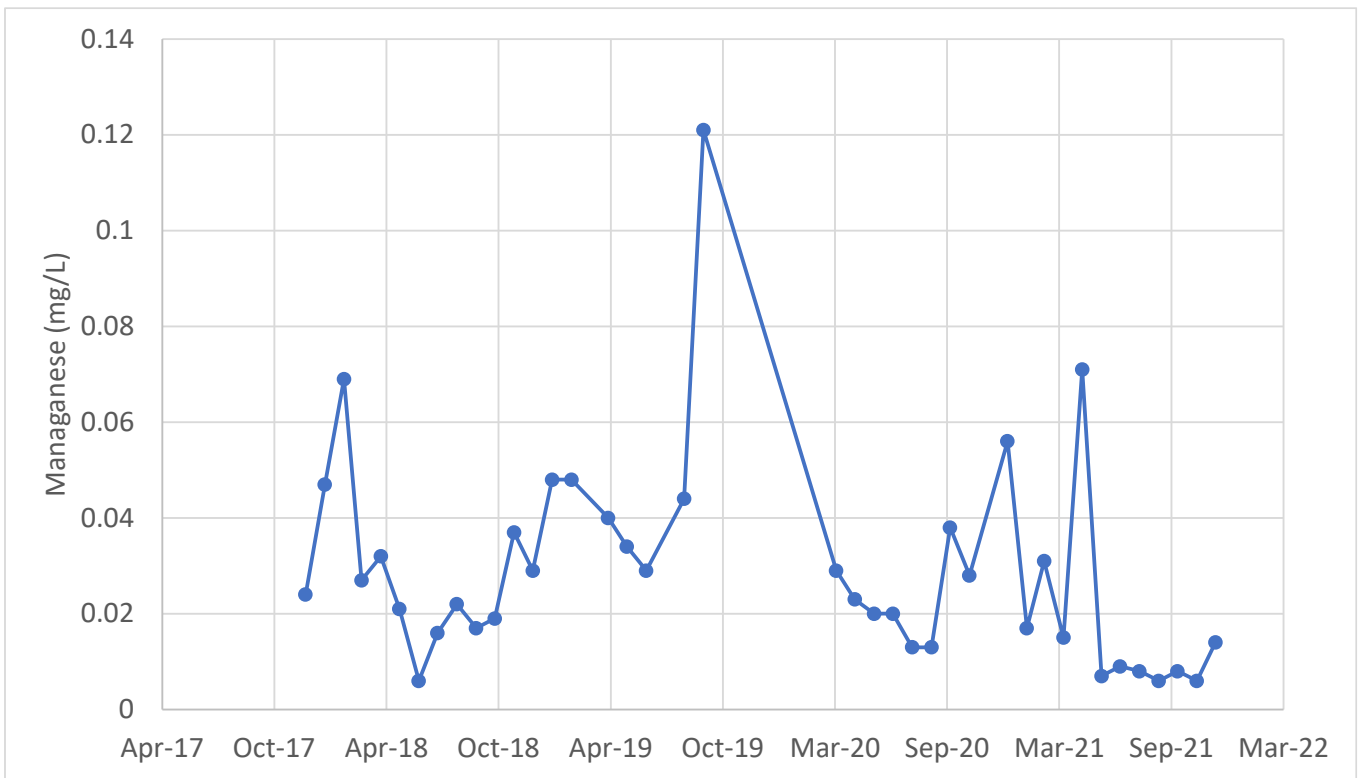
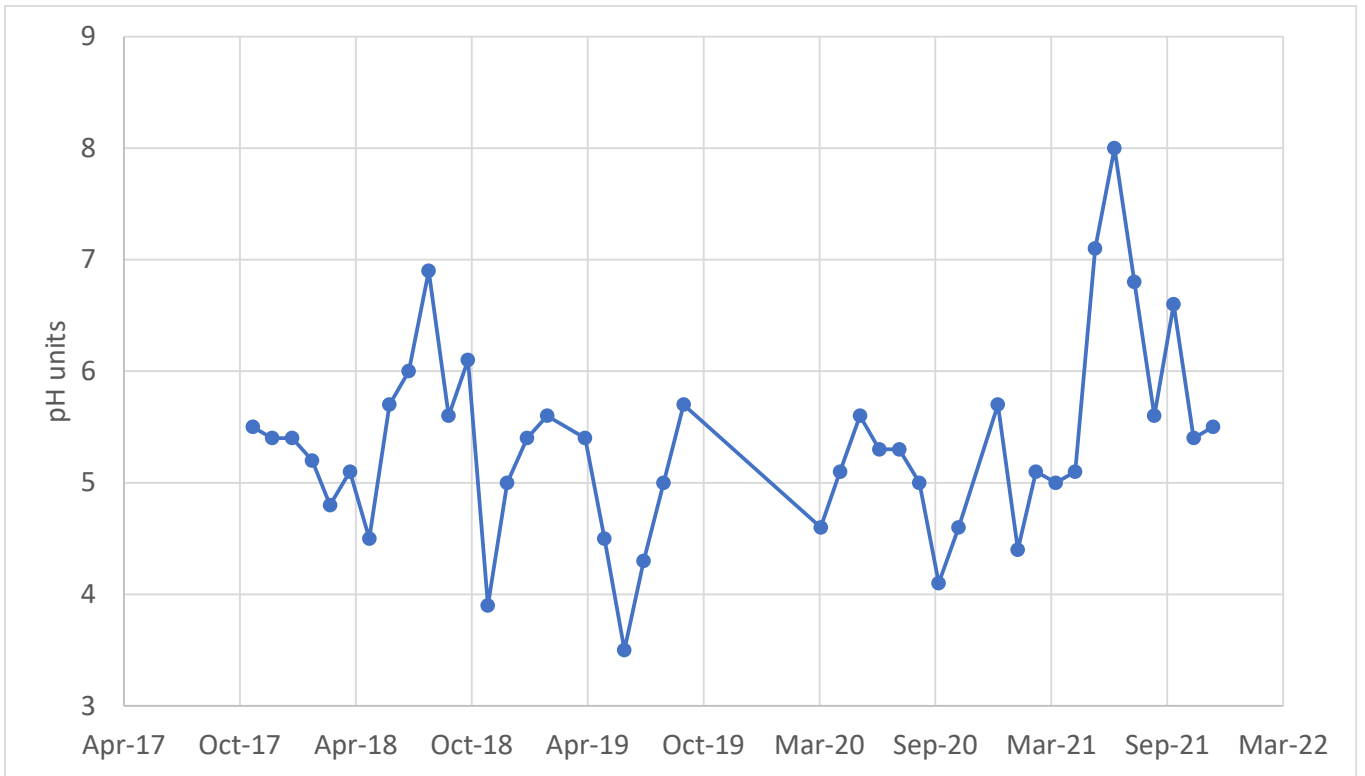
# C-1-4 Nine Mile Swamp – water quality

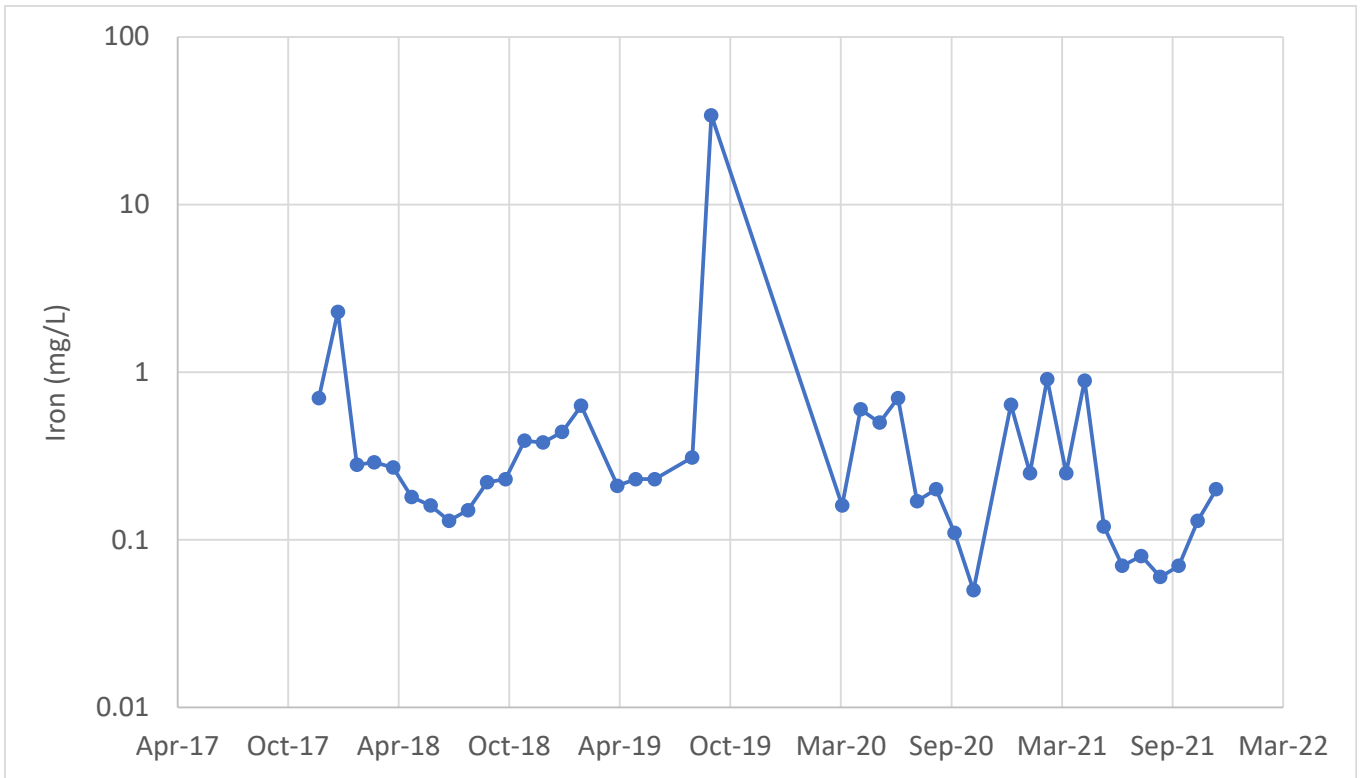
Nine Mile Swamp – statistical summary of water quality results

Parameter	Unit	Count	Mean	Date
EC	µS/cm	42	43	November 2017 – December 2021
pH	pH units	42	5.4	
Mn	mg/L	44	0.036	
Fe	mg/L	44	0.694	

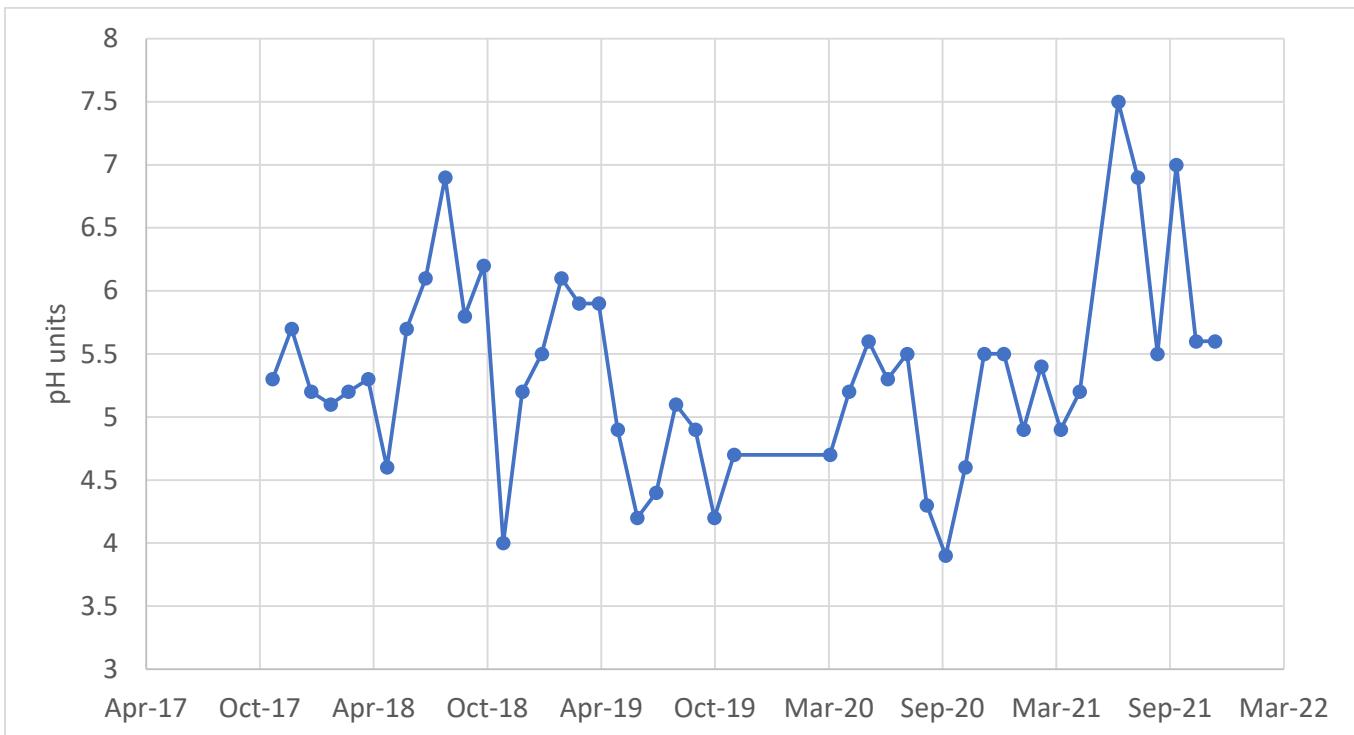
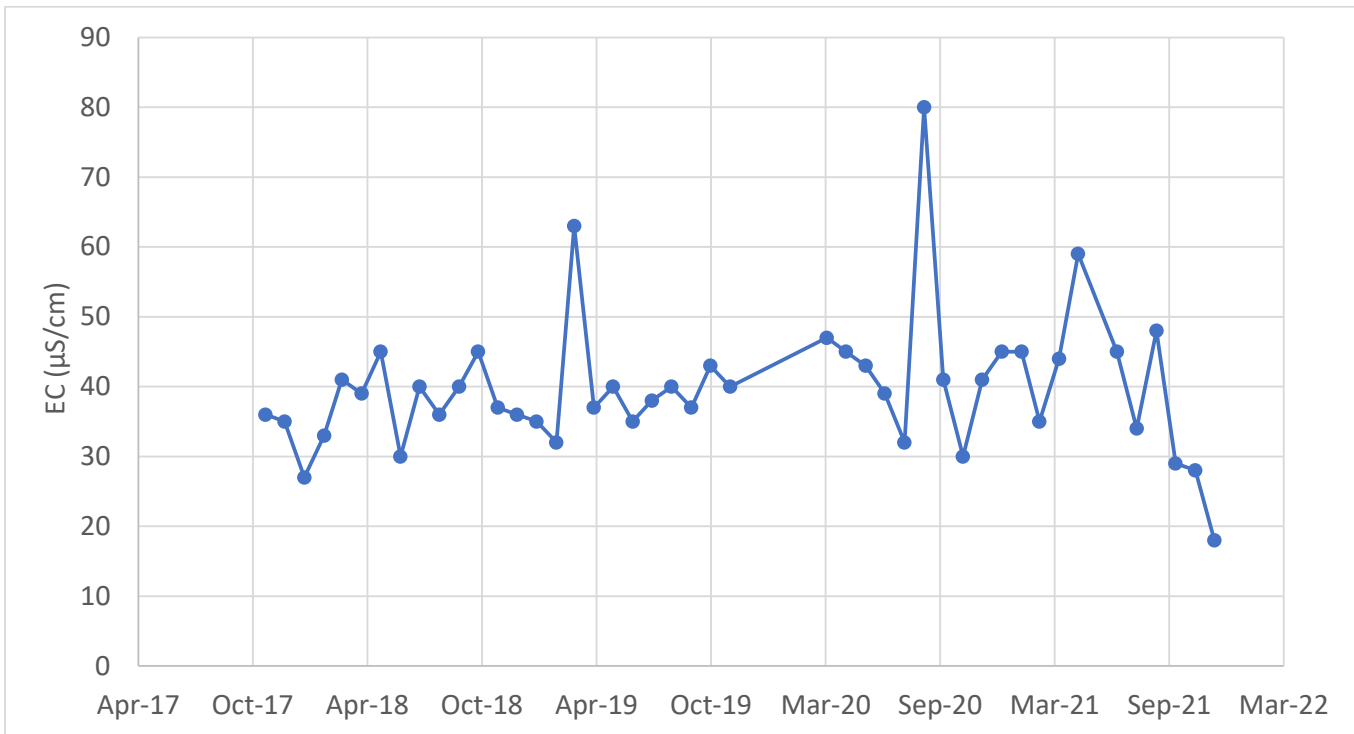
## Nine Mile Swamp – water quality

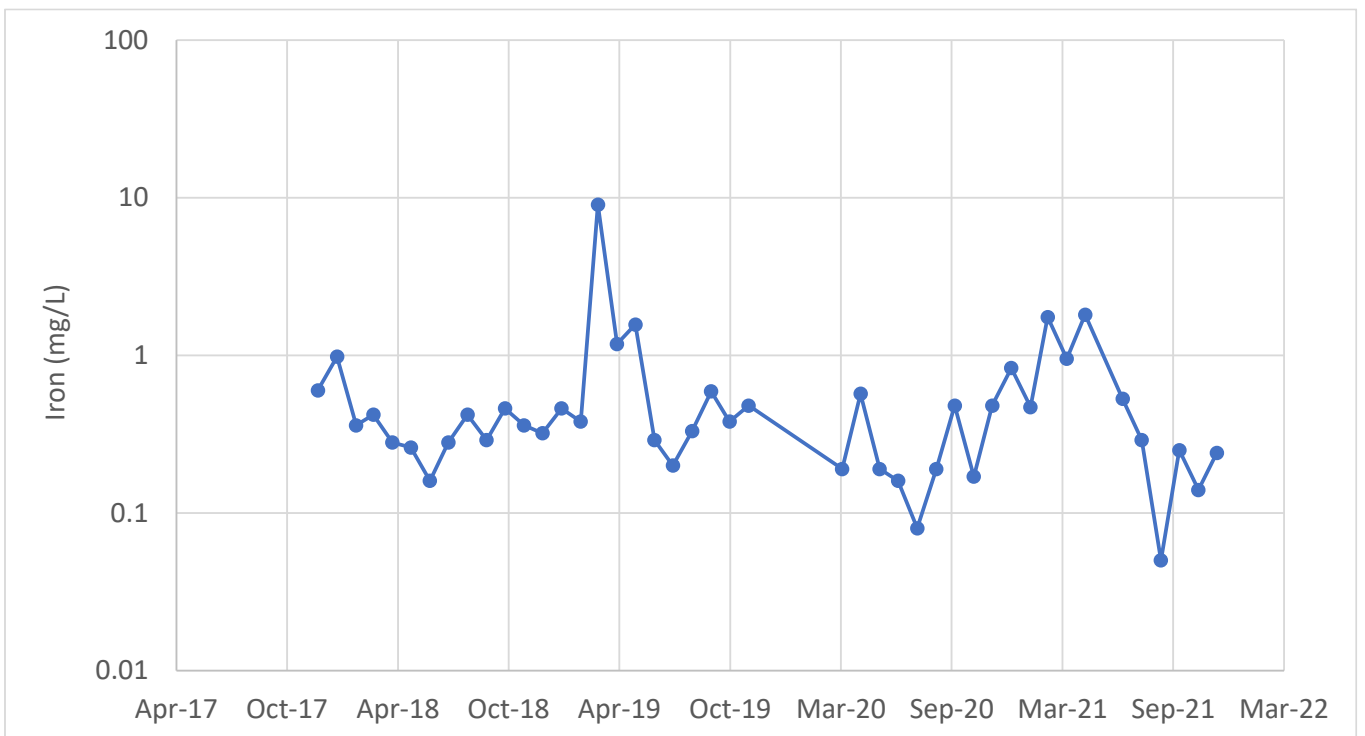
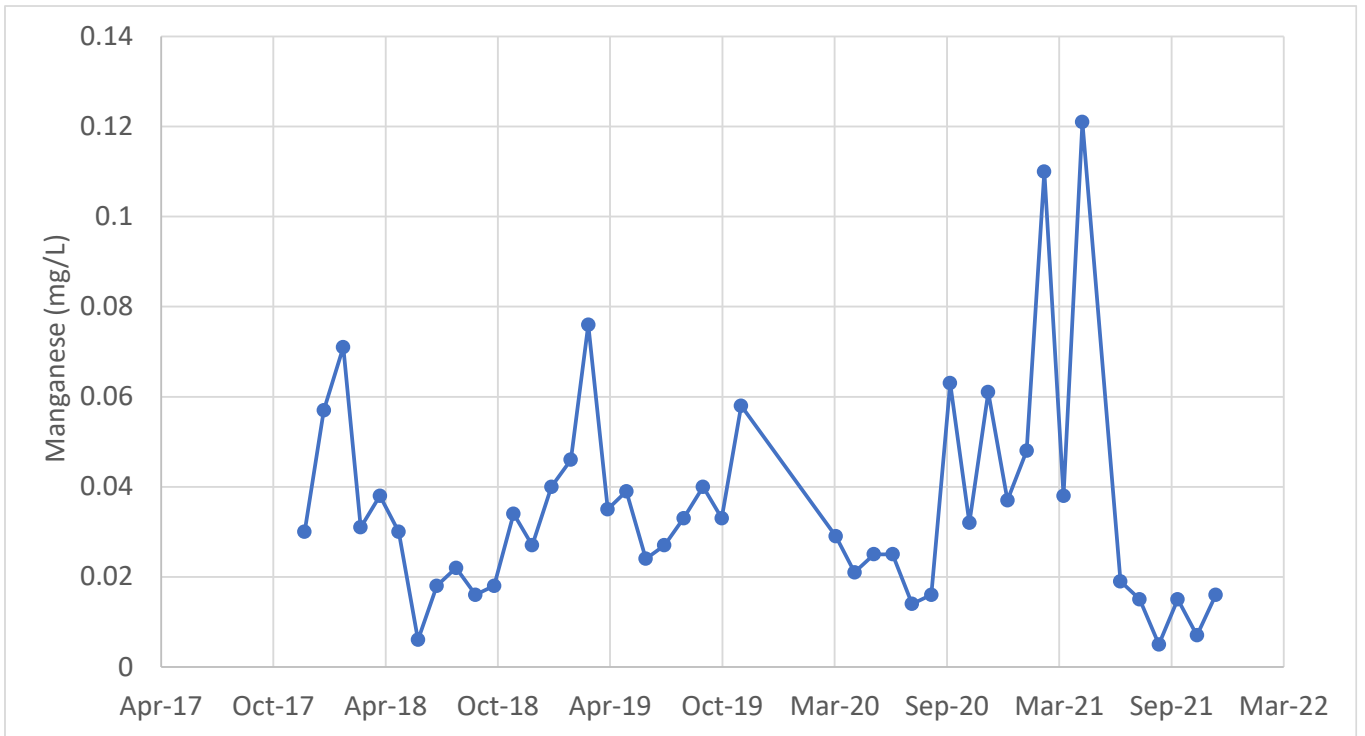






### Pine/Nine Mile Swamp Confluence

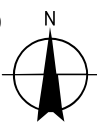
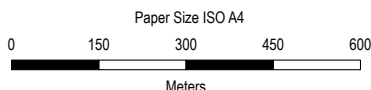
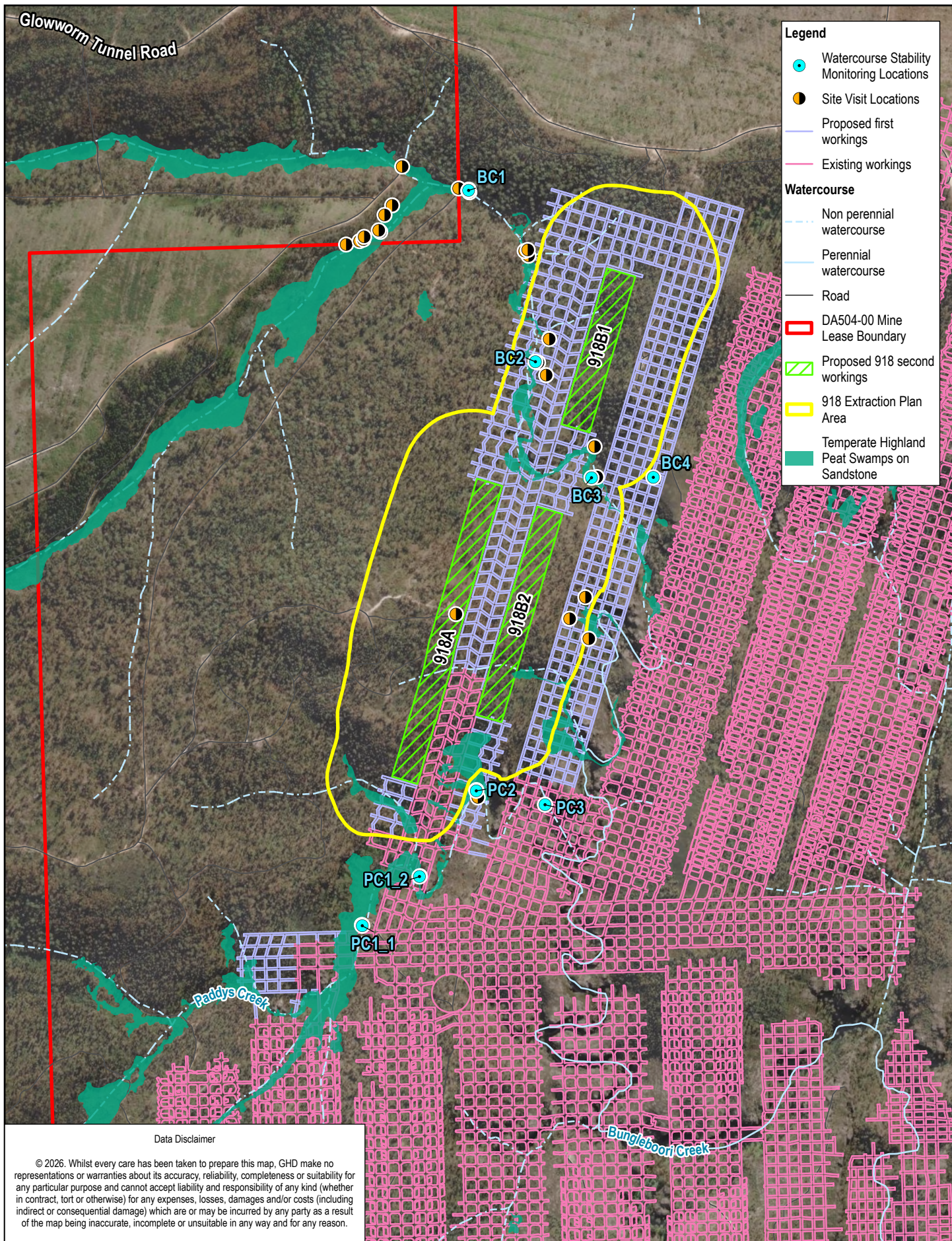




## **C-1-5 Stream and flow path stability**

The baseline stream and flow path stability photo locations captured in the May 2023 baseline inspection undertaken by GHD 2023 are shown in Figure B.1.

The baseline photo locations taken along Bungleboori Creek and Paddys Creek are compiled respectively in the below tables.



Map Projection: Transverse Mercator  
Horizontal Datum: GDA2020  
Grid: GDA2020 MGA Zone 56

Clarence Colliery  
918 Extraction Plan WMP

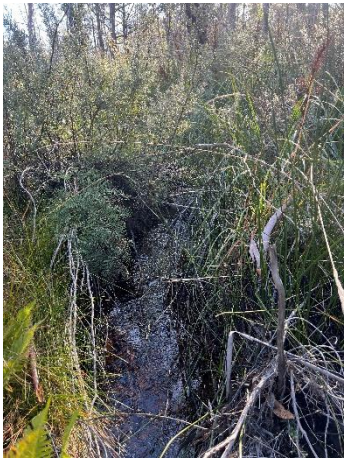



Project No. 12655704  
Revision No. 0  
Date 24/02/2026



Baseline watercourse stability photo locations – May and November 2023

**FIGURE C.1**




## Bungleboori Creek stability assessment

Monitoring Point / Orientation	Location	Channel characteristics	Other notes
BC1	BC1 is located near the downstream end of a good condition, narrow, elongate channelised fill swamp and about 40 m downstream of the access track ford.  GHDs monitoring location was slightly upstream of EMMs BC1, due to vegetation growth hindering access.	Channel runs along left margin of swamp.  Approx. 0.5 m wide and deep.  No visible adverse erosion or deposition. Channel appears stable and in good condition.	Dense reeds and grasses established since EMM monitoring.  No apparent impact from upstream track.





Upstream	Downstream	Left Bank	Right Bank
View upstream of dense riparian corridor and narrow, incised channel.	View downstream of dense riparian corridor and narrow, incised channel.	View of riparian corridor above left bank and close-up of left bank and channel, showing dense vegetation.	View of swamp adjacent to right bank, showing shrub vegetation indicative of drier swamp conditions.
 <p>IMG_7166</p>	 <p>IMG_7168</p>	 <p>IMG_7172</p>	 <p>IMG_7174</p>

Upstream	Downstream	Left Bank	Right Bank
			
<p>IMG_7167</p>	<p>IMG_7170</p>	<p>IMG_7173</p>	

Swamp condition adjacent to BC1			
Upstream	Downstream	Across (left to right, looking southwest)	
 <p>IMG_7177</p>	 <p>IMG_7176</p>	 <p>IMG_7175</p>	<p>Swamp vegetation is shrubby, with dry surface conditions.</p>
<p>Track approx. 40 m upstream of BC1</p> <p>View upstream of densely vegetated swamp and water pooled on track. Track has been repaired with angular cobbles.</p>	<p>View downstream of pooled water entering much smaller natural channel. Note in-channel vegetation.</p>	<p>View of left bank, where repaired track enters watercourse.</p>	<p>View of right bank, showing broad pooled water and repairs to track with angular cobbles and jute erosion matting.</p>
 <p>IMG_7178</p>	 <p>IMG_7181</p>	 <p>IMG_7179</p>	 <p>IMG_7180</p>





Swamp condition adjacent to BC1			
Main track approx. 220 m upstream of BC1			
View upstream of densely vegetated swamp and channel, with water pooled on track. Track has been repaired with angular cobbles.	View downstream of pooled water entering much smaller natural channel. Note in-channel vegetation.	View of left bank, where repaired track enters watercourse.	View of right bank, showing broad pooled water and repairs to track with angular cobbles and jute erosion matting.
			
IMG_7182	IMG_7183	IMG_7184	IMG_7185

Monitoring Point / Orientation	Location	Channel characteristics	Other notes
BC2 NOTE Location difficult to identify from EMM photographs due to lack of identifiable features.	BC2 is located approx. 300 m upstream from an eroding fire trail.	Small, well-defined channel approx. 1 m wide, incised approx. 0.5 m into swamp. Channel meanders around.	Ground waterlogged in places. Rock outcropping on right valley wall. Passed rock outcrops / small cliffs adjacent to creek upstream. Flood debris had accumulated on trees approx. 2 m above creek level at time of site visit.

Upstream	Downstream	Left Bank	Right Bank
View upstream of narrow, incised channel winding through densely vegetated swamp margins.	View downstream at narrow channel with wider pool at acute meander. Channel winds through densely vegetated swamp margins.	View of large tree and shrub swamp margins above left bank.	View over swamp and right bank of channel.
			
IMG_7150	IMG_7151	IMG_7152	IMG_7153

Track approx. 350 m upstream of BC2			
View upstream at iron-stained channel, which widens at track crossing. Dense riparian vegetation.	View downstream showing narrowing of channel below track, with small, pools (up to 1 m deep). Densely vegetated riparian corridor and some vegetation in channel.	EMM 2022 and GHD 2023 image of left bank of creek and track. Track has eroded considerably since 2022, with gullies and sheetwash eroding to bedrock in places.	View of vegetated creek right bank and gullied track above left bank.
		 <p data-bbox="1106 587 1742 710">Waratah Ridge Rd, Newnes Plateau NSW 2790, Australia Latitude -33.398721° Longitude 150.228982° LOCAL 09:01:23 GMT 22:01:23 THURSDAY 03.24.2022 ALTITUDE 1084 ME</p> <p data-bbox="1106 719 1301 746">EMM image 2022</p>	
IMG_7143	IMG_7145		IMG_7147
Swamp appears more extensive than mapped, with a narrow swamp connecting mapped swamps upstream and downstream of track.			
	IMG_7146	IMG_7142	IMG_7148

Monitoring Point / Orientation	Location	Channel characteristics	Other notes
BC3 NOTE Location difficult to identify from EMM photographs due to lack of identifiable features.	BC3 was accessed from the fire trail and BC2, walking over the ridgeline and dropping into the valley via a gully. Located near the mapped head of a large hanging swamp.	Small, well-defined channel approx. 1 m wide, incised approx. 0.5 m into swamp.	Ground waterlogged in places. Rock outcropping on right valley wall. Passed rock outcrops/small cliffs adjacent to creek upstream.

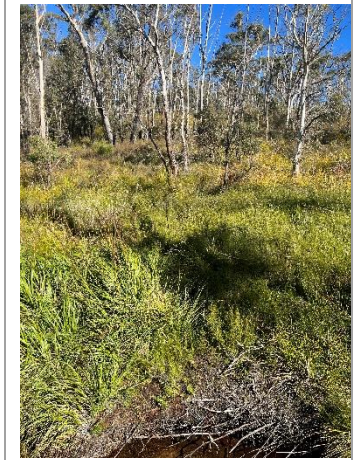
Upstream	Downstream	Left Bank	Right Bank
View upstream showing swiftly flowing, well-defined creek with bedrock outcropping in creek bed. Dense swamp vegetation within riparian corridor.	View downstream showing rock outcropping within bed of creek. Cliffs visible approx 50 m downstream.	View of hillside above left bank.	View of right bank and swamp beyond right bank.
			
IMG_7154	IMG_7155	IMG_7157	IMG_7158



IMG\_7160









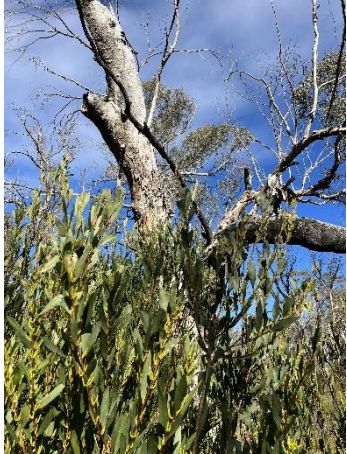
IMG\_7156









IMG\_7158



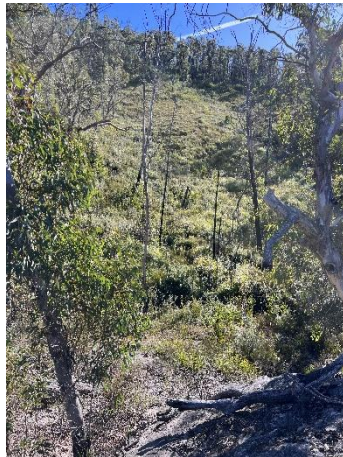
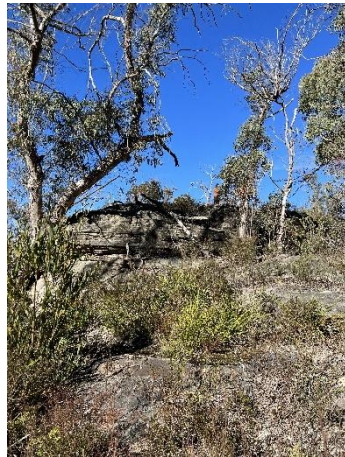
Paddys Creek stability assessment





Monitoring Point / Orientation	Location	Channel characteristics	Other notes
<p>PC1 NOTE EMM location difficult to reach and did not appear to resemble EMM 2022 site visit images. Alternative locations recorded.</p>	<p>PC1 alternate location (PC1_2) is located at the base of the valley where safe to access, at the downstream end of the upstream swamps and upstream end of rock outcropping above the left bank. Park at end of track and walk across dry hanging swamp to access main creek. Alternative location 2 is located adjacent to the trail end parking area.</p>	<p>The channel is bedrock-controlled with small, stepped waterfalls. Flow runs along the base of a rock outcrop. Banks were sandy, with minor slumping of the right bank. Riparian corridor densely vegetated.</p>	

Upstream	Downstream	Left Bank	Right Bank
<p>GHD 2023 alternative location PC1_2 – adjacent to upstream end of rock outcropping and downstream end of swamp View upstream at narrow channel. Bedrock outcropping in channel bed, with stepped waterfalls.</p>	<p>View downstream at natural wider pool within channel where water draining rock outcrop enters main channel. Pagoda visible in background.</p>	<p>View of rock outcropping above vegetated left bank, where water draining outcrop enters to form a wider pool in the main channel.</p>	<p>Slumping of sandy soil along right bank of creek. Large tree marks location of monitoring point.</p>
 <p>IMG_7114</p>	 <p>IMG_7116</p>	 <p>IMG_7117</p>	 <p>IMG_7119</p>
 <p>IMG_7121</p>	 <p>IMG_7115</p>		 <p>IMG_7120</p>




GHD Alternative location PC1_1 – adjacent to car park.			
View upstream at channel approx. 1.5 m wide. Characterised by pools and riffles with in-channel vegetation. Rock outcrops visible in background.	View downstream at densely vegetated channel and riparian corridor, with good condition swamp.	View across densely vegetated left bank and swamp.	View of area above right bank to car parking area at trail end.
			
IMG_7123	IMG_7125	IMG_7127	
			
IMG_7124	IMG_7126		

Monitoring Point / Orientation	Location	Channel characteristics	Other notes
PC2 NOTE EMM location dangerous to access due to rock outcropping. EMM 2022 photographs do not appear to be in keeping with local conditions. Alternative location recorded.	PC2 alternate location is from a prominent rock outcrop overlooking the hanging swamp. The channel can be accessed safely to the left of the outcrop.	The channel is bedrock-controlled with rock steps and deeper pools. Channel is approx. 1 m-1.5 m wide Riparian corridor densely vegetated.	

Upstream	Downstream	Left Bank	Right Bank
GHD 2023 alternative location PC2			
View upstream at swiftly flowing, bedrock-controlled creek, approx. 1 m-1.5 m wide. Densely vegetated banks and riparian corridor.	View downstream at rock step and deeper pool. Densely vegetated banks and riparian corridor.	Top: view across good condition, well-vegetated, steep hanging swamp from rock outcrop above creek. Bottom: view of left bank and hanging swamp from creek level.	View of rock outcrop vantage point above right bank of creek.
			
IMG_7133	IMG_7135	IMG_7129	IMG_7138

Upstream	Downstream	Left Bank	Right Bank
 <p data-bbox="210 676 327 703">IMG_7134</p>	 <p data-bbox="844 676 960 703">IMG_7136</p>	 <p data-bbox="1265 676 1382 703">IMG_7137</p>	

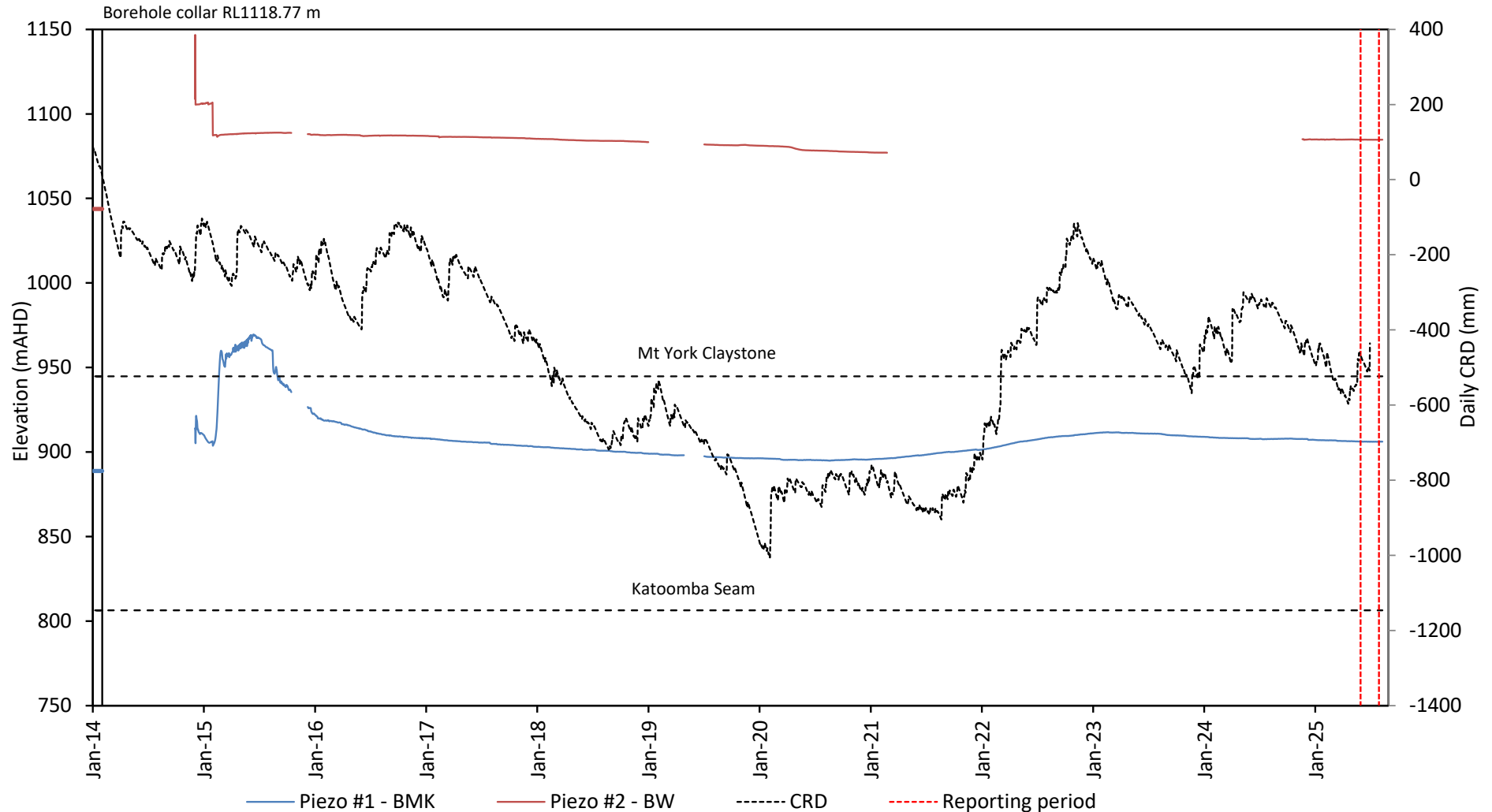
Monitoring Point / Orientation	Location	Channel characteristics	Other notes
PC3	PC3 is located within a narrow bedrock gorge and not considered susceptible to mining impacts as it is outside the anticipated impact area.	The channel is bedrock-controlled with rock steps and deeper pools. Channel is approx. 1 m-1.5 m wide. Riparian corridor densely vegetated.	

Upstream	Downstream	Left Bank	Right Bank
View of similar location at PC1	View upstream at rock steps and scour holes in creek upstream of pool	View into gully above wide pool at meander apex, with sediment from gully forming a vegetated delta in break in cliffline, and accumulating in pool.	
 <p>IMG_7113</p>	 <p>IMG_7126</p>	 <p>IMG_7129</p>	

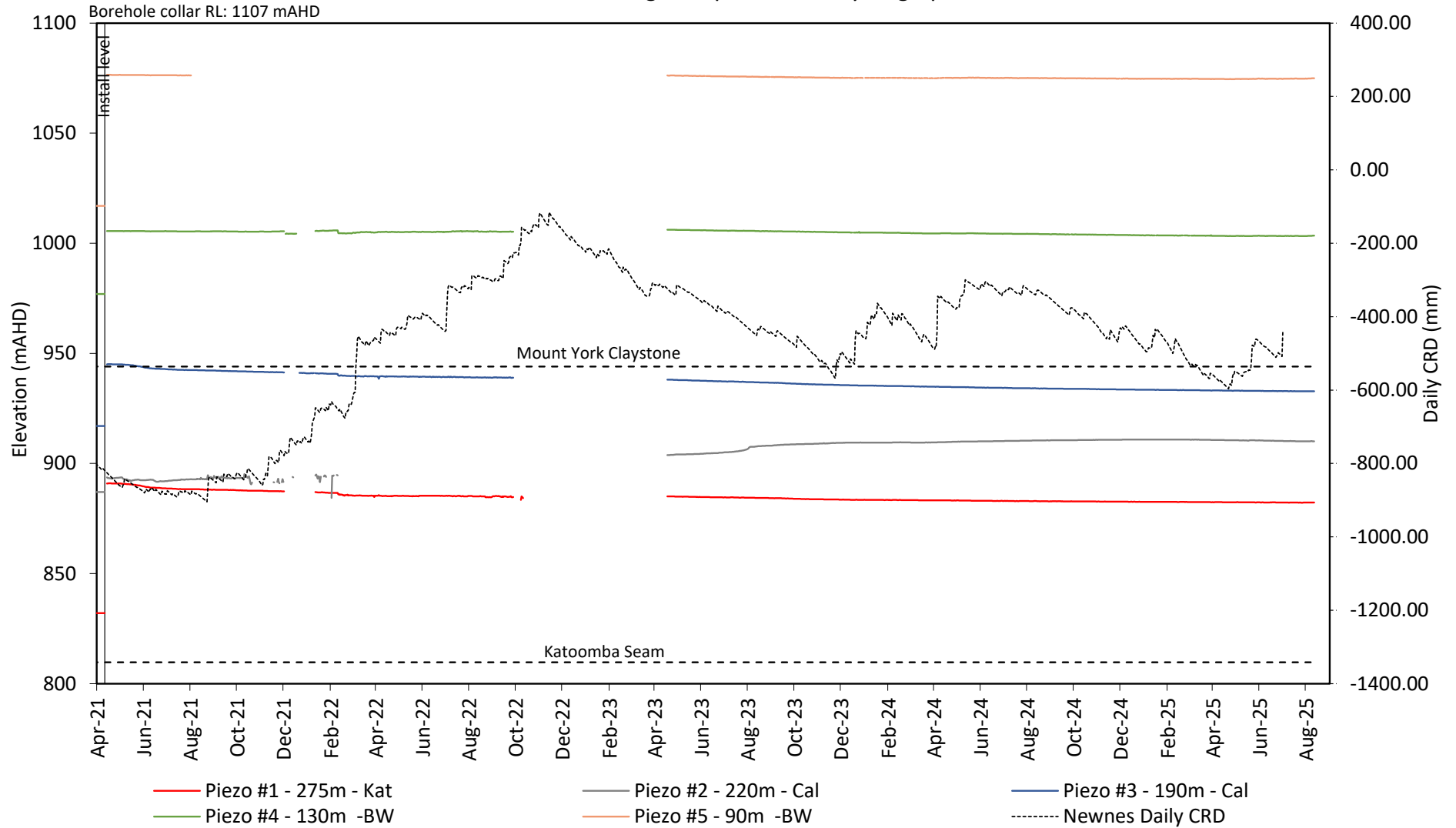
## C-2 Groundwater

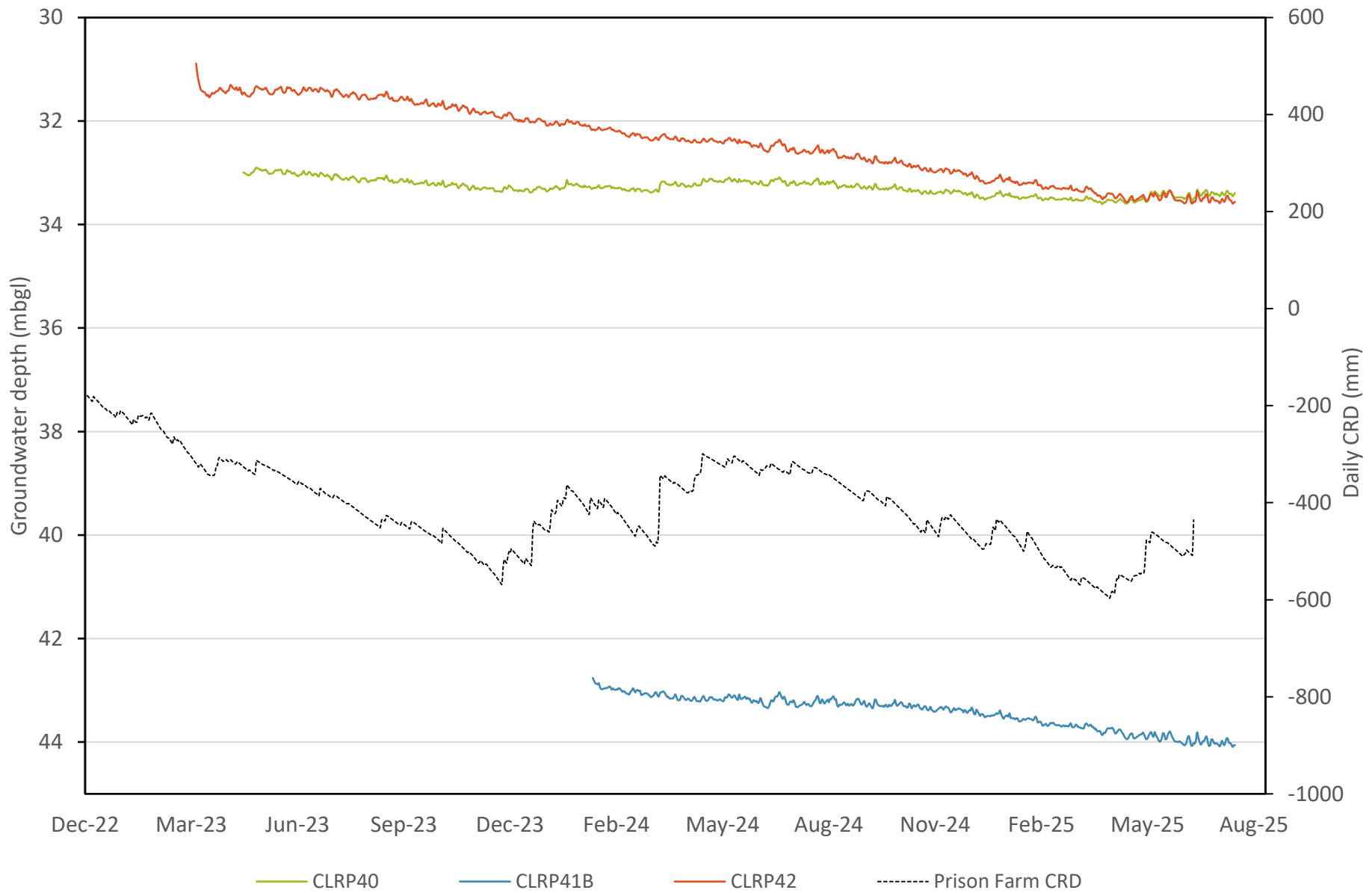
### C-2-1 Groundwater level/pressure hydrographs

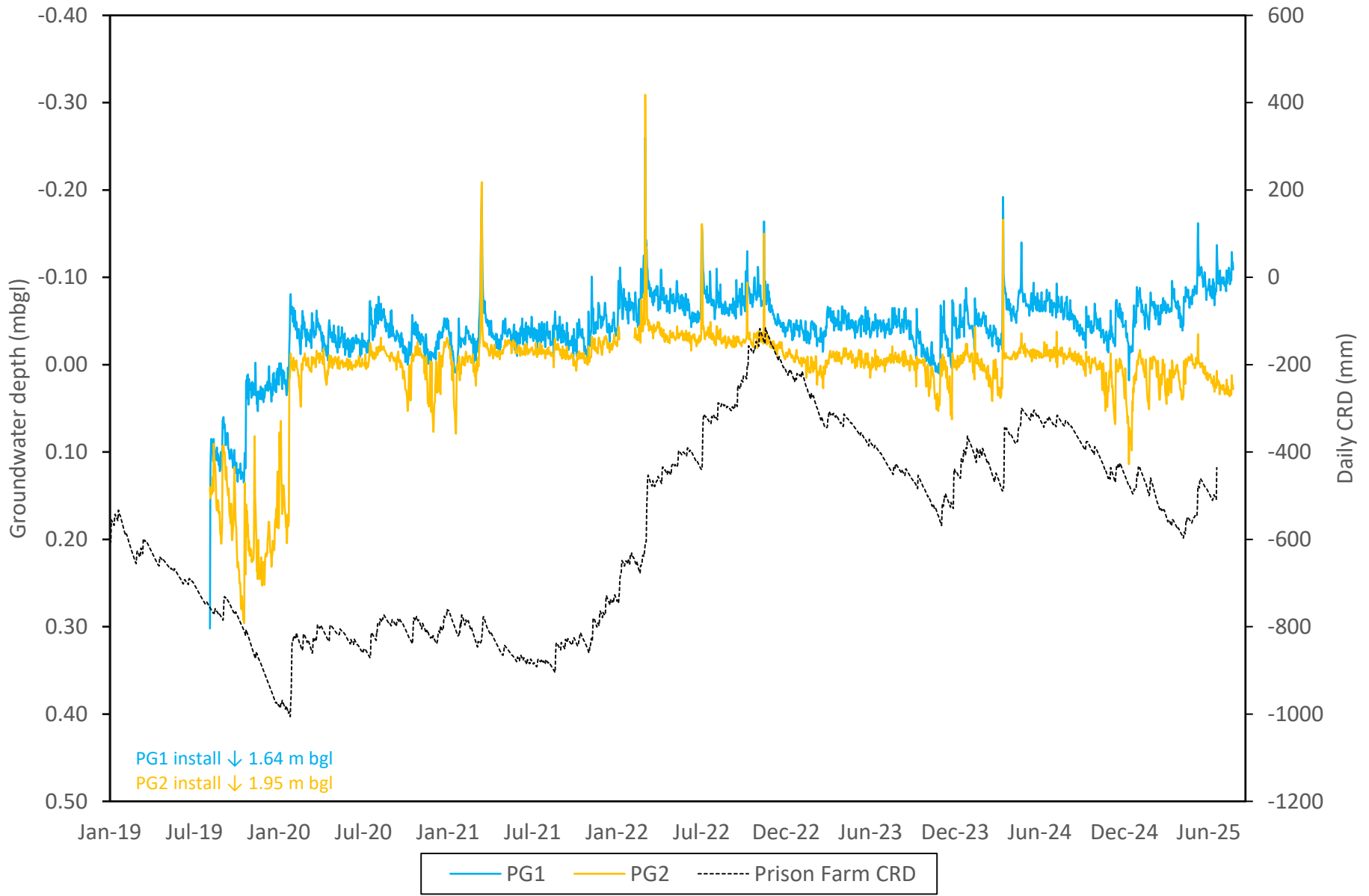
CLRP18 Vibrating wire piezometer hydrograph

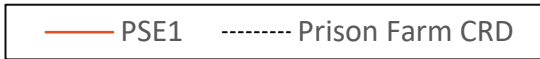
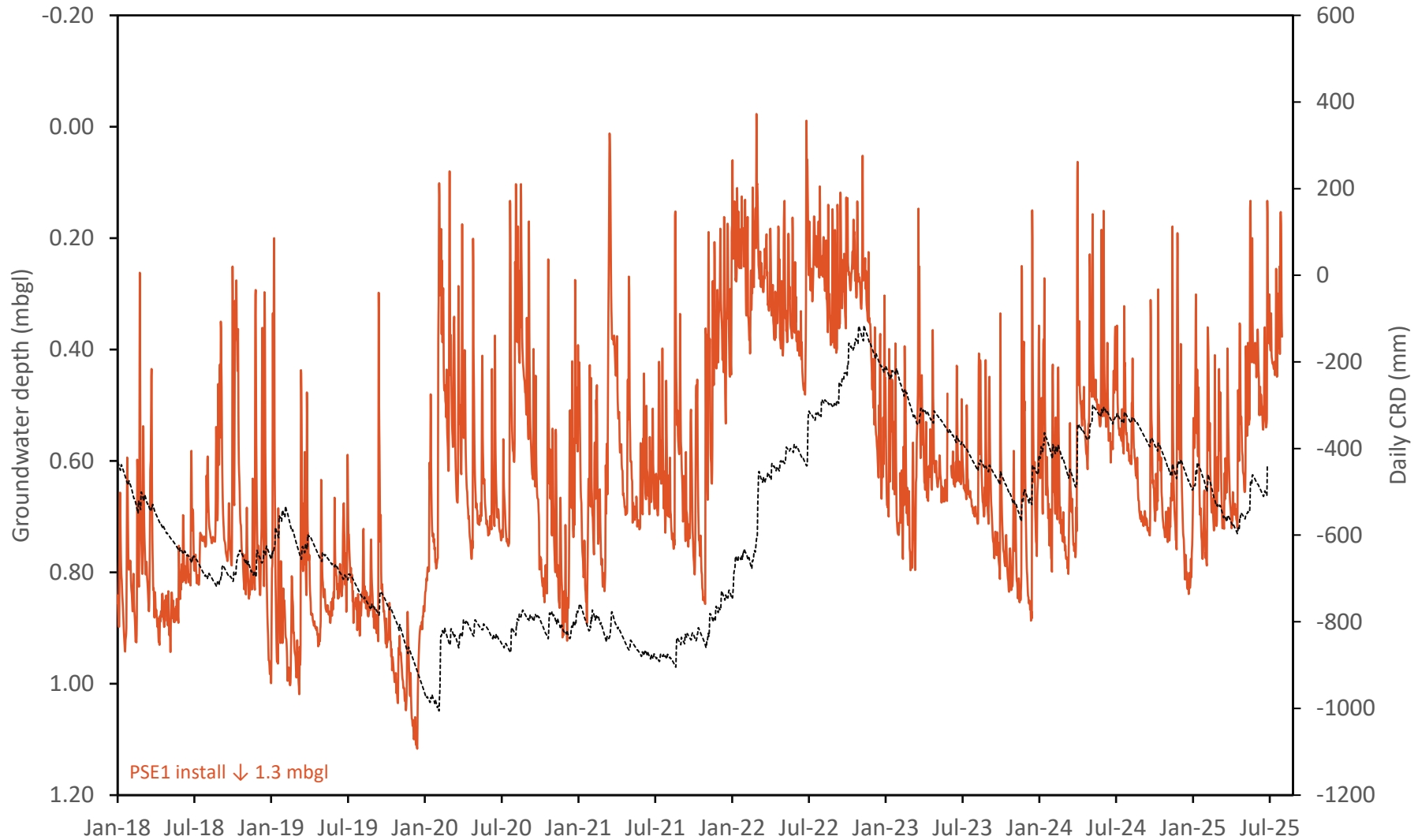


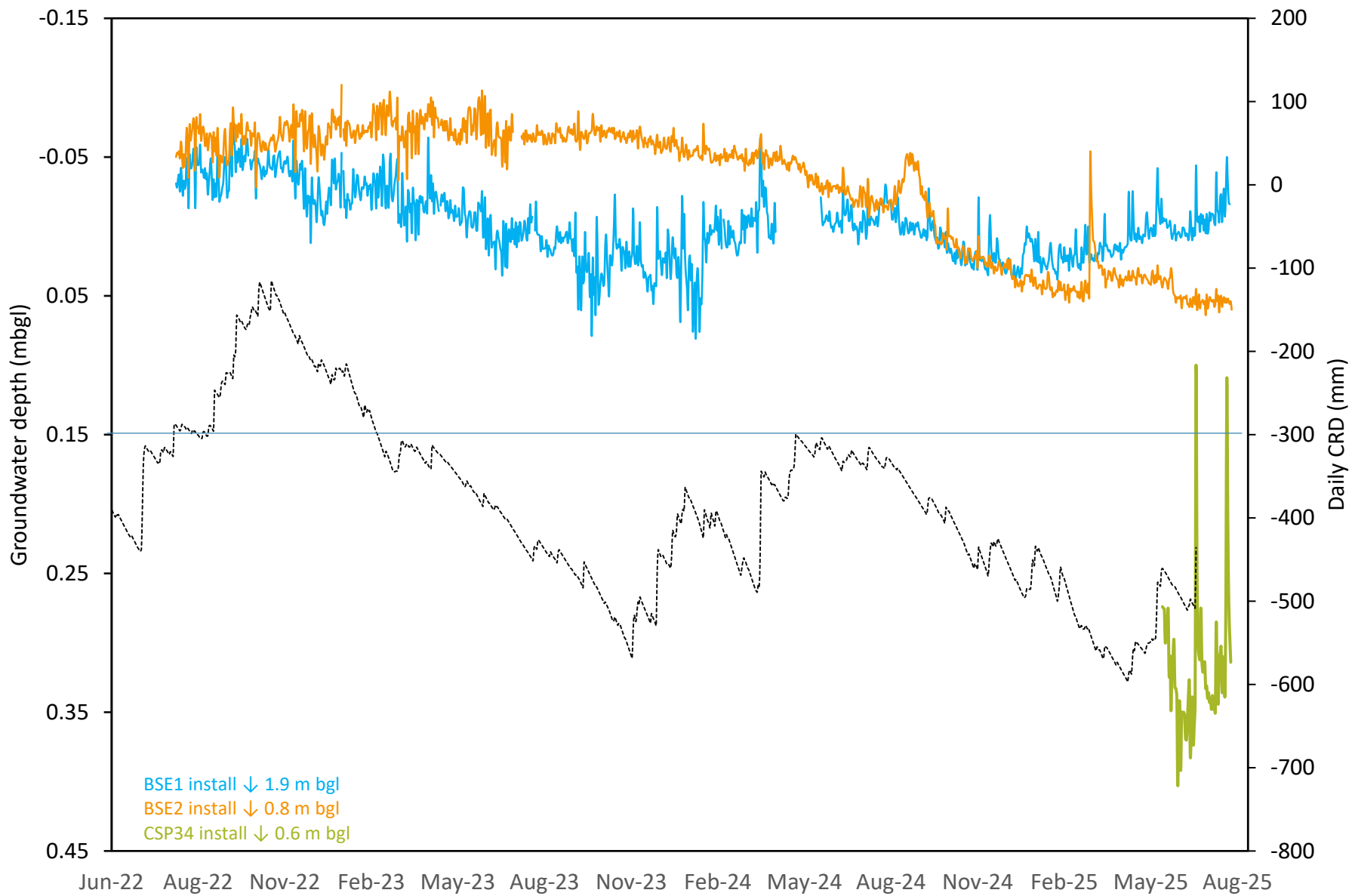
### CLRP27 Vibrating wire piezometer hydrograph

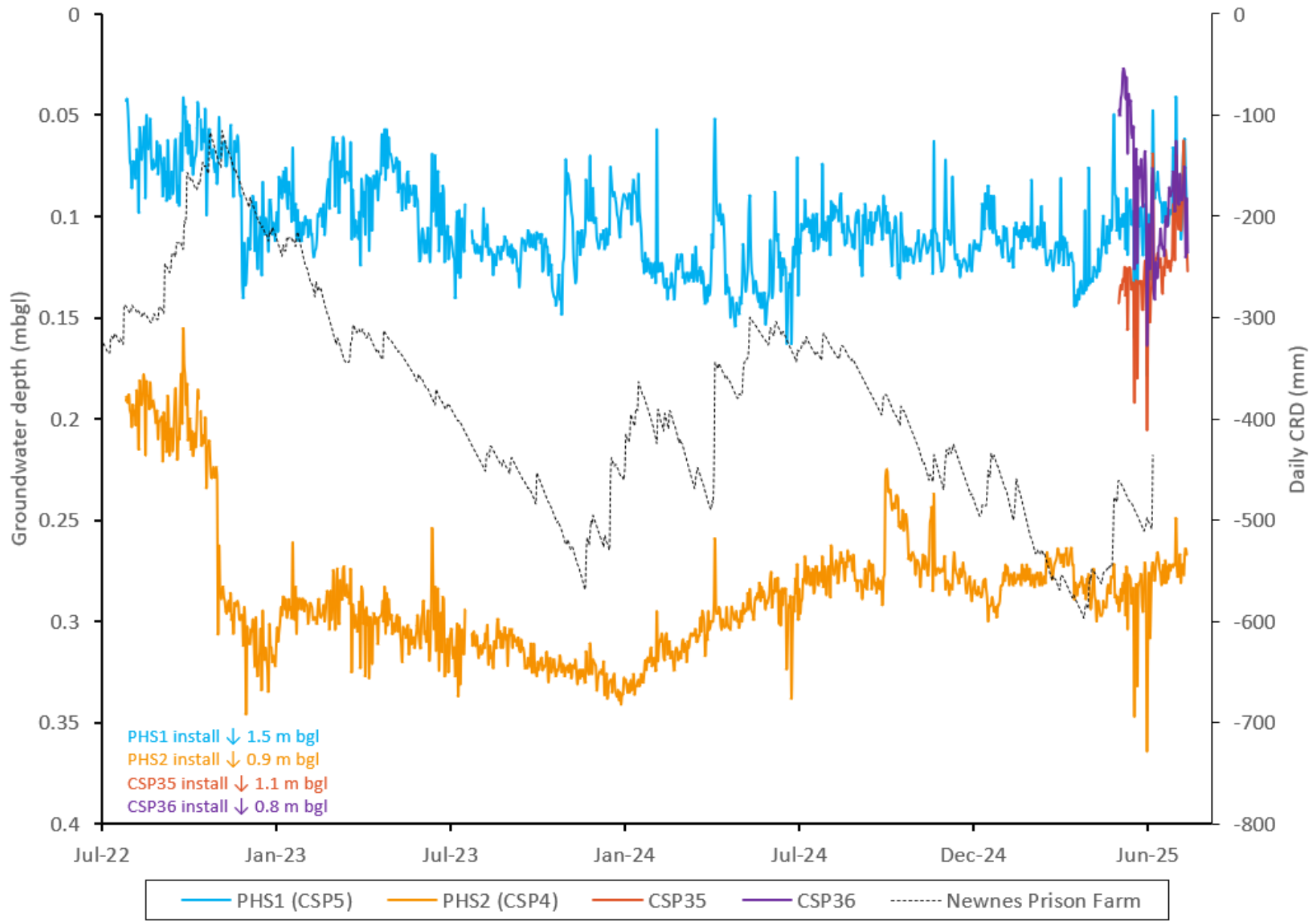




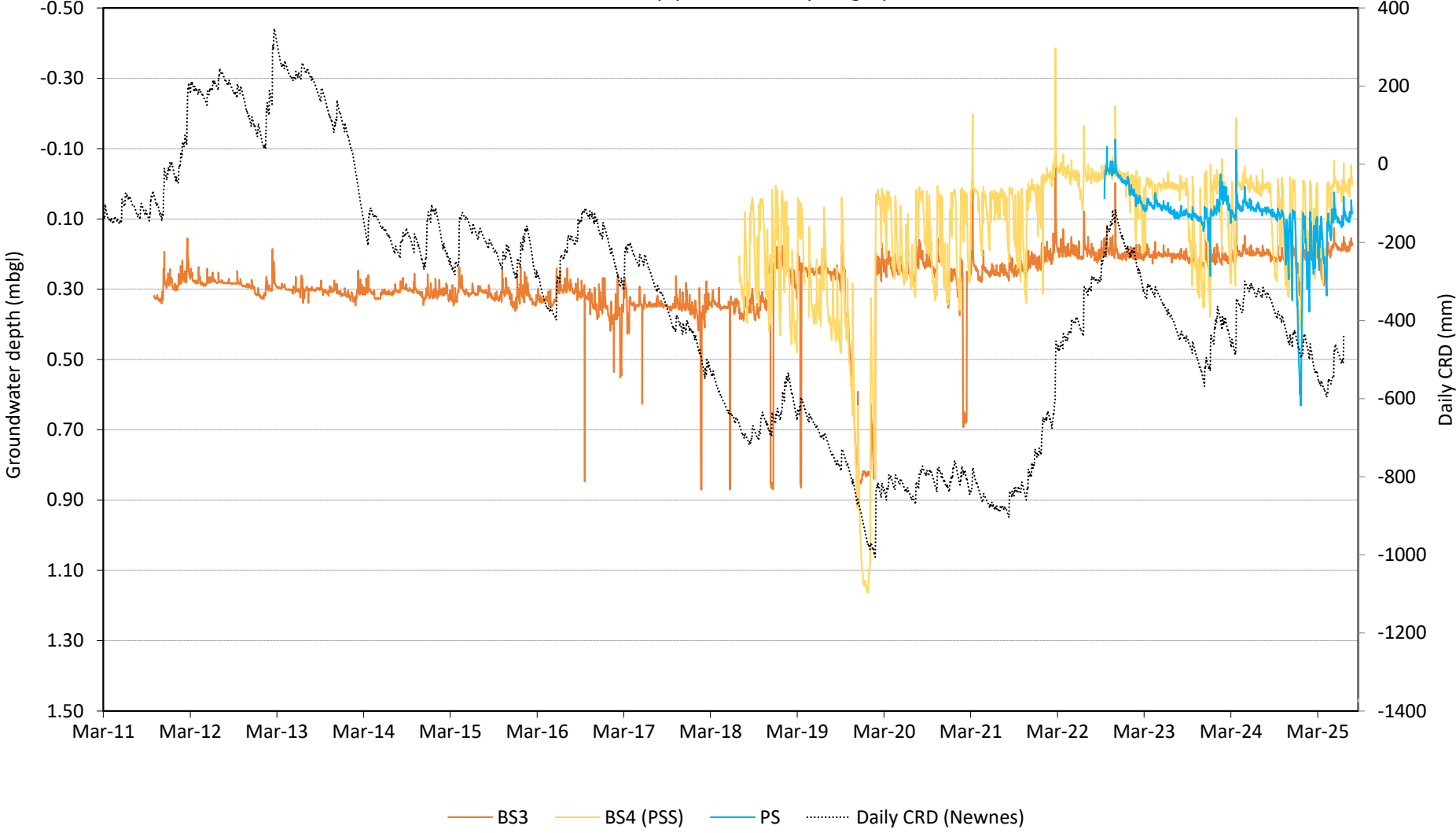




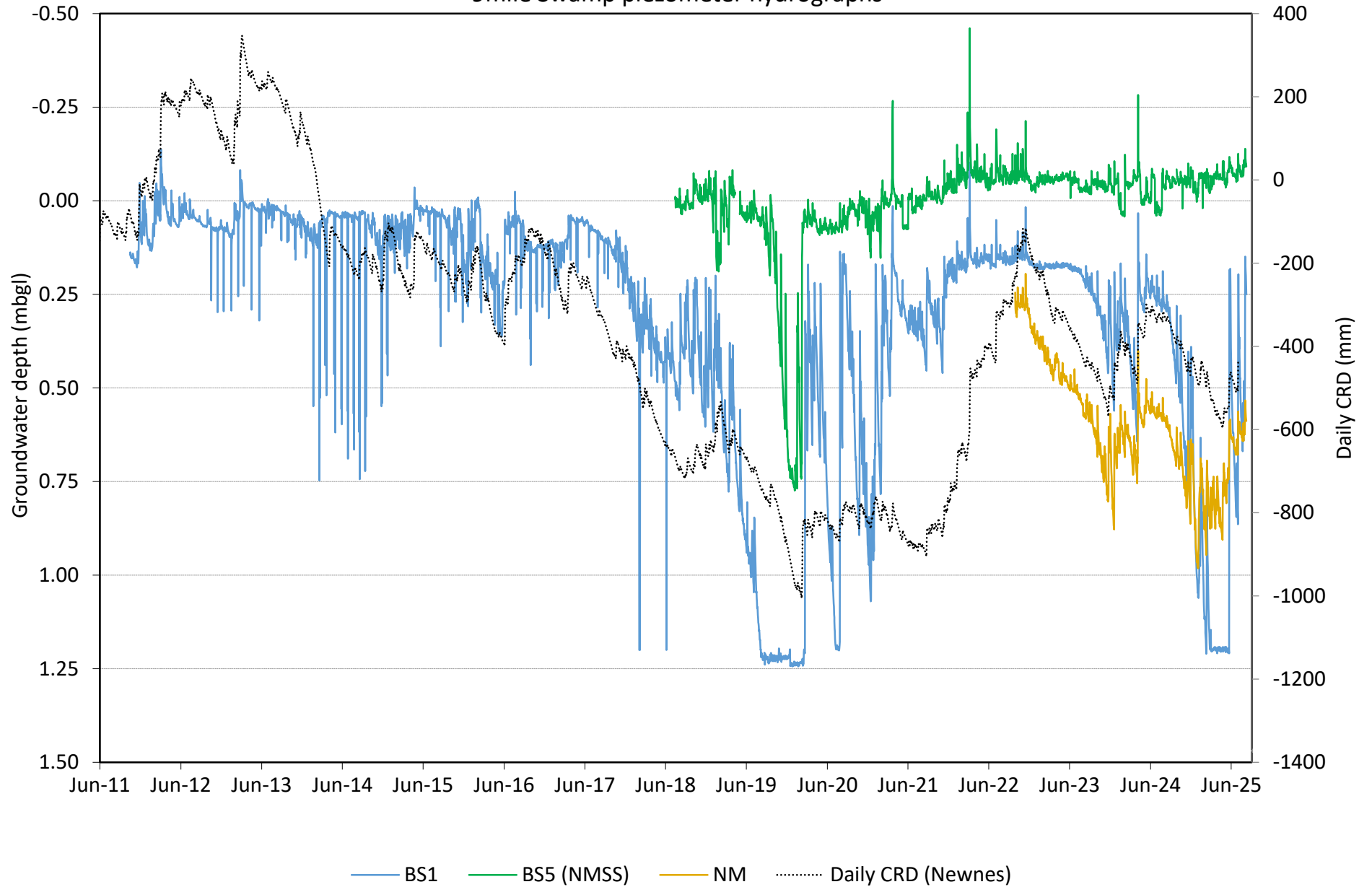




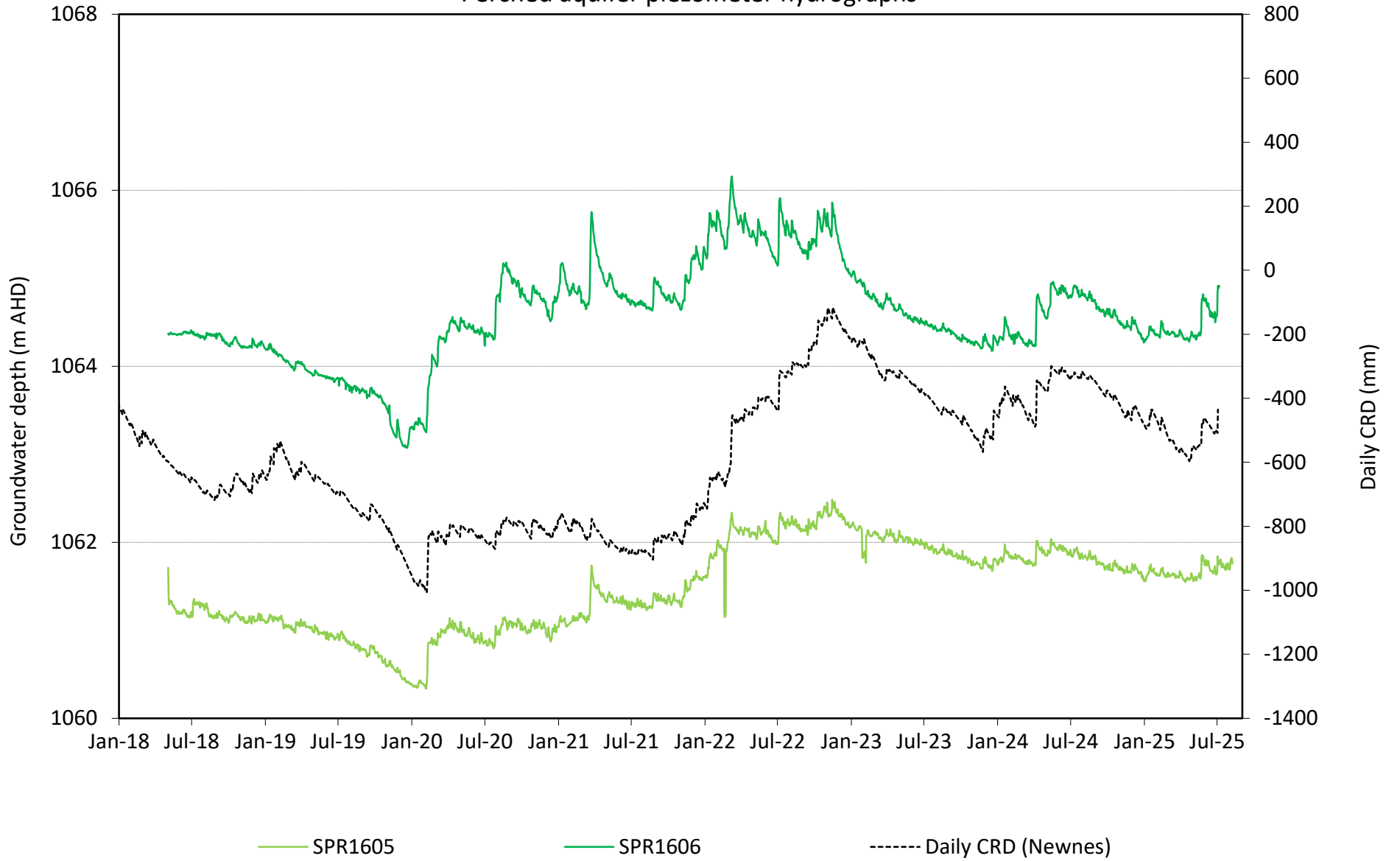
Pine Swamp piezometer hydrographs



# 9mile Swamp piezometer hydrographs



# Perched aquifer piezometer hydrographs



# **Appendix D**

**Registered groundwater bores**

Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW019481	36.5	10BL012303	Domestic	16.4		0.63	16.4	Sandstone
GW042618		10BL102368	Industrial	3.3		2.27	16.7-22.7	Sandstone
GW042618	29.3	10BL102368	Industrial	3.3		2.27	16.7-22.7	Sandstone
GW047445	53.3	Unknown	Domestic					
GW047878	44.2	10BL114826	Irrigation	25.9		0.13,0.13, 0.25	32-32.3, 36.5-37.5, 39.6-42.6	Sandstone
GW047900	21.9	10BL111586	Recreation (Groundwater)	5.2		1.59	5.6-6.5	Sandstone
GW050800	29	10BL109767	Domestic	12.8		0.03, 0.06, 0.25	14.6, 20.10, 25.9	Sandstone
GW050803	29.8	10BL109688	Domestic, Stock	16.7		0.8	24.3-27.4	Sandstone
GW050985	45.7	10BL110300	Not Known					
GW052753	39.6	Unknown	Domestic					
GW054140	61	10BL113870	Domestic	39.6		0.13, 0.18	45.7-46, 56.4-56.7	Sandstone
GW054416	18.3	10BL115979	Domestic	4.6		0.13, 0.25, 0.25	3-5.4, 9.1, 13.7	Clay Gravel, Fractured Shale
GW055249	32	10BL119776	General Use	12.2	Good	0.9	29-30.5	Sandstone
GW055459	48.8	10BL120527	Domestic					
GW056340	35.1	10BL120164	Domestic					
GW057432	12.5	Unknown	General use			0.25	9.4-12.4	Shale
GW058348	99.3	10BL127810	Domestic	36.6	Good	0.38	63.4-65.2	Sandstone
GW059292	52.4	Unknown	Industrial	30.5	501-1000	6.25	44.2-44.5	
GW059377	83.8	10BL127701	Irrigation	64	0-500 ppm	0.5	73.2-82.3	Sandstone
GW059893	50	Unknown	Domestic					
GW059969	36.5	10BL130341	Horticulture					
GW065197	38.1	Unknown	Domestic				27.4-28.9, 33.5-33.8, 35-35.6	
GW067395	5	Unknown	Groundwater Exploration					Sandstone and shale bands

Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW067396	6	Unknown	Groundwater Exploration					Silty clay alluvium/coal
GW067397	4.5	Unknown	Groundwater Exploration					Clayey silt, mixed former topsoil, Fine grey shale
GW067398	5.5	Unknown	Groundwater Exploration					Clay, Fine shale
GW067399	7	Unknown	Groundwater Exploration					Sandstone
GW068258	62.8	10BL140481	Stock, Domestic	16.7		0.25, 0.25, 0.38	27.4-28.9, 33.5-35, 51.8-53.3	Sandstone
GW068505	48.8	10BL140920	Domestic		Good	2.02	6.1-6.4, 21.3-22.9, 24.4-48	Shale, sandstone, coal
GW068514	54.9	10BL140947	Stock, Domestic				22.9-24.4, 33.5-36.6, 48.8-51.8	White sandstone
GW069012	31	Unknown	Stock, Domestic	13	Good	0.13	20-21	Sandstone
GW071914	90	10BL152532	Industrial	16	Fresh	0.06, 0.19, 0.75	24-24.1, 54-54.8, 57.5-57.7	
GW072919	40	10BL156295	Industrial (Mineral Water Extraction)				15-24, 31-33	Shale
GW099052		Unknown						
GW099053								
GW099054		Unknown						
GW100082	74	10BL143324	Domestic	74			36-70	Sandstone with Ironstone Bands
GW100084	72	10BL143351	Domestic	36	Good	1.5	36-60	Sandstone and Iron Stone bands
GW100220	60	10BL152401	Stock, Domestic					
GW100368	90	Unknown	Stock, Domestic					
GW100536	28.04	10BL143041	Domestic					
GW100625	4.1	10BL157434	Monitoring bore	1.5			0-1.5	clay, sand

Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW100626	12	10BL157434	Monitoring bore	5.18			0-5.18	Sandstone, clay, shale
GW100627	6	10BL157434	Monitoring bore				0-0.5	Weathered shale
GW100628	6	10BL157434	Monitoring bore	0.2			0-0.2	Sandstone
GW100629	6	10BL157434	Monitoring bore	1.6			0-1.6	Shale, siltstone
GW100630	21	10BL157434	Monitoring bore	12.5			0-12.5	Sandstone, clay, shale, coal
GW100631	10.5	10BL157434	Monitoring bore	8.2			0-8.2	Sandstone, shale, gravel, siltstone
GW100632	9	10BL157434	Monitoring bore	4.7			0-4.7	Sand, clay, shale
GW100633	9	10BL157434	Monitoring bore	2.9			0-2.9	Sand, sandstone
GW100634	13.8	10BL157434	Monitoring bore	7.9			0-7.9	Clay, shale, siltstone
GW100635	16	10BL157434	Monitoring bore	7.6			0-7.6	Shale, sandstone
GW100636	11	10BL157434	Monitoring bore	3.9			0-3.9	Shale, clay
GW100637	12	10BL157434	Monitoring bore	6.1			0-6.1	Sandstone, shale
GW100638	6	10BL157434	Monitoring bore	0.2			0-0.2	Sandstone
GW100639	10.5	10BL157434	Monitoring bore	8.2			0-8.2	Sandstone, shale, gravel, siltstone
GW100718	15.2	10BL157348	Domestic, Stock	6.1		0.25	6.1-7.9, 9.1-9.3	Sand and gravel, shale
GW100883	18.29	10BL156781	Domestic	3.048		0.06		
GW100897	61	10BL156809	Stock, Domestic	6.4		0.3	42.6-43.2	Granite
GW101484	60	10BL158307	Stock, Domestic	10		0.1	Dec-13	Sandy clay
GW101672	62	10BL158743	Test bore	4		0.03	10.5-11	Coal

Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW101773	15.8	10BL157362	Domestic, Stock	7.6		0.25, 0.25	7.9-8.2, 12.2-12.8	
GW101798	72	10BL157240	Domestic					
GW101882	40	10BL157480	Domestic	16.5		0.089		
GW101947	49	10BL158742	Stock, Domestic	16	Good	0.25	32-33	Soft sandstone
GW101985	30	10BL158537	Domestic	12		0.36	18-19, 24-25	Sandstone
GW102457	83.8	10BL153968	Stock, Domestic	38.1		0.51	44.2-74.6	
GW102712	49	10BL159442	Stock, Domestic	15		2.1, 3.75, 5	29-30, 36-43, 43-47	Sandstone
GW102728	156.5	10BL158917	Test bore					Sandstone
GW103223	10.5	10BL157020	Industrial (Mineral Water Extraction)					
GW103224	7.6	10BL157021	Industrial (Mineral Water Extraction)	3.5		1.67		
GW103495	54.86	10BL159921	Stock, Domestic	21.33		0.6		
GW103496	1	Unknown	Domestic					
GW103517		10BL159984	Stock, Domestic			0.505		
GW103693	76	10BL159691	Domestic	7.8			59-63	Blue shale
GW103734	104	10BL159024	Stock, Domestic	21		0.25	100-104	Sandstone
GW103846	110	10BL160156	Domestic	10				
GW103853	6	10BL160177	Domestic	2		0.28		
GW103909	40.6	Unknown	Industrial					
GW104058	70	10BL160248	Stock, Domestic			1		
GW104222	38.8	Unknown	Monitoring bore				14-17	Sandstone
GW104364	76.2	10BL156513	Stock, Domestic				60.9-61.2	Sandstone
GW104879	90	10BL160465	Test bore					
GW104880	200	10BL160465	Test bore					
GW104914	72	10BL160840	Stock, Domestic	16		0.13, 0.01, 0.13	11-12, 30-34, 41-42	Blue shale

Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW104916	56	10BL160788	Stock, Domestic	16		0.13, 0.32	32-40, 47-48	Fractured Blue Shale
GW105165	6	10BL157680	Stock, Domestic	2				
GW105226	104	10BL160971	Domestic	41		0.3, 0.45	85-86, 92-93	Sandstone
GW105291	194	Unknown	Domestic					
GW105292	194	10BL161941	Domestic	72		0.063	85-85.5, 183-183.5	Sandstone
GW105433	72	10BL163805	Domestic	12		0.06, 0.38	11.5-12, 58-58.5	Sandstone
GW105434	72	10BL163806	Domestic	16		0.18	60-64	Sandstone
GW105435	72	10BL163807	Domestic	12		0.13, 0.32	18-24, 40-42	Sandstone
GW105466	44.81	10BL162237	Domestic			0.5		
GW105576	126.5	10BL162495	Stock, Domestic	88	47.6, 21.3	0.1, 0.6	99.5-102.5, 114.5-116	Quartz Porphyry
GW105672	72.7	10BL162736	Domestic	18		1	24-66	Sandstone
GW105734	120	10BL156676	Domestic			0.5		
GW105874		10BL163080	Domestic					
GW105993	80	10BL162723	Domestic	35			48-80	Sandstone
GW106211	30	10BL161987	Stock, Domestic	6		0.25	29-30	Sandstone
GW106213		Unknown	Domestic					
GW106239		10BL163840	Domestic					
GW106240		10BL163839	Domestic					
GW106241		10BL163838	Domestic					
GW106242		10BL163837	Domestic					
GW106244		10BL163841	Domestic					
GW106314		10BL163867	Domestic					
GW106315	26	10BL163868	Domestic					
GW106376	35	10BL163866	Domestic					
GW106584	45.72	10WA116344	Domestic	24.38		0.25		

Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW106601	30	Unknown	Domestic					
GW106646	30	10BL160376	Industrial - Sand and Gravel	27		20		
GW106794	42	10BL161213	Domestic	9		0.19	Sep-34	Sandstone
GW106966	78	10BL164555	Stock, Domestic	42		0.02, 0.35	42-42.1, 73-73.2	Sandstone
GW107340	89	10BL165332	Domestic, Stock	40		1.26	69-72	Sandstone
GW107698	25	10BL165898	Domestic					
GW107875	64	10BL164623	Stock, Domestic	20		0.252	32-33, 59-60	Sandstone
GW107909	114	10BL165410	Stock, Domestic				53-54, 62-66, 94-96, 110-111	Sandstone, quartz; sandstone, ironstone
GW108185	295	10BL161965	Monitoring bore			0.5		
GW108187	197	10BL161964	Monitoring bore	175		0.5		
GW108766	113	10BL601112	Domestic	36		0.25	36-66, 72-107	Sandstone
GW109022	78	10BL602032	Stock, Domestic	34		0.1, 0.1	42-48, 54-60	Sandstone
GW109125	4.5	10BL602230	Monitoring bore	3.5		1	3-4.5	Silty clay/sandstone
GW109126	2.9	10BL602230	Monitoring bore	2.5	512	1	2.5-2.9	Weathered sandstone
GW109127	1.5	10BL602230	Monitoring bore	1.3		0.1	1.3-1.5	Sandstone
GW109128	4.5	10BL602230	Monitoring bore	3.6	800	1	3.6-4.5	Silty sand, sandstone, shale
GW109307	55	10BL601996	Domestic					
GW109332	71.3	10BL161962	Monitoring bore	8.87		1	20-69	Sandstone, siltstone
GW109336	319.5	10WM000002	Conservation of water, Power Generation, Recreation - Low Security				54-58, 287-290.5, 310-314	Coal

Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW109337	400	10WM000002	Recreation - Low Security, Conservation of water, Power Generation			0.25, 0.75, 3	53-55, 79-81, 388-390	Sandstone, Coal
GW109447		Unknown	Monitoring bore					
GW109448	5	Unknown	Monitoring bore					
GW109449	5	Unknown	Monitoring bore	2.21				
GW109450	5	Unknown	Monitoring bore	2.21				
GW109451	5	Unknown	Monitoring bore	2.21				
GW109452	5	Unknown	Monitoring bore	2.21				
GW109766	258	10BL602213	Monitoring bore					
GW109767	273.6	10BL602212	Monitoring bore					
GW109783	271.9	10BL602211	Monitoring bore					
GW109842	72	10BL165797	Monitoring bore	53	48	0.5	70.2-70.3	Fractured Quartz
GW109843	72	10BL165797	Monitoring bore	62			64-72	Sandstone
GW109844	60	10BL165797	Monitoring bore	34	39	0.1	34-45	Ironstone, quartz
GW109845	42	Unknown	Monitoring bore	26		0.1	31-42	Sandstone
GW109846	30	10BL165797	Monitoring bore	17	17	0.1	18-30	Sandstone, Quartz bands
GW110078	4.7	10BL164957	Monitoring bore	2.62			2.62-4.2	Clay, shale
GW110079	4	10BL164957	Monitoring bore		270		1.39-3.96	Clay, shale
GW110080	4	10BL164957	Monitoring bore	2.83	390		2.83-4	Fill, clay, shale
GW110081	4.7	10BL164957	Monitoring bore	2.52	270		2.52-4.22	Shale
GW110082	3.8	10BL164957	Monitoring bore	3.72	80.1		3.72-3.8	Shale
GW110083	4	10BL164957	Monitoring bore	1.3	113		1.3-3.47	Clay, shale
GW110188	290	10BL602820	Monitoring bore			0.2, 0.5, 0.25	18-20, 65-66, 185-188	Sandstone
GW110190	199	10BL602819	Monitoring bore			0.25, 0.25	58-62, 185-195	

Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW110704	1.55	10BL603337	Monitoring bore	0.2			0.2-1.55	Peat, Sand
GW110705	1.7	10BL603337	Monitoring bore	0.2			0.2-1.7	Peat, sand, sandy gravel
GW110706	1.1	10BL603337	Monitoring bore	0.2			0.2-1.1	Sand
GW110707	1.4	10BL603337	Monitoring bore	0.2			0.2-1.4	Sandy Clay, Clayey Sand, Sand
GW110939	1.27	10BL603706	Monitoring bore	0.2			0.3-1.27	Sand
GW110940	1.15	10BL603706	Monitoring bore	0.3			0.3-1.15	Clayey sand
GW110941	1.25	10BL603706	Monitoring bore	0.3			0.3-1.25	Silty clay with sand, sand, gravelly sand
GW111317	229	10BL604098	Monitoring bore					
GW111318	140	10BL604098	Monitoring bore			0.25,0.5	50-54, 114-120	
GW111319	156	10BL604098	Monitoring bore			0.5, 0.25	60-66, 114-120	
GW111338	215	10BL604099	Monitoring bore			0.25, 0.5	36-40, 114-120	
GW111339	280	10BL604099	Monitoring bore			0.5, 0.5	124-130, 194-196	
GW111340	265	10BL604099	Monitoring bore			0.5,1.0	114-120, 174-180	
GW111620	110	10WA116375	Domestic		Good	0.5	78-80, 96-100	Sandstone
GW111711	60	Unknown	Domestic					
GW111866	387	10BL603154	Monitoring bore			0.5, 1, 1.5	30-34, 66-70, 260-270	
GW111867	422	10BL603154	Monitoring bore				28-30, 180-190, 240-250	
GW111868	285	10BL603154	Monitoring bore			1.5	60-66	
GW112429	380	10BL604512	Monitoring bore			0.3, 0.5, 0.75	40-44, 140-145, 250-256	Sandstone
GW112442		10BL602014	Monitoring bore					
GW112443		10BL602014	Monitoring bore					

Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW112445		10BL602014	Monitoring bore					
GW112446		10BL602014	Monitoring bore					
GW112447		10BL602014	Monitoring bore					
GW112448		10BL602014	Monitoring bore					
GW112449		10BL602014	Monitoring bore					
GW112450		10BL602014	Monitoring bore					
GW112451		10BL602014	Monitoring bore					
GW112452		10BL602014	Monitoring bore					
GW112455		10BL602014	Monitoring bore					
GW112457		10BL602014	Monitoring bore					
GW112463		10BL602014	Monitoring bore					
GW112464		10BL602014	Monitoring bore					
GW112468		10BL602014	Monitoring bore					
GW112469		10BL602014	Monitoring bore					
GW112470		10BL602014	Monitoring bore					
GW112471		10BL602014	Monitoring bore					
GW112526	108	10BL604765	Mining, Dewatering (Groundwater)					
GW112531		10BL604020	Monitoring bore					Silty sand, some gravel
GW112532	3	Unknown	Monitoring bore					Silty sand, some gravel
GW112533	3	Unknown	Monitoring bore					Silty sand, gravel
GW112534	22	10BL604020	Monitoring bore					Sandstone
GW112535	18	Unknown	Monitoring bore					Silty sand, gravel, sandstone

Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW112536	11.5	Unknown	Monitoring bore					Silty sand, some gravel, sandstone
Gw112563		10BL601909	Mining, Dewatering (Groundwater)					
GW112565		10BL601908	Mining, Dewatering (Groundwater)					
GW112566		10BL603192	Dewatering (Groundwater)					
GW112719		10BL602827	Monitoring bore					
GW112720		10BL602827	Monitoring bore					
GW112721		10BL602827	Monitoring bore					
GW112722		10BL602827	Monitoring bore					
GW112845		10BL604713	Monitoring bore					
GW112846		10BL604713	Monitoring bore					
GW112847		10BL604713	Monitoring bore					
GW112848		10BL604713	Monitoring bore					
GW112849		10BL604713	Monitoring bore					
GW112850		10BL604713	Monitoring bore					
GW112851		10BL604713	Monitoring bore					
GW112852		10BL604713	Monitoring bore					
GW112853		10BL604713	Monitoring bore					
GW112854		10BL604713	Monitoring bore					
GW113101	422	10BL605313	Test bore				50-58, 365-375	Sandstone, Siltstone
GW113102	422	10BL605313	Test bore				50-58, 365-375	Sandstone, Siltstone, Mudstone, Coal
GW113103	422	10BL605313	Test bore				50-58, 365-375	Sandstone, Siltstone, Mudstone, Coal

Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW113104	422	10BL605313	Test bore				50-58, 365-375	Sandstone, Siltstone, Mudstone, Coal
GW113278		10BL163987	Monitoring bore					
GW114215	9	Unknown	Monitoring bore					
GW114216	9	Unknown	Monitoring bore					
GW114217	9	Unknown	Monitoring bore					
GW114218	10	Unknown	Monitoring bore					
GW114247		10BL605131	Monitoring bore					
GW114248		10BL605131	Monitoring bore					
GW114249		10BL605131	Monitoring bore					
GW114250		10BL605131	Monitoring bore					
GW114251		10BL605131	Monitoring bore					
GW114270		10BL604512	Monitoring bore					
GW114271		10BL604512	Monitoring bore					
GW114273		10BL604512	Monitoring bore					
GW114285		10BL604512	Monitoring bore					
GW114301		10BL603802	Monitoring bore					
GW114537	3.8	10BL604607	Monitoring bore			1	2.6-3.8	Silty Clay, Weathered shale
GW114538	3.3	10BL604607	Monitoring bore	1.9		1	2.2-3.3	Silty Clay
GW114539	3.9	10BL604607	Monitoring bore	1.9		1	2.8-3.9	Silty clay
GW114597	20.5	Unknown	Monitoring bore					
GW114598	25.2	Unknown	Monitoring bore					Shale, coal
GW114856	335	Unknown	Monitoring bore					
GW114856	335	10BL605612	Monitoring bore					
GW114938	259	Unknown	Monitoring bore			0.5, 1	114-120, 174-180	

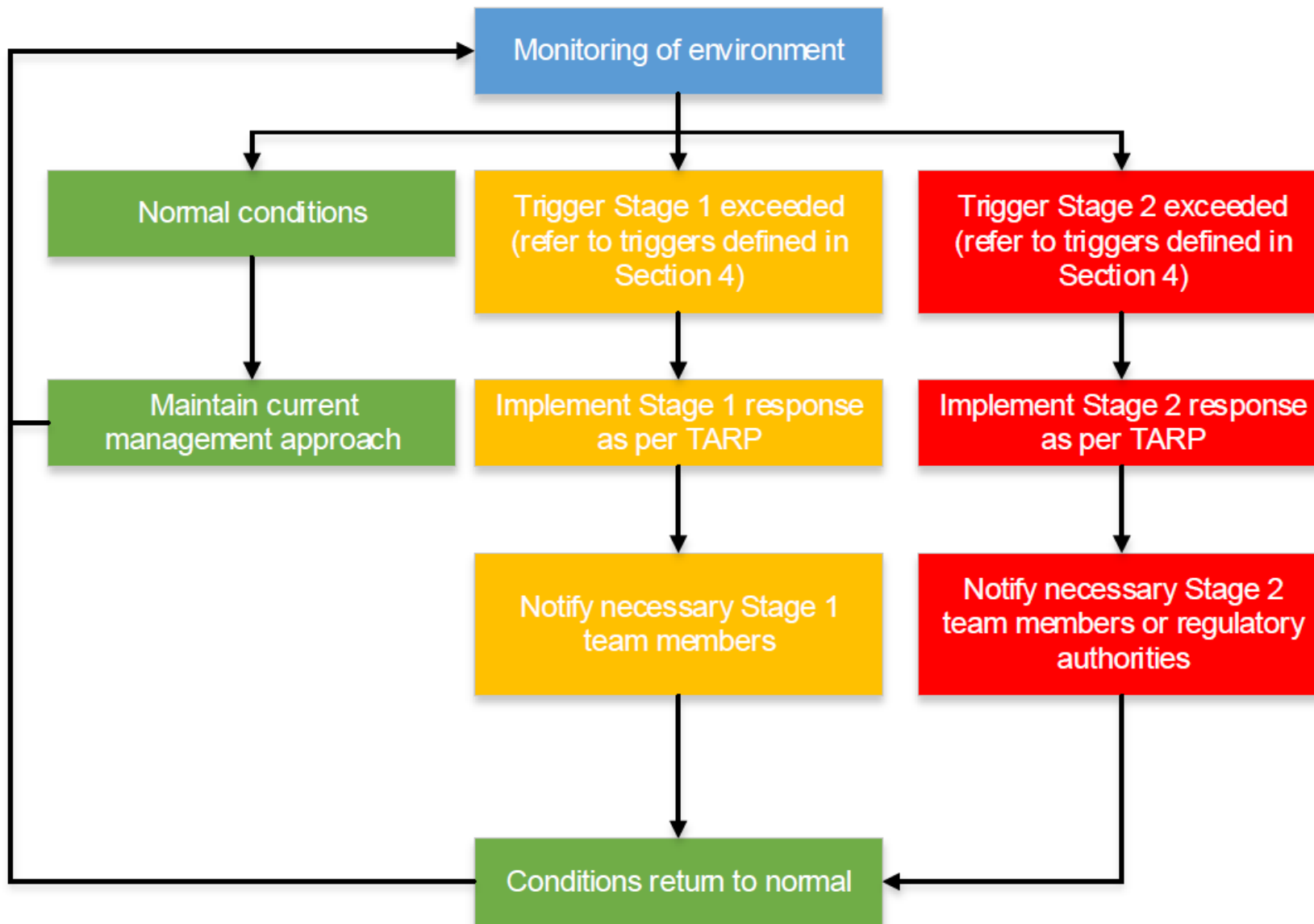
Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW114938	259	10BL604063	Monitoring Bore			1		
GW115052	130	Unknown	Monitoring bore	4.3				Sandstone
GW115053	130	Unknown	Monitoring bore	32				Sandstone
GW115053	130		Monitoring Bore	32				
GW115137	10	Unknown	Monitoring bore					Shale, coal
GW115138	2.9	Unknown	Monitoring bore					Clay, shale
GW115139	10	Unknown	Monitoring bore					Shale, coal
GW115140	10	Unknown	Monitoring bore					Shale, coal
GW115149	132	10WA119087	Domestic	80		0.01, 0.49	32-33, 108-132	Sandstone, sand
GW115156								
GW115293								
GW115445								
GW115446								
GW115459								
GW115761	78	10WA121745	Stock, domestic	30		30	47-48, 59-60, 65-66	Sandstone
GW116312	1	UNKNOWN	Monitoring bore					
GW116315	1.1	UNKNOWN	Monitoring bore					
GW116317	1.1	UNKNOWN	Monitoring bore					
GW116321	0.7	UNKNOWN	Monitoring bore					
GW116322	8.86	UNKNOWN	Monitoring bore				3.8-4	Sandstone
GW116323	9	UNKNOWN	Monitoring bore				2-2.1	Gravel
GW116324	10.2	UNKNOWN	Monitoring bore				3.8-4	Sandstone
GW116581								
GW116967	52	UNKNOWN		17		0.8	28-40	Sandstone
GW116968	162	UNKNOWN		40		0.4, 0.3, 0.3	42-48, 72-78, 98-104	Sandstone

Bore	Depth (m)	Licence	Purpose	Standing water level (m bgl)	Salinity	Yield (L/s)	Water bearing zone (m bgl)	Aquifer
GW116970	66	UNKNOWN		30	100	0.8	45-55	Sandstone
GW116971	72	UNKNOWN		48	90, 100	0.2, 0.5	26-28, 60-70	Sandstone
GW117384	308.5		Monitoring bore					
GW204603		Unknown						
GW204606								
GW204610								
GW204611								
GW276094	49.9	UNKNOWN					38-49.9	Sandstone
GW276103	54	UNKNOWN					41-47	Sandstone

Note: blank cell denotes information unknown

# **Appendix E**

**Trigger action response plans**



Aspect	Normal	Trigger 1	Trigger 2	Response
<b>Groundwater environment</b>				
Groundwater quality	No community complaints to Clarence regarding groundwater quality	<p>Community complaint to Clarence regarding groundwater quality.</p> <p><b>Action: Review recent monitoring results and any relevant operational data (e.g., mining activities, meteorological data).</b></p> <p><b>Undertake investigation to determine if the change in groundwater quality is due to mining-related activities.</b></p>	<p>Investigation into Stage 1 trigger identified that change in groundwater quality is due to mining related activity.</p> <p><b>Action: If environmental impacts are unacceptable and/or if the beneficial use of the groundwater changes, remediation options will be considered.</b></p> <p><b>Loss of water supply from an adjacent landholder will need to be replaced by Clarence.</b></p>	<p><b>Trigger 1: Notify Environment and Community Coordinator/ Mine Manager as soon as non-conformance is detected.</b></p> <p><b>Trigger 2: Notify relevant agencies in accordance with Pollution Incident Response Management Plan (PIRMP) requirements or if material harm has occurred.</b></p> <p><b>Notify DPE (DPE-Water) and any potentially affected landowners as soon as practicable if the investigation into the Stage 1 trigger identifies that change in groundwater quality is due to mining related activities.</b></p>

Aspect	Normal	Trigger 1	Trigger 2	Response
<p>Groundwater level – above Mount York Claystone</p> <p>Clarence Environment and Community Coordinator to review data as it becomes available and action the necessary response/action if groundwater levels are below the trigger values presented in Table 4.2</p>	<p>Monitoring groundwater levels are greater than values presented in Table 4.2</p>	<p>Monitored groundwater levels are below the values presented in Table 4.2.</p> <p><b>Action: Review recent monitoring results including at control sites and any relevant operational data (e.g., mining activities, meteorological data). Investigate the source of the exceedance.</b></p>	<p>Investigation into Stage 1 trigger identifies that trigger exceedance is due to mining-related activity.</p> <p>Community complaint to Clarence regarding groundwater levels.</p> <p><b>Action: Verify whether monitoring results are consistent with hydrogeological model predictions and consider recalibration.</b></p> <p>Loss of alluvial groundwater may need to be licensed under the water sharing plan.</p> <p><b>If predicted environmental impacts are unacceptable, develop and implement corrective/preventative actions based on the outcomes of the investigation. This will implementing Adaptive Management Procedures including review of mine design of future extraction areas.</b></p>	<p><b>Trigger 1: Notify Environment and Community Coordinator/ Mine Manager as soon as non-conformance is detected.</b></p> <p><b>Trigger 2: Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred.</b></p> <p><b>Notify DPE, DPE-Water as soon as practicable if the investigation into the Stage 1 trigger identifies that change in groundwater levels is due to mining related activities.</b></p> <p><b>Calibrate geotechnical, subsidence and groundwater models.</b></p> <p><b>Review of mine plan and extraction voids by experienced and qualified geotechnical/ subsidence engineers.</b></p>
<p>Groundwater inflow</p>	<p>Groundwater inflow into the 918 Panel is within 20% of modelled groundwater inflow.</p> <p>Review to be undertaken once every three months and at the end of sub-panel.</p>	<p>Groundwater inflow into the 918 Panel exceeds modelled groundwater inflow by more than 20%.</p> <p><b>Action: Investigate the source of the exceedance. Review recent monitoring results including relevant operational data (e.g., mining activities, meteorological data).</b></p> <p><b>Commence recalibration of the numerical groundwater model.</b></p> <p><b>Review total groundwater inflow into the mine workings and compare against volume of WALs held by Clarence.</b></p>	<p>Investigation into Stage 1 trigger identifies that total groundwater inflow into the mine workings exceeds volume of WALs held by Clarence.</p> <p><b>Action: Notify DPE, DPE-Water and commence negotiations to obtain additional WAL volume.</b></p>	<p><b>Trigger 1: Notify Environment and Community Coordinator/ Mine Manager as soon as non-conformance is detected.</b></p> <p><b>Trigger 2: Notify DPE, DPE-Water if investigations identify total groundwater inflow into the mine workings exceeds the volume of WALs held by Clarence.</b></p>

Aspect	Normal	Trigger 1	Trigger 2	Response
<b>Surface water and swamps</b>				
<p>Water quality Clarence Environment and Community Coordinator to review data as it becomes available and action the necessary response/action if water quality parameters monitoring locations are within or below SSGVs provided in Table 4.1 for Bungleboori Creek, Paddys Creek, Paddys Creek East Swamp, Nine Mile Swamp, and Pine/Nine Mile Swamp.</p>	<p>Water quality parameters at monitoring locations are within or below SSGVs provided in Table 4.1 for Bungleboori Creek, Paddys Creek, Paddys Creek East Swamp, Nine Mile Swamp, and Pine/Nine Mile Swamp.</p>	<p>Water quality parameters are outside or above SSGVs provided in Table 4.1 for Bungleboori Creek, Paddys Creek, Paddys Creek East Swamp, Nine Mile Swamp, and Pine/Nine Mile Swamp or not consistent with historical baseline for at least one parameter for two consecutive sampling events.</p> <p><b>Action: Review recent monitoring results and any relevant operational data (e.g., operational activities, meteorological data) and identify any potentially contributing factors.</b></p> <p><b>Investigate the source of the exceedance.</b></p>	<p>Investigation into Stage 1 trigger identifies that trigger exceedance is due to operational activity.</p> <p>Community complaint to Clarence regarding surface water quality.</p> <p><b>Action: determine if an incident has potentially occurred.</b></p> <p><b>Increase monitoring frequency and undertake additional monitoring where relevant.</b></p> <p><b>Develop and implement corrective/preventative actions, in consultation with relevant agencies, based on the outcomes of the investigation and additional monitoring.</b></p>	<p><b>Trigger 1: Notify Environment and Community Coordinator/Mine Manager as soon as exceedance is detected.</b></p> <p><b>Trigger 2: Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred.</b></p> <p><b>Notify DPE, DPE-Water as soon as practicable if Stage 2 exceedance is found to be mining related.</b></p>

Aspect	Normal	Trigger 1	Trigger 2	Response
<p>Water flow Clarence Environment and Community Coordinator to review data as it becomes available and action the necessary response/action based on the trigger level.</p>	<p>Creek flow rates and relationships with rainfall are consistent with historical baseline results.</p>	<p>Reduction in flow compared with historical baseline results and reference sites.</p> <p><b>Action: Review recent monitoring results and any relevant operational data (e.g., operational activities, meteorological data) and identify any potentially contributing factors.</b></p> <p><b>Investigate the source of the reduction in flow and develop corrective/ preventative actions based on outcomes.</b></p>	<p>Loss of flow compared with historical baseline results and reference sites.</p> <p>Community complaint to Clarence regarding surface water flow.</p> <p><b>Action: Review recent monitoring results and any relevant operational data (e.g., operational activities, meteorological data) and identify any potentially contributing factors.</b></p> <p><b>Determine if an incident has potentially occurred and investigate the sources of the loss of flow.</b></p> <p><b>Develop and implement corrective/preventative actions, in consultation with relevant agencies, based on the outcomes of the investigation and additional monitoring. This will include review of mine design of future extraction areas.</b></p> <p><b>Loss of water supply from an adjacent landholder will need to be replaced by Clarence.</b></p>	<p><b>Trigger 1: Notify Environment and Community Coordinator/Mine Manager as soon as non-conformance is detected.</b></p> <p><b>Trigger 2: Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred.</b></p> <p><b>Notify DCCEEW, DCCEEW-Water as soon as practicable if loss in flow is mining related.</b></p>

Aspect	Normal	Trigger 1	Trigger 2	Response
<b>Geomorphic condition and watercourse stability</b>				
Stream and riparian vegetation	Refer to Appendix 2 of the Biodiversity Management Plan (RPS, 2026) for TARP for Stream and riparian vegetation			
Watercourse instabilities Clarence Environment and Community Co-ordinator to review data as it becomes available and action the necessary response/action based on trigger level.	Subsidence within predictions. <b>Action: Continue site inspections in accordance with the monitoring program. To be conducted 6-monthly before, during, and post mining for three years post extraction. With the objective of monitoring to confirm mining induced changes on watercourse stability/or condition compared to baseline conditions.</b>	Subsidence is greater than 100 mm. <b>Action: Within 3 months of observation of subsidence being greater than 100 mm, undertake watercourse stability monitoring by qualified and experienced geomorphologist at the monitoring locations listed in Table 2.3. Continue 6-monthly monitoring frequency if deemed appropriate by the geomorphologist.</b>	Watercourse monitoring indicates one or more areas of instabilities in watercourses possibly as a result of subsidence impacts. Causing sediment loads to migrate and/or impact to riparian vegetation. <b>Action: Immediately isolate areas of instability and implement remediation measures to stabilise surface and/or watercourse. Any remedial measures for stream rehabilitation to be consistent with the Rutherford et al (2000) – prioritising protection of existing stable features, early intervention, use of soft-engineering techniques, targeted structural controls where required, and documented implementation and monitoring of effectiveness. Refer to GHD (2025) for possible engineering solutions, noting that these are provided as indicative examples only and do not constitute prescriptive requirements or mandatory actions. Investigate the factors contributing to the instability, which may include advice from technical specialists.</b>	<b>Trigger 1: Notify Environment and Community Coordinator/Mine Manager as soon as practicable.</b> <b>Trigger 2: Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred.</b> Notify DCCEEW-Water as soon as practicable. Calibrate geotechnical, subsidence and groundwater models. Review of mine plan and extraction voids by experienced and qualified geotechnical/subsidence engineers

Aspect	Normal	Trigger 1	Trigger 2	Response
			<p>Implement corrective/preventative actions based on the outcomes of the investigation and/or additional monitoring. Prioritise actions based on the risk to the environment and likelihood of further impact. This will include review of mine design of future extraction areas.</p> <p>Increase monitoring frequency in consultation with DCCEEW-Water and undertake additional monitoring where relevant.</p>	



[ghd.com](http://ghd.com)

→ **The Power of Commitment**