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REPORT ON

CENTRAL NORTH EXTENSION ANNUAL GROUNDWATER MONITORING REPORT

JULY 2023 TO JUNE 2024 WATER YEAR

Project number: 4159

Date: 01/04/2025

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Central North Extension Annual Groundwater Monitoring Report

July 2023 to June 2024 Water Year

Prepared for

Jellinbah Group Pty Ltd

1. Introduction

This Annual Groundwater Monitoring Report for the Central North Extension Project (the Project) has been prepared by **hydrogeologist.com.au** on behalf of the Jellinbah Group Pty Ltd (Jellinbah) to satisfy the conditions of the Project's Associated Water Licence (AWL) number 624007. The AWL authorised activity includes the taking of and interfering with associated water from the Rangal Coal Measures and adjacent formations with the point of take on or under the area of Mining Leases (ML) 700011, 700012 and 700013.

Jellinbah Resources have an obligation under the AWL for the Project to prepare an Annual Monitoring Report, with the report requirements outlined in Condition 47. The Annual Monitoring Report requirements under Condition 47 of the AWL and the report section in which they are addressed, are summarised in Table 1-1.

Table 1-1   Reporting requirements and report section

| AWL Condition	Requirement	Report section
47	The Licensee must provide an Annual Monitoring Report to the chief executive. These reports must include:	
	a) the underground water levels in the monitoring bores of the approved Underground Water Monitoring Program.	Section 5
	b) maps showing the actual water level drawdown contours for each aquifer.	Section 5
	c) details of the underground water model and any review undertaken of the underground water model since the previous Annual Monitoring Report.	Section 6
	d) an assessment of any differences between the actual water level impact and the impact predicted for the same period by the underground water model.	Section 6
	e) details of any bores which are predicted by the underground water model to be located in the affected area.	Section 7
	f) raw data provided in a format as requested by the chief executive.	Attachment B

2. Geology and hydrogeology

The Project is located within the central part of the Bowen Basin, an early Permian to middle Triassic age basin that covers an area of approximately 160,000 km². Table 2-1 shows the stratigraphic relationship and description of strata that occurs within the Project area. This includes Bowen Basin strata (Late Permian Burngrove Formation and Rangal Coal Measures and the Triassic Rewan Group) that are overlain by Quaternary / Tertiary alluvium.

Figure 2-1 shows the Bowen Basin solid geology for the Project area. The Project area is underlain predominantly by strata of the Rangal Coal Measures, with the underlying Burngrove Formation and the overlying Rewan subgroup. The Rangal Coal Measures contain the target coal seams for mining. The Permian and Triassic units are overlain by unconsolidated Quaternary and Tertiary alluvium, with the Quaternary age alluvial sediments associated with surface drainage features such as Twelve Mile Creek and the Mackenzie River. The surface geology of the Project area is shown in Figure 2-2.

Table 2-1   Stratigraphy

Geological age	Unit	Lithology	Thickness (m)
Quaternary	Alluvium	Unconsolidated soil, silt clay, sand and gravel associated with current surface drainage systems, e.g. Blackwater Creek and Mackenzie River	0 to 50
Tertiary	Duaringa Formation and residual units	Mudstone, sandstone, conglomerate, siltstone	0 to 30
Triassic	Rewan Group	Lithic sandstone, pebbly lithic sandstone, green to reddish brown mudstone and minor volcanilithic pebble conglomerate at base.	0 to 100
Late Permian	Rangal Coal Measures	Feldspathic and lithic sandstone, carbonaceous mudstone, siltstone, tuff and coal seams. Coal seams include Aries, Castor and Pollux Seam	100 + m
		- Aries	0 to 1
		- Castor	0 to 1
		- Pollux	0 to 10
	Burngrove Formation	Mudstone, siltstone, sandstone, coal, tuff	0 to 90
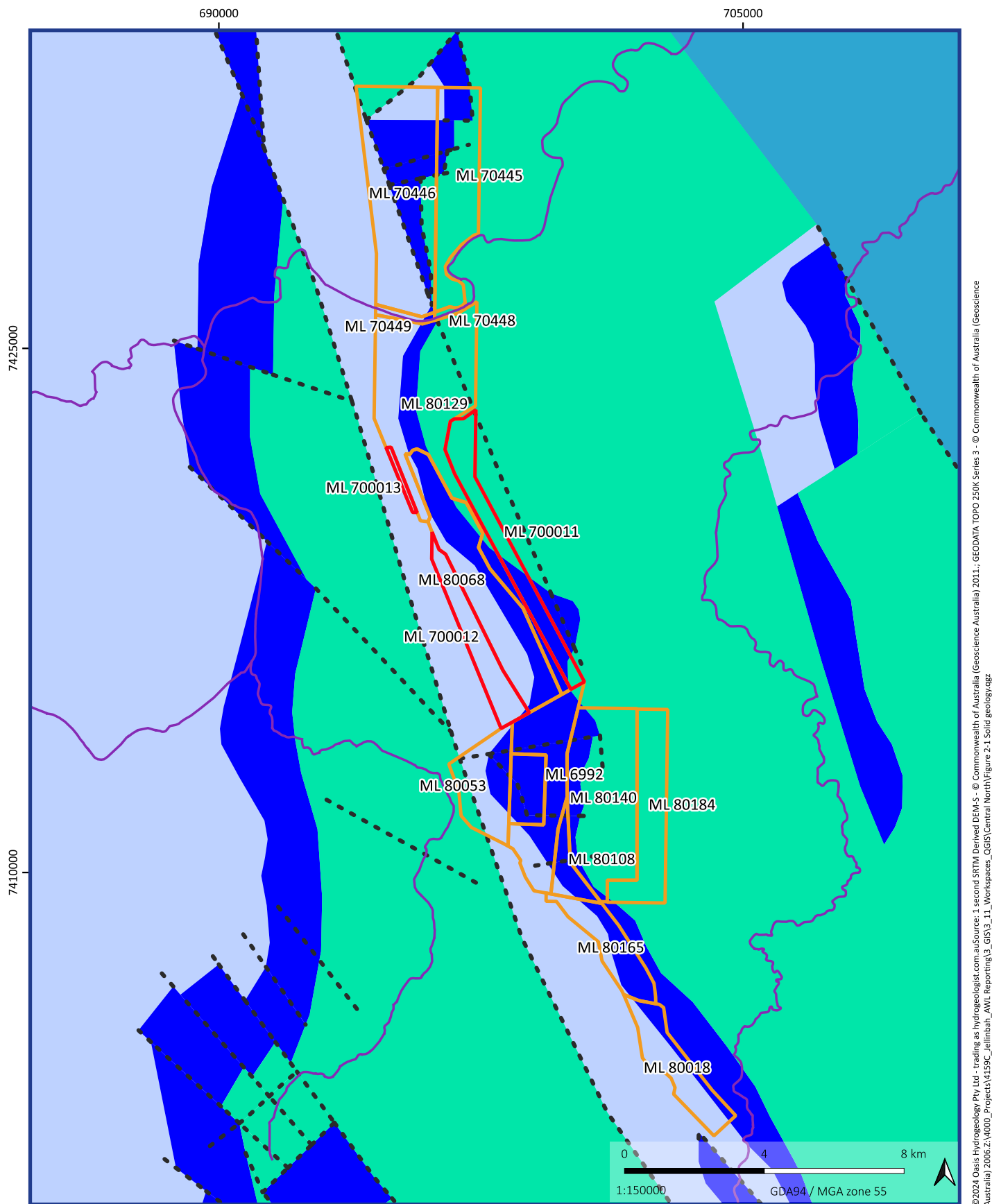
Solid geology

(4159C) Central North Project -
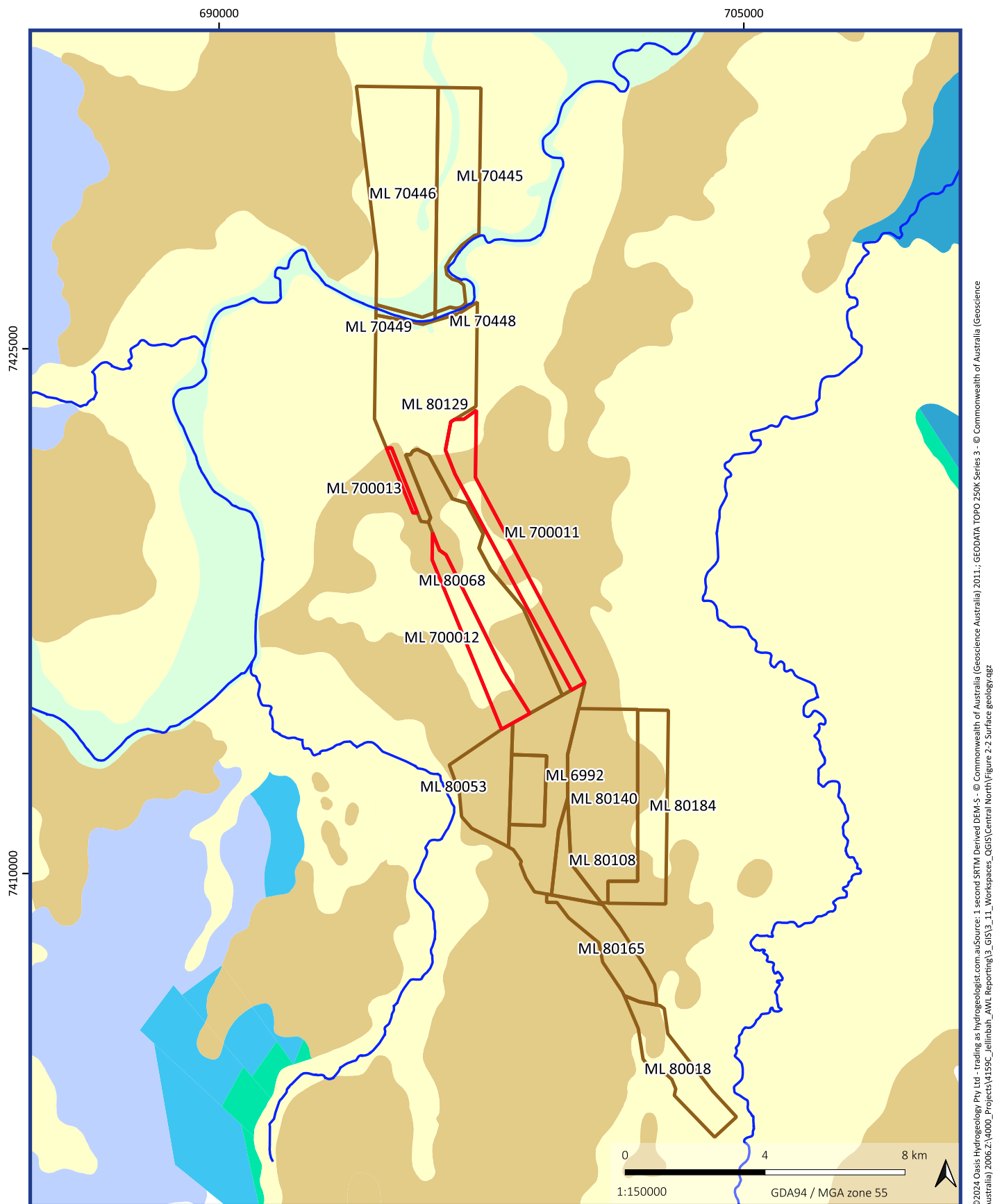Annual Groundwater Monitoring Report 2024 Year

Figure 2-1

12/09/2024

Legend

— Watercourses

☐ Jellinbah Mining leases

☐ CNE Mining leases

Geology

▢ Pwg - Burngrove Formation

▢ Pwj - Rangal Coal Measures

▢ Rr - Rewan Group

▢ Pwy - Gyranda Subgroup

Surface geology

(4159C) Central North Project -
Annual Groundwater Monitoring Report 2024 Year

Figure 2-2

12/09/2024

Legend

— Watercourses

☐ Jellinbah Mining leases

☐ CNE Mining leases

Geology

- Qa - Alluvium (clay, silt)
- Qha - Alluvium (sand, gravel)
- Tu - Duaringa Formation
- Rr - Rewan Group
- Pwj - Rangal Coal Measures
- Pwg - Burngrove Formation
- Pwy - Gyranda Formation

3. Rainfall data

Rainfall data for the Project was obtained from the Queensland Government SILO Data Drill website. The SILO data accesses grids of climate data available from surrounding Bureau of Meteorology (BoM) point observations and then creates interpolated climate values for a specific location. The interpolated climate data is calculated using splining and kriging techniques, based on the proximity of surrounding BoM point observations.

Monthly rainfall data and the Cumulative Rainfall Departure (CRD) curve is shown below in Figure 3-1. The CRD is calculated by subtracting the long-term average monthly rainfall from the actual monthly rainfall, to provide a monthly departure from average conditions. Periods of below average rainfall are represented as downward trending slopes and above average rainfall as upward trending slopes. The CRD curve is used in groundwater investigations due to the potential correlation between the CRD and groundwater level trends.

The CRD curve shows an upward trend from 2010 to 2011 due to above average rainfall over that period but has been in decline due to generally below average rainfall conditions from 2012 to 2021. The overall trend of the CRD curve has been rising from January 2021 to June 2024. This rise is primarily driven by multiple above average rainfall events.
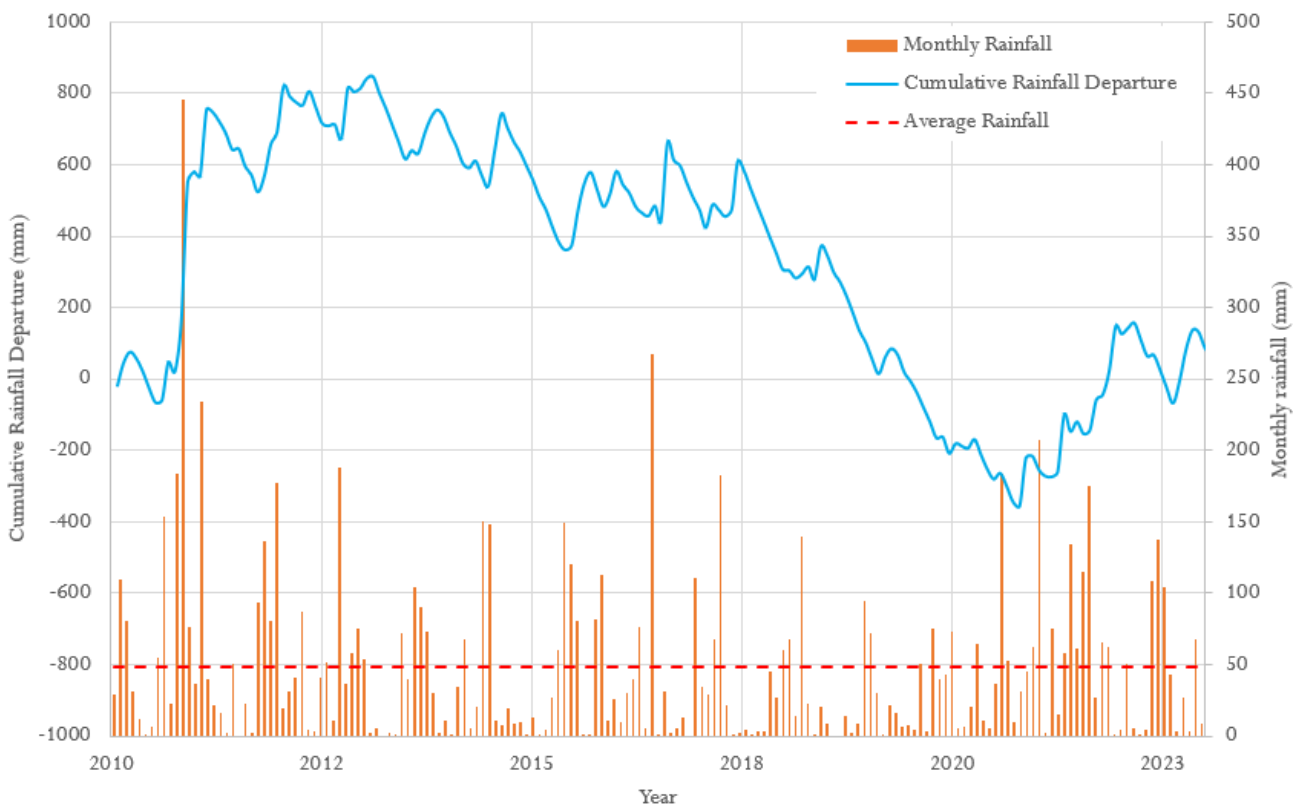

Figure 3-1   Monthly rainfall data and cumulative rainfall departure

4. Groundwater monitoring

The Central North Extension groundwater monitoring network details are shown in Table 4-1 and the locations are presented in Figure 4-1. Three vibrating wire piezometer (VWP) arrays make up the Central North Extension groundwater monitoring network. VWP construction logs are included in Attachment A. VWP arrays allow the recording of pore pressures (equivalent to groundwater level data) at different vertical locations within the same drill hole. All VWP arrays include five VWP sensors and the same lithologies are targeted in each VWP including the:
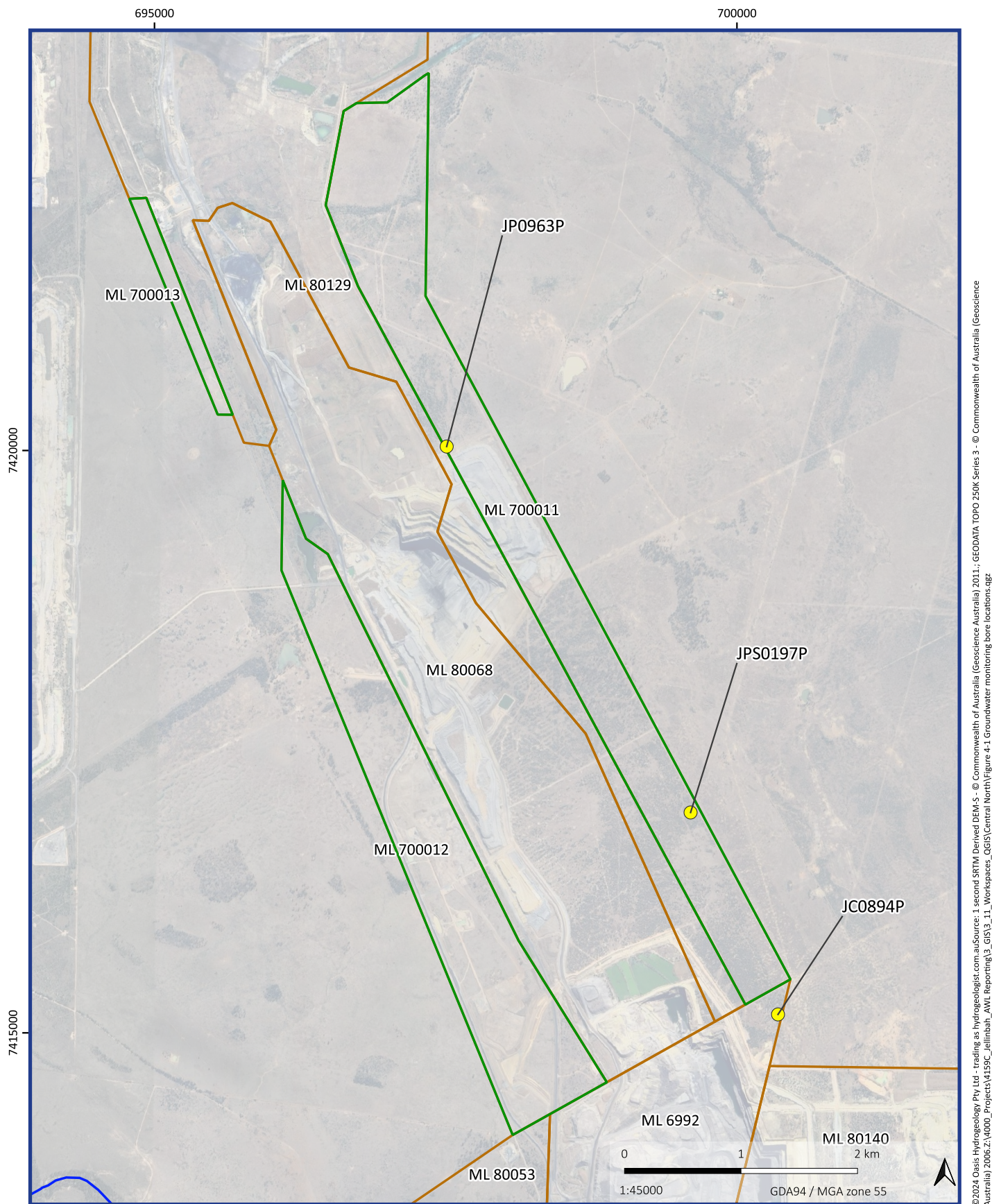
- Aries seam;
- interburden between the Aries seam and the Pollux Upper seam;
- Pollux Upper seam;
- Pollux Lower Seam; and
- sandstone/siltstone immediately below the floor of the Pollux Lower seam.

The Quaternary and Tertiary alluvium are dry at the Project location and no groundwater monitoring bores have been constructed within these units (JBT, 2020).

Table 4-1   Central North Extension groundwater monitoring network

Monitoring location	Easting	Northing	Collar elevation (mAHD)	Sensor depth (mbgl)	Target unit
JC0894P	700352	7415159	148.58	75.5	Aries seam
				90	Interburden between Aries seam and Pollux Upper seam
				102	Pollux Upper seam
				141.5	Pollux Lower seam
				145	Siltstone below Pollux Lower seam floor
JPS0197P	699602	7416893	146.95	90.5	Aries seam
				104	Interburden between Aries seam and Pollux Upper seam
				137	Pollux Upper seam
				163	Pollux Lower seam
				165.5	Siltstone below Pollux Lower seam floor
JP0963P	697508	7420035	138.94	123	Aries seam
				135	Interburden between Aries seam and Pollux Upper seam
				167	Pollux Upper seam
				196	Pollux Lower seam
				200.5	Siltstone below Pollux Lower seam floor

Notes: *Coordinates are in GDA94, Zone 55*

mbgl – metres below ground level

mAHD – metres above Australian Height Datum

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Groundwater monitoring locations

(4159C) Central North Project -
Annual Groundwater Monitoring Report 2024 Year

Figure 4-1

13/09/2024

Legend

- ● VWP locations
- — Mackenzie River
- ☐ Jellinbah Mining leases
- ☐ CNE Mining leases

Groundwater level monitoring is conducted with VWP logging at a set frequency of three hourly. The VWP details are provided in Appendix A. Figure 4-2 to Figure 4-4 shows the groundwater level monitoring results in metres Australian Height Datum (mAHD).

Figure 4-2 shows the groundwater level results for VWP JC0894P. Sensor 1 located in the Aries seam recorded an increase in water levels. Sensor 2 monitoring the sandstone between the Aries and Castor seams showed the greatest decrease in water levels and sensor 3 Pollux Upper seam showed a slight decrease in water level. The deeper sensors 4 and 5 had a slight increase in water levels over the reporting period. Data gaps exist due to a fault in the datalogger. The datalogger was repaired and resumed logging for a brief period in January 2024, however the datalogger failed again and has been sent to the manufacture for repair.

Figure 4-3 shows the groundwater level results for VWP JP0963P. All sensors showed a steady decrease in water level with the highest decrease recorded in sensor 2 monitoring the sandstone between the Aries and Castor seams. In November 2023, the datalogger at VWP JP963P failed was removed and sent to the manufacture for repair.

Figure 4-4 shows the groundwater level results for VWP JPS0197P. Between September 2022 and August 2023, all sensors (except sensor 4) showed a groundwater level increase, while sensor 4 showed a gradual decrease. Following a data gap between August 2023 and October 2023, logging resumed with sensors 3, 4 and 5 showing higher water level readings which quickly stabilised. Over the monitoring period sensor 1 (located in the Aries seam) recorded a decrease in water levels. Sensor 2 monitoring the sandstone between the Aries and Castor seams showed stable water levels. The deeper sensors 4 and 5 had a decrease in water levels over the reporting period.
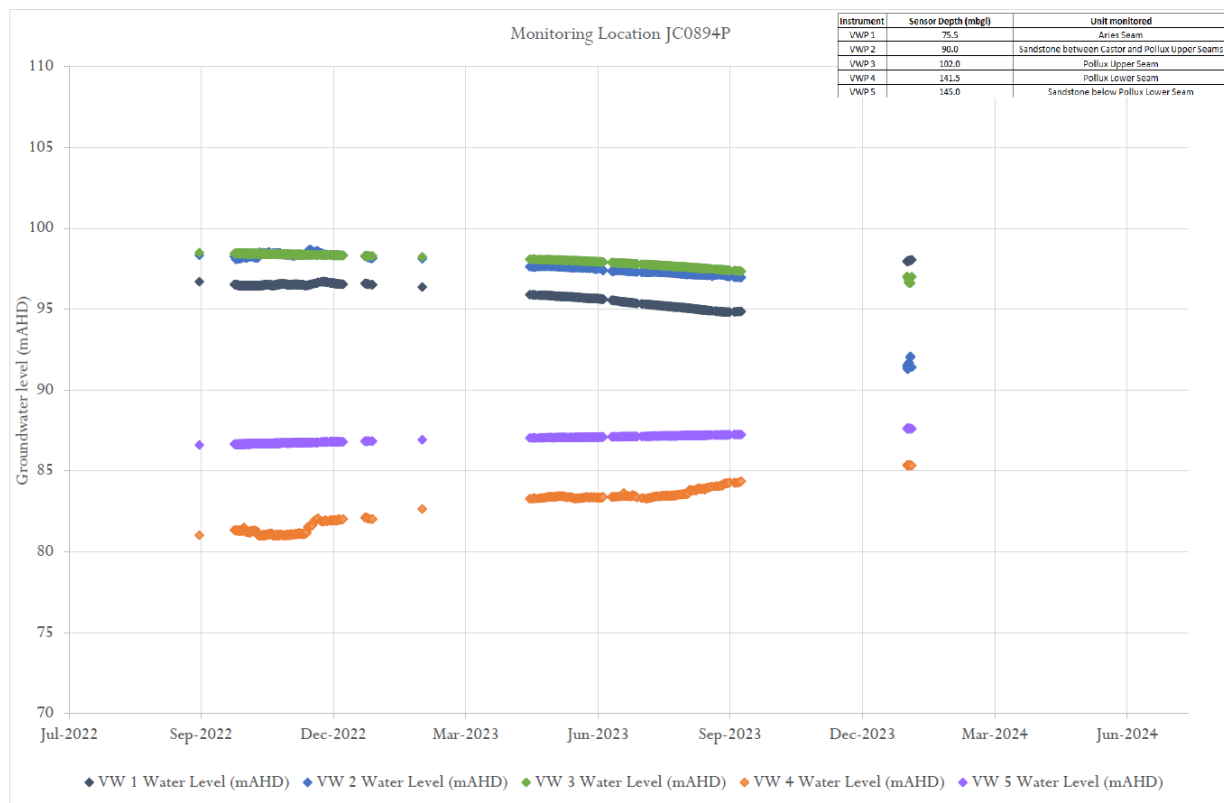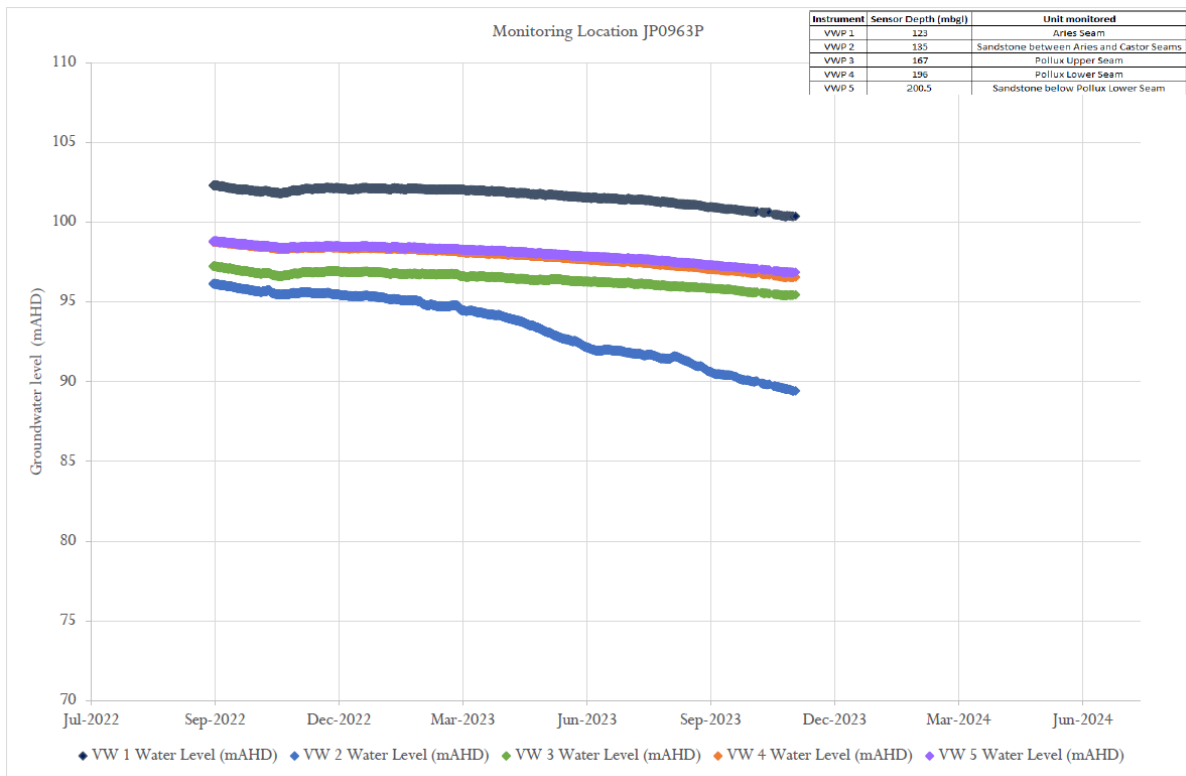

Figure 4-2   JC0894P VWP

4159C_ Jellinbah AWL Reporting

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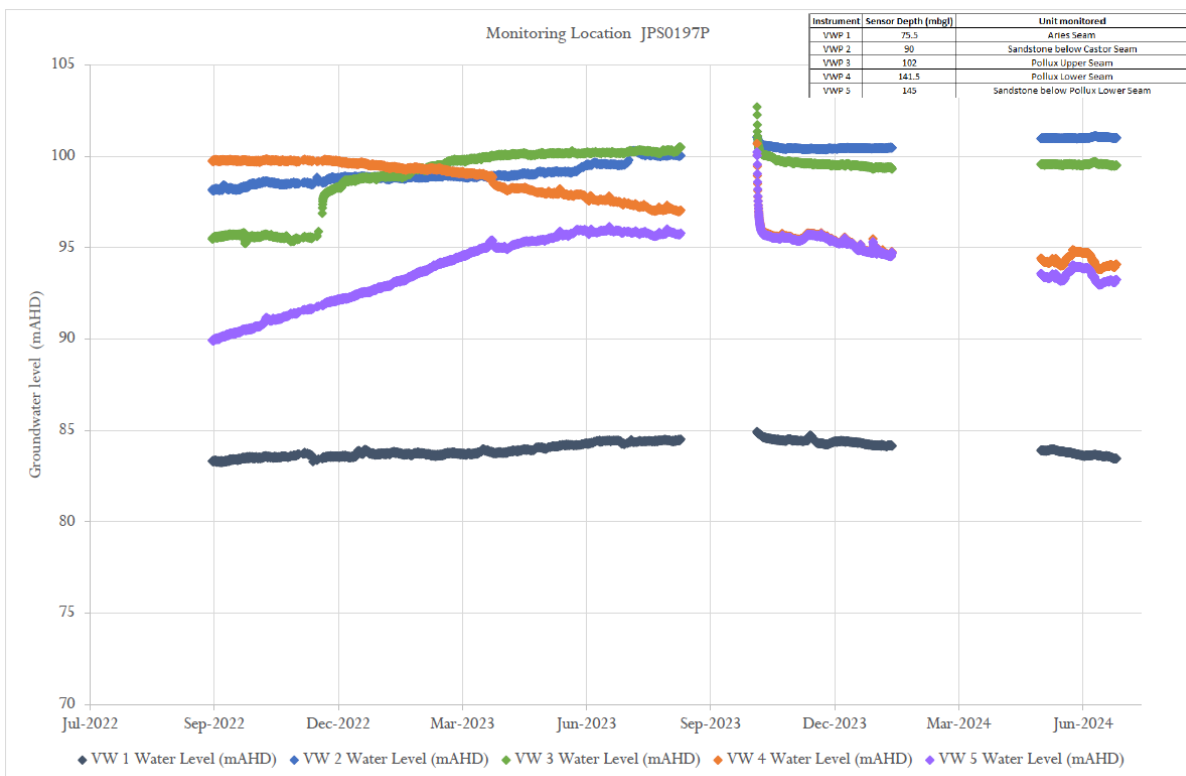**Figure 4-3   JP0963P VWP**

Figure 4-4   JPS0197P VWP

5. Impact of mining on groundwater levels

Condition 47 (c) requires details of the underground water model and any review undertaken of the underground water model since the previous Annual Monitoring Report. Mining operations commenced at ML700011 in July 2023. No mining has occurred in ML700012 as this is used for overburden spoil and ML700013 is undisturbed. Mining of the Permian strata commenced in January 2024 at ML700011. It is assessed that the take of associated water commenced January 2024, as the overlying Quaternary alluvium or Tertiary sediments are dry in the current mining area and the potentiometric surface is in the Permian strata. Based on the available information the review of the numerical underground water model would be required by January 2026.

Condition 47 (d) requires an assessment of any differences between the actual water level impact and the impact predicted. The extent and depth of mining in August 2024 is shown in Figure 5-1. The latest numerical model completed by JBT Consulting (JBT, 2020) concluded that the unconsolidated sediments in the Project area are dry and that the water level is below the base of weathering and above the upper coal seam.

The numerical model predicted drawdown contours to the east and north. Drawdown was insignificant in distance to the west. This is due to the lack of coal measures in the west and dip of strata. The Burngrove Formation which is the dominant unit west of the mining area, has relatively low permeability. To the south, drawdown was not considered due to the existence of the Jellinbah Central pit in that direction. Groundwater level drawdown has been recorded in the Permian coal measures in the north as recorded at JP0963P, and in the south as recorded at JPS0197P and JCO894P. Drawdown was recorded at 963P prior to the commencement of mining in July 2023.

The extent and depth of mining in August 2024 is shown in Figure 5-1. The deepest area of mining of the pit was 15 mAHD or 120 mbgl, compared to a ground elevation at the adjacent crest of 135 mAHD. Figure 5-2 shows the depth of mining in August 2024 below the pre-mining groundwater level contours for the Permian groundwater unit, based on inferred water levels (JBT, 2020).

Mining is occurring approximately 80 m below the pre-mining groundwater level. For mine depths of 120 mbgl, there is unlikely any observable groundwater inflows. There have been no reported observations of groundwater inflow to the mine, this may be attributed to groundwater inflow rates lower than onsite evaporation rates.
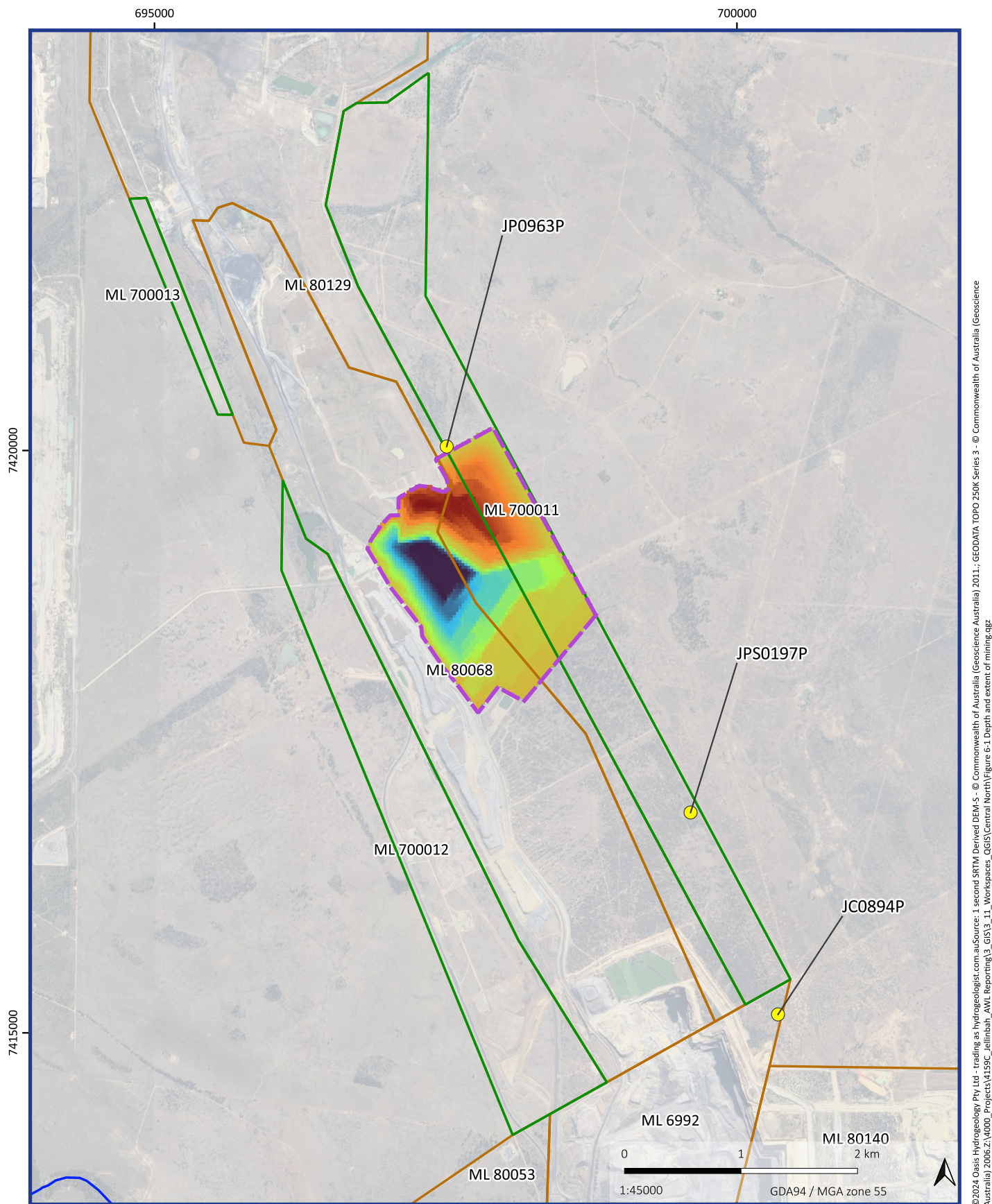
Elevation and extent of mining

(4159C) Central North Project -
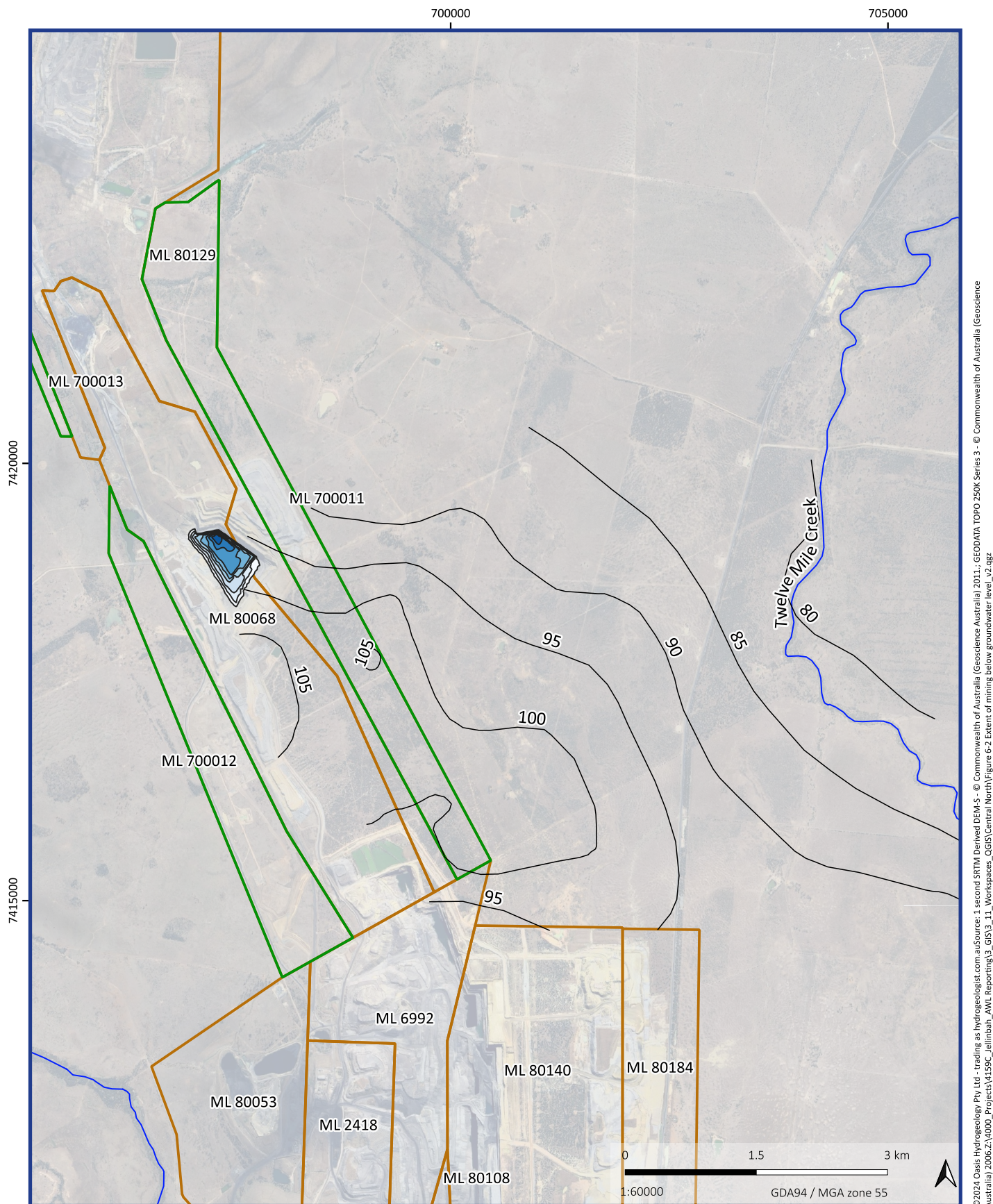Annual Groundwater Monitoring Report 2024 Year

Figure 5-1

12/09/2024

Legend

- VWP locations
- Mackenzie River
- Jellinbah Mining leases
- CNE Mining leases
- Extent of mining (August 2024)

Elevation (mAHD)

- 40
- 80
- 120
- 165
- 205

Extent of mining below groundwater level

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Figure 5-2

12/09/2024

Legend

- 🟡 VWP locations
- — Groundwater contours (mAHD)
- — Watercourse
- ▭ Jellinbah Mining leases
- ▭ CNE Mining leases

Depth of mining (m) at August 2024 below Dec 2012 Permian Water Level

10m	70m
20m	80m
30m	
40m	
50m	
60m	

Scale: 1:60000

GDA94 / MGA zone 55

0 — 1.5 — 3 km

Labels on map: ML 80129, ML 700013, ML 700011, ML 80068, ML 700012, ML 6992, ML 80140, ML 80184, ML 80053, ML 2418, ML 80108, Twelve Mile Creek

Contour labels: 105, 105, 100, 95, 95, 90, 85, 80

Coordinate labels: 700000, 705000, 7420000, 7415000

6. Private bores within the affected area

Section 47 (e) of the AWL requires the Annual Monitoring Report to include "details of any bores which are predicted by the underground water model to be located in the affected area". The Project's AWL defines the "affected area" for the purpose of this licence, as the area identified by the most current numerical underground water model where the water level is predicted to decline, at any time because of the Authorised Purpose authorised by this associated water licence, by more than 5 m for a consolidated aquifer or 2 m for an unconsolidated aquifer. The affected area, as defined in the AWL, has been determined based on predicted drawdown data at the end of mine life for the most current numerical underground water model.

The affected area as defined in the AWL has been determined based on predicted drawdown as presented in the report for the current numerical underground water model (JBT, 2020). The predicted model drawdown has been digitised for presentation in this report (Figure 6-1).

A bore census has been undertaken to establish whether bores exist within the predicted area of impact as defined from groundwater modelling (JBT, 2020). The properties that are within the area of predicted impact are shown in Figure 6-1. The bore census was undertaken between 30 September and 1 October 2020, with all landowners or their representatives contacted within that period. The bore census found no active groundwater bores. A desktop review of the Queensland Government registered bore database showed no new private bores have been drilled within the affected area during the 2023 and 2024 reporting period. No private registered groundwater bores exist that are screened in the unconsolidated or consolidated aquifers within the affected area. There are no groundwater impacts on existing groundwater users based on the information available. Summary details of the bore census are shown below in Table 6-1.

Table 6-1   Results of Landowner Bore Census (JBT, 2020)

Property lot plan	Landholder bore census description
6CLR94	No groundwater bores currently located on property.
14RP885348	Property is owned by Jellinbah Mining.
13LR102	No groundwater bores currently located on property.
50SP257934	No groundwater bores currently located on the leased section of property. Lessee is unaware of any bores on remainder of property.
10LR103	No groundwater bores currently located on property.
1SP161090	No groundwater bores currently located on property.
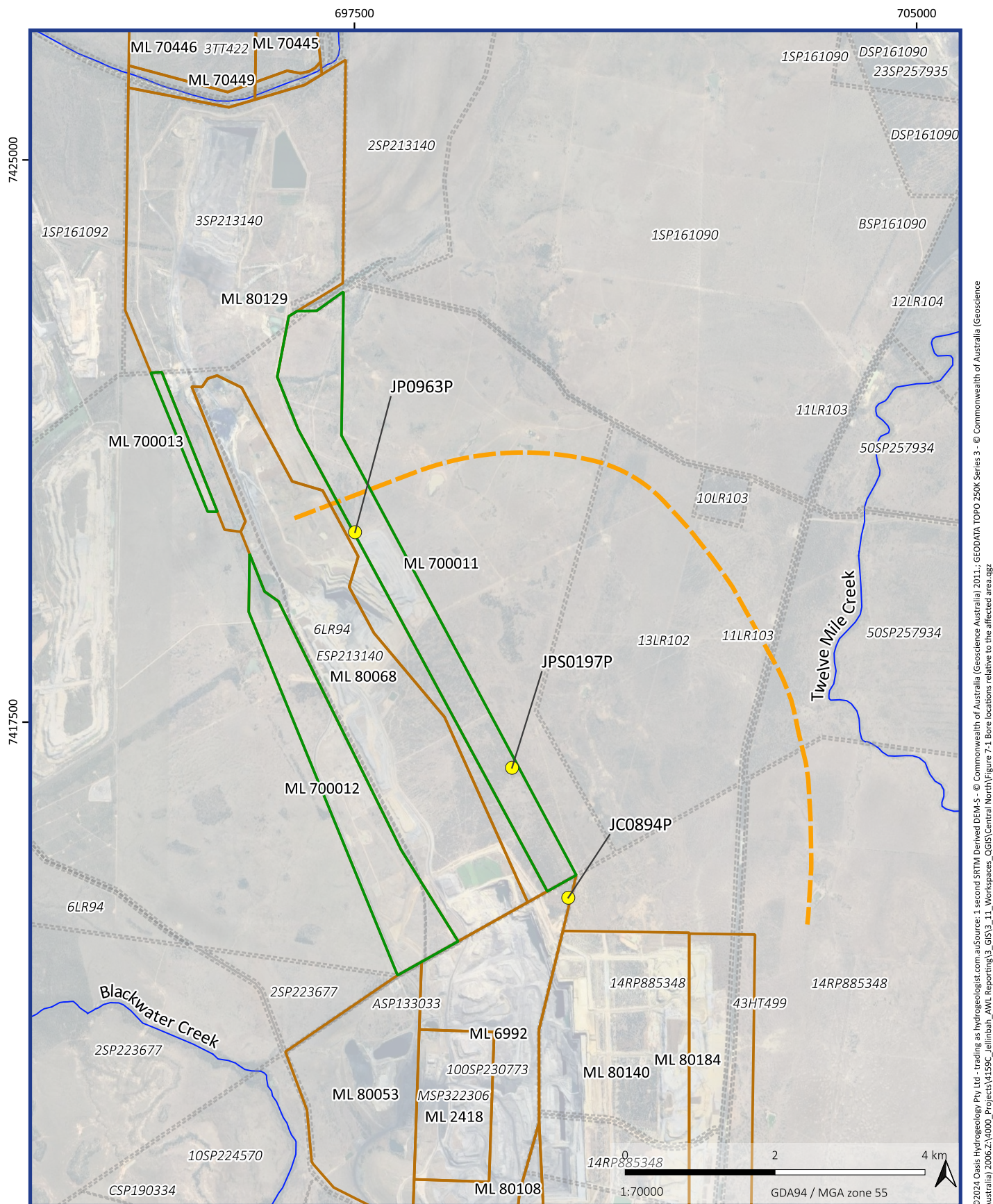
Bore locations relative to the affected area

Legend

- ⬤ VWP locations
- ▬ 5 m drawdown - Post-Mining Equilibrium - CN + CNE Mining
- — Watercourse
- ▢ Jellinbah Mining leases
- ▢ CNE Mining leases
- ▢ Landholder lot numbers

7. References

AARC Environmental Solutions, 2020. Jellinbah Central North Extension Associated Water Licence. 21 October 2020.

JBT, 2020. Jellinbah Central North Extension (CNE) Area, Groundwater Report for Associated Water Licence (AWL) Application. Final 15 October 2020.

JBT, 2020. Jellinbah Mine, Central North Extension, Underground Water Monitoring Program. Final, 20 October 2020.

Geoaxiom Groundwater Consulting, 2020. VWP Installation Report for new Environmental Monitoring Bores Jellinbah Central North Extension. 8 September 2020.

Queensland Government, Associated Water Licence 624007, Water Act 2000. 25 June 2021.

Appendix A Vibrating wire piezometer details

Location	Sensor order down hole	Sensor installation depth (mbgl)	GeoKon VWP Sensor Serial #
JC0894P	1	75.5	4930
JC0894P	2	90	4932
JC0894P	3	102	4933
JC0894P	4	141.5	4937
JC0894P	5	145	4936
JPS0197P	1	90.5	4920
JPS0197P	2	104	4931
JPS0197P	3	137	4935
JPS0197P	4	163	4938
JPS0197P	5	165.5	4939
JP0936P	1	123	4934
JP0936P	2	135	4970
JP0936P	3	167	4971
JP0936P	4	196	4972
JP0936P	5	200.5	4940