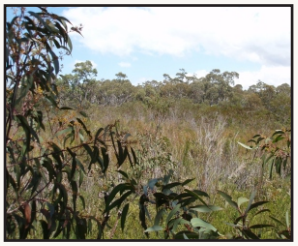
METROPOLITAN COAL

2024 ANNUAL REVIEW



Peabody

Name of Operation	Metropolitan Coal
Name of Operator	Peabody Energy Australia Pty Ltd
Project Approval	Project Approval 08_0149
Name of Holder of Project Approval	Metropolitan Collieries Pty Ltd
Mining Leases	Consolidated Coal Lease 703 Mining Lease 1610 Mining Lease 1702 Mining Purpose Lease 320 Coal Lease 379 Exploration Licence 9364
Name of Holder of Mining Leases	Metropolitan Collieries Pty Ltd
Water Licence	Water Access Licence – WAL25410 Bore Licence Certificate – 10BL603595
Name of Holder of Water Licence	Metropolitan Collieries Pty Ltd
Annual Review Start Date	1 January 2024
Annual Review End Date	31 December 2024

I, James Hannigan, certify that to the best of my knowledge and belief that this Annual Review is a true and accurate record of the compliance status of Metropolitan Coal for the period 1 January to 31 December 2024 and that I am authorised to make this statement on behalf of Peabody Energy Australia Pty Ltd.

Name of Authorised Reporting Officer	James Hannigan
Title of Authorised Reporting Officer	General Manager
Signature of Authorised Reporting Officer	
Date	31/03/2025

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1 STATEMENT OF COMPLIANCE

The compliance status of the Metropolitan Coal Mine with its relevant approval conditions at the end of the reporting period (31 December 2024) is provided in Table 1.

Table 1
Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
Project Approval 08_0149	No, Refer to Table 2.
Development Consent D90/832	Yes
Consolidated Coal Lease 703	Yes
Mining Lease 1610	Yes
Mining Lease 1702	Yes
Coal Lease 379	Yes
Mining Purpose Lease 320	Yes
Exploration Licence 9364	Yes
Environment Protection Licence No. 767	Yes

Table 2 summarises the non-compliances with the approval conditions.

Table 2
Summary of Non-Compliances

Relevant Approval	Condition Number	Condition Description	Comment	Report Section
Project Approval 08_0149	Condition 1, Schedule 3	Subsidence Impact Performance Measures (Table 1 of Project Approval)	Exceedance of the Eastern Tributary watercourse subsidence impact performance measure in relation to iron staining and pool flow/drainage behaviour downstream of the Longwall 26 maingate.	6.2 and 13.1
Project Approval 08_0149	Condition 1, Schedule 4	Noise Impact Assessment Criteria (Table 2 of Project Approval)	Noise monitoring has identified sustained non-compliances during the review period.	7.1

2 INTRODUCTION

The Metropolitan Colliery (Metropolitan Coal Mine) is owned and operated by Metropolitan Collieries Pty Ltd (Metropolitan Coal), which is a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody), and is located adjacent to the township of Helensburgh and approximately 30 kilometres (km) north of Wollongong in New South Wales (NSW) (Figure 1). Metropolitan Coal is located within Consolidated Coal Lease (CCL) 703, Mining Lease (ML) 1610 and ML 1702. Metropolitan Coal is one of the earliest established and longest continually running coal mining operations in Australia, with a history dating back to the 1880s.

Metropolitan Coal was granted approval for the Metropolitan Coal Project (the Project) by the Minister for Planning under section 75J of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 22 June 2009. A copy of the Project Approval (08_0149) is available on the Peabody website (http://www.peabodyenergy.com). The Project comprises the continuation, upgrade and extension of underground coal mining operations and surface facilities at Metropolitan Coal. The underground mining longwall layout is shown on Figure 1. The extent of the mine's surface facilities area is shown on Figure 2.

The surface facilities include administration buildings, workshops, bath houses, ablution facilities, haul roads, access roads, fuel and consumables storages, hardstand areas, a coal handling and preparation plant (CHPP), stockpiles (including run-of-mine [ROM] coal, product coal and coal reject stockpiles), underground coal reject emplacement plant and associated coal handling infrastructure (e.g. conveyors, transfer points and buffer bins).

Coal extracted from the underground mining operations is transferred by conveyor to the surface facilities area. ROM coal is crushed, screened and washed at the CHPP. The majority of product coal is transported by train to the Port Kembla Coal Terminal (PKCT) (in Wollongong) for domestic and overseas customers. CHPP coal reject material is transported by rail and truck to the PKCT, emplaced in unused workings, or transported to offsite locations for beneficial reuse.

The Environmental Management Structure of the Project is shown on Figure 3. It includes the Metropolitan Coal Environmental Management Strategy, developed to provide the strategic context for environmental management at Metropolitan Coal, and management plans and monitoring programs applicable to the underground mining area or mine's surface facilities area.

Metropolitan Coal submitted the Longwalls 308-310 Extraction Plan to the then Department of Planning and Environment (DPE) (now Department of Planning, Housing and Infrastructure [DPHI]) in February 2022. The Longwalls 308-310 Extraction Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences, subject to the previously approved Metropolitan Coal Extraction Plans for Longwalls 20-22, 23-27, 301-303, 304 and 305-307. The DPE approved the Longwalls 308-310 Extraction Plan on 12 December 2022 and mining of Longwall 308 commenced on 12 December 2022. Metropolitan Coal submitted the Longwalls 311-316 Extraction to the DPHI in March 2024. Secondary extraction of Longwall 311 was approved by the DPHI on 19 October 2024. Under this Annual Review, environmental performance for the period 1 January 2024 to 20 October 2024 is reported against the Longwalls 308-310 Extraction Plan and the environmental performance for the period 21 October 2024 to 31 December 2024 is reported against the Longwalls 311-316 Extraction Plan. From 21 October 2024 to 31 December 2024 approximately 563 metres (m) of Longwall 311 was mined.

2.1 PURPOSE AND SCOPE

Metropolitan Coal's environmental reporting requirements include an Annual Review, which is to be prepared in accordance with Condition 3, Schedule 7 of the Project Approval, an Annual Environmental Management Report, to be prepared in accordance with CCL 703, and an Annual Rehabilitation Report, to be prepared in accordance with ML 1610, ML 1702, MPL 320 and Coal Lease (CL) 379.

The Metropolitan Coal 2024 Annual Review has been prepared to meet the above reporting requirements and to review the environmental performance of the Project during the reporting period (i.e. 1 January to 31 December 2024), consistent with the NSW Government (2015) *Annual Review Guideline for State Significant Mining Developments*.

2.2 MINE CONTACTS

Contact details for key Metropolitan Coal employees are provided below:

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3 APPROVALS

Metropolitan Coal operates under a number of statutory approvals, leases and licences granted by the NSW Government as outlined in Table 3.

Table 3
Consent, Lease and Licence Details

Consent/Lease/Licence	Authority	Grant/Renewal	Expiry Date
Project Approval 08_0149	DPHI	22/6/2009	22/6/2032
Project Approval 08_0149 – Mod 1	DPHI	8/9/2010	22/6/2032
Project Approval 08_0149 – Mod 2	DPHI	2/7/2011	22/6/2032
Project Approval 08_0149 – Mod 3	DPHI	3/10/2013	22/6/2032
Development Consent D90/832	WCC	5/1/1995	-
Consolidated Coal Lease 703	MEG	27/1/2024	26/1/2045
Mining Lease 1610	MEG	19/5/2014	18/12/2031
Coal Lease 379	MEG	14/11/2013*	4/10/2033
Mining Purpose Lease 320	MEG	16/6/2014	9/12/2035
Mining Lease 1702	MEG	13/10/2014	13/10/2035
Exploration License 9364	MEG	24/02/2022	24/02/2028
Bore Licence Certificate 10BL603595	NSW DCCEEW - Water	25/1/2013	24/1/2028
Camp Creek Weir Surface Water Certificate of Title	NSW DCCEEW - Water	28/11/2012	-
Environment Protection Licence (EPL) No. 767	EPA	9/9/2002	-
Radiation Licence – Radiation Management Licence 5063985	EPA	27/9/2023	27/9/2025
Licence to Store Explosives and/or Security Sensitive Dangerous Substances – Licence XSTR200082	SafeWork NSW	15/06/2017	15/06/2027

Note: DPHI = NSW Department of Planning, Housing and Infrastructure; MEG = NSW Division of Mining, Energy and Geoscience; EPA = NSW Environment Protection Authority; WCC = Wollongong City Council; NSW DCCEEW – Water = NSW Department of Climate Change, Energy, the Environment and Water - Water.

* Date lease offer was signed.

4 OPERATIONS SUMMARY

4.1 MINING OPERATIONS

Prior to the reporting period, the extraction of Longwall 309 commenced on 28 July 2023 and was completed in February 2024. Longwall 310 commenced on 28 March 2024 and was completed in September 2024. Longwall 311 commenced 21 October 2024 and continued through the remainder of the reporting period (Figure 4).

The amount of waste rock/overburden, ROM coal, coal reject and product coal produced in the previous reporting period, current reporting period and forecast for the next reporting period is provided in Table 4.

Table 4
Production Summary

Material	Approval Limit	2023 Reporting Period (Actual)	2024 Reporting Period (Actual)	2025 Reporting Period (Forecast)
Waste Rock/Overburden	N/A			
ROM Coal	3.2 Mt per calendar year[1]	2,527,376 t	2,233,297 t	2,162,919 t
Coal Reject[2]	N/A	485,903 t[3]	605,440 t[4]	495,462 t
Saleable Product[2,5]	2.8 Mt per calendar year[1]	12,043,937 t	1,628,836 t	1,667,457 t

N/A = not applicable; Mt = million tonnes; t = tonnes.

1 Condition 6, Schedule 2 of the Project Approval states:

The Proponent shall not:

(a) extract more than 3.2 million tonnes of ROM coal from the mining area in a calendar year, or

(b) transport more than 2.8 million tonnes of product coal from the site in a calendar year.

2 Coal rejects and saleable product out of the CHPP.

3 Of the 485,903 t of coal reject produced in 2023 447,470 t was transported via rail to PKCT and 39,792 t was emplaced underground.

4 Of the 605,440 t of coal reject produced in 2024 571,101 t was transported via rail to PKCT and 34,339 t was emplaced underground.

5 Note, there is no Approval limit for saleable product itself. The only Approval limit relating to saleable product is the amount of product coal transported from the site in a calendar year. Note that the quantities presented in Table 4 reflect the saleable product produced by Metropolitan Coal and are therefore not consistent with the quantities dispatched from site that are reported on the Peabody website in the Truck and Rail Register.

4.2 OTHER OPERATIONS – METROPOLITAN COAL SURFACE FACILITIES AREA

In addition to the Project Approval limits detailed in Table 4, other relevant operational conditions are described in Table 5 and primarily relate to the Metropolitan Coal surface facilities area.

During the reporting period, Metropolitan Coal continued the coal reject backfill emplacement project.

Table 5
Other Relevant Operational Conditions

Operational Condition		Operational Condition Met?	Comment
Limits on Approval (Project Approval Conditions 5, 7 and 8, Schedule 2)	5. *The Proponent may undertake mining operations in the mining area for up to 23 years from the date of this approval.* *Note: Under this approval, the Proponent is required to rehabilitate the site and perform additional undertakings to the satisfaction of the Director-General. Consequently, this approval will continue to apply in all other respects other than the right to conduct mining operations until the site has been properly rehabilitated.*	Yes	Metropolitan Coal was granted approval for the Project in June 2009.
	7. *The Proponent shall not export any coal reject from the site after 2021 without the written approval of the Director-General.*	Yes	Metropolitan Coal has DPHI approval to continue the export of Coal Wash Reject (CWR) from site until 31 December 2026. All CWR was transported from site by rail during the reporting period.
	8. *The Proponent shall not emplace coal reject on the surface of the site without the written approval of the Director-General.* *Note: This condition applies to the Camp Gully Emplacement Area, as well as to the rest of the surface of the site. It does not apply to the proposed additional coal reject stockpile shown in Appendix 4.*	Yes	Metropolitan Coal has DPHI approval to emplace coal reject on the site when used for construction purposes (e.g. as engineered fill material). No construction activities requiring fill were undertaken and no coal reject was emplaced on the surface of the site during the reporting period.
Structural Adequacy (Project Approval Condition 9, Schedule 2)	• *The Proponent shall ensure that all new buildings and structures, and any alterations or additions to existing buildings and structure, are constructed in accordance with:* *(a) the relevant requirements of the BCA; and* *(b) any additional requirements of the MSB in areas where subsidence effects are likely to occur.* *Notes:* • *Under Part 4A of the EP&A Act, the Proponent is required to obtain construction and occupation certificates for the proposed building works.* • *Part 8 of the EP&A Regulation sets out the requirements for the certification of the project.*	Yes	Metropolitan Coal did not undertake any construction activities during the reporting period.
Demolition (Project Approval Condition 10, Schedule 2)	• *The Proponent shall ensure that all demolition work is carried out in accordance with Australian Standard AS 2601-2001: The Demolition of Structures, or its latest version.*	Yes	Metropolitan Coal did not undertake any demolition activities during the reporting period.
Operation of Plant and Equipment (Project Approval Condition 11, Schedule 2)	• *The Proponent shall ensure that all plant and equipment used at the site is:* *(a) maintained in a proper and efficient condition; and* *(b) operated in a proper and efficient manner.*	Yes	All plant and equipment in use at Metropolitan Coal is regularly serviced in accordance with the relevant Industry & Investment NSW *Mining Design Guidelines* to ensure plant and equipment is maintained in proper and efficient condition. All plant and equipment are operated in a proper and efficient manner.

Table 5
Other Relevant Operational Conditions (Continued)

Operational Condition		Operational Condition Met?	Comment
Rail Noise (Project Approval Condition 4, Schedule 4)	4. *The Proponent shall only use locomotives that are approved to operate on the NSW rail network in accordance with noise limits L6.1 to L6.4 in RailCorp's EPL (No. 12208) and ARTC's EPL (No. 3142) or a Pollution Control Approval issued under the former Pollution Control Act 1970.*	Yes	All locomotives used by Metropolitan Coal are approved to operate on the NSW rail network in accordance with the relevant noise limits.
Blasting (Project Approval Condition 7, Schedule 4)	• *The Proponent shall not undertake blasting operations at the surface facilities area without the written approval of the Director-General.*	Yes	No blasting activities were carried out at the surface facilities area during the reporting period. Minor blasting underground is necessary at times when geological structures are encountered that cannot be excavated by the continuous miner or the longwall mining machine and when a section of the longwall roof falls ahead of the hydraulic supports of the longwall mining machine.

4.3 OPERATIONAL ACTIVITIES IN THE NEXT REPORTING PERIOD

Longwall 311 commenced extraction on 21 October 2024 and is forecast to be completed in May 2025. The figures presented in this Annual Review show the approved Longwalls 311-316 Extraction Plan layout. In the next reporting period, Longwall 312 is anticipated to commence extraction in June 2025 (Figure 5).

The amount of waste rock/overburden, ROM coal, coal reject and product coal forecast for the next reporting period is provided in Table 4.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

A reconciliation of the actions required by relevant agencies, the previous Annual Review and actions taken in response by Metropolitan Coal during the reporting period are outlines in Table 6.

The DPHI provided comments on the 2023 Annual Review in its letter dated 16 June 2024. In response to DPHI's comments, Metropolitan Coal provided a revised 2023 Annual Review incorporating the DPHI's comments on 30 August 2024. Comments raised by DPHI related to including potential water quality impacts on Woronora Reservoir, leakage from the Woronora Reservoir and height of fracturing.

The DPHI's comments have also been considered in this Annual Review where appropriate, as outlined in Table 6.

Table 6
Actions Required by Relevant Agencies and 2023 Annual Review

Action	Requested by	Action Taken	Section Reference
Include a table that identifies actions required as an outcome of previous Annual Reviews	DPHI	Table 6 has been included to identify actions required by relevant agencies, the previous Annual Review and actions taken in response by Metropolitan Coal during the reporting period.	Section 5
Include water taken in the previous 'water year' (1 July to 30 June) as per Table 7 of the Guideline	DPHI	A summary of the water taken in the previous water year (1 July 2023 to 30 June 2024) has been included in Section 8 of the Annual Review.	Section 8 and Table 13
Update the AR to include reporting on additional actions to improve the energy efficiency of the site in accordance with the Metropolitan Coal Air Quality and Greenhouse Gas Management plan dated December 2010 published on the company website.	DPHI	Greenhouse gas emissions reductions have been included in the relevant section in Section 7.2 of the Annual Review.	Section 7.2 and Table 11
Update the AR to clarify the action/response to Level 3 trigger for amphibian monitoring in accordance with table 18 of the Metropolitan Coal Longwalls 308-310 Biodiversity Management Plan	DPHI	Cenwest has undertaken further monitoring of the amphibian populations across sites 1-39 and has also undertaken threatened fauna species assessment at Swamp 20, Swamp 28 and sites on the Eastern Tributary and Waratah Rivulet (Cenwest, 2024). The assessment concludes that the Performance Measure continues to be met. A copy of threatened fauna species assessment was provided to DPHI on 30 August 2024. A copy of the 2024 amphibian monitoring report is in Appendix L.	Appendix L

6 ENVIRONMENTAL PERFORMANCE – UNDERGROUND MINING AREA AND SURROUNDS

This section provides a summary of the key environmental monitoring results for subsidence, surface water, groundwater, biodiversity, land, heritage, built features and public safety in the underground mining area, an assessment of environmental performance and a description of the management measures implemented during the reporting period.

Each section indicates the relevant management plan or monitoring program where details of the underground mining management and monitoring are available. The Metropolitan Coal management plans/monitoring programs are available on the Peabody website (http://www.peabodyenergy.com).

The Longwalls 308-310 Extraction Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences, subject to the previously approved Metropolitan Coal Extraction Plans for Longwalls 20-22, 23-27, 301-303, 304 and 305-307.

The Longwalls 311-316 Extraction Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences, subject to the previously approved Metropolitan Coal Extraction Plans for Longwalls 20-22, 23-27, 301-303, 304, 305-307 and 308-310.

6.1 SUBSIDENCE MONITORING

The Metropolitan Coal Longwalls 308-310 Subsidence Monitoring Program was prepared to validate subsidence predictions and analyse the relationship between the subsidence effects and subsidence impacts of the Metropolitan Coal Longwalls 308-310 Extraction Plan in accordance with Condition 6(e), Schedule 3 of the Project Approval.

The Longwall 311 to 316 Subsidence Monitoring Program was prepared to validate subsidence predictions and analyse the relationship between the subsidence effects and subsidence impacts of the Metropolitan Coal Longwall 311-316 Extraction Plan in accordance with Condition 6(e), Schedule 3 of the Project Approval.

Subsidence movements are surveyed in three dimensions using a total station survey instrument, real time Global Navigation Satellite System and Light Detection and Ranging (LiDAR) units. The subsidence parameter monitoring locations are shown on Figure 6.

A review of the subsidence survey results and comparison between the predicted and observed subsidence movements for the reporting period has been conducted by Mine Subsidence Engineering Consultants Pty Ltd (MSEC). The report prepared by MSEC is provided in Appendix A. A summary of the key findings is provided below.

6.1.1 Predicted and Observed Subsidence Movements

The reporting period included the continued extraction of Longwall 309 from chainage 340 m (void length 1,490 m) to completion, the full extraction of Longwall 310 (void length 2,024 m) and Longwall 311 from commencement to chainage 1,266 m (void length 563 m). The total length of extraction for Longwalls 309, 310 and 311 during the 2024 reporting period was 2,927 m. Details of the observed and predicted subsidence movements at the subsidence monitoring locations (300 XL Line, Princes Highway Line, M1 Princes Motorway, Bridge 2 [Old Princes Highway Underpass], Cawley Road Overbridge, Eastern Tributary, Waratah Rivulet Cross Lines, and Ridge Top Survey Stations) are provided in Appendix A. The monitoring locations are shown on Figure 6.

The observed subsidence profile shapes and subsidence parameters were generally similar to those predicted or within limits of accuracy of the predicted subsidence parameters. The maximum observed total conventional subsidence parameters above the extracted longwalls was greater than predicted, particularly at higher magnitudes of observed subsidence. Based on previous LiDAR surveys, and the survey monitoring lines, the location of greatest increase in observed subsidence is located at the area around the topographical high point above Longwalls 301 and 302 (Appendix A).

Metropolitan Coal used a Trigger Action Response Plan (TARP) designed to monitor valley closure movements on the Waratah Rivulet. The Waratah Rivulet Valley Closure TARP has been successfully implemented by Metropolitan Coal for Longwalls 307, 308, 309 and 310.

Condition 3, Schedule 3 of the Project Approval states:

3. *If the subsidence effects and subsidence impacts of the project exceed the relevant predictions by more than 15% at any time after mining has progressed beyond the halfway mark of Longwall 21, or if the profile of vertical displacement does not reflect predictions, then the Proponent shall use appropriate numerical modelling to supplement the subsequent predictions of subsidence effects and subsidence impacts for the project to the satisfaction of the Director-General.*

A comparison of the maximum observed and maximum predicted total conventional subsidence for the Project after each longwall for Longwalls 3 to 27 and Longwalls 301 to 310 is shown in Chart 1. The comparison of conventional subsidence effects excludes the valley cross lines which represent non-conventional subsidence movements.

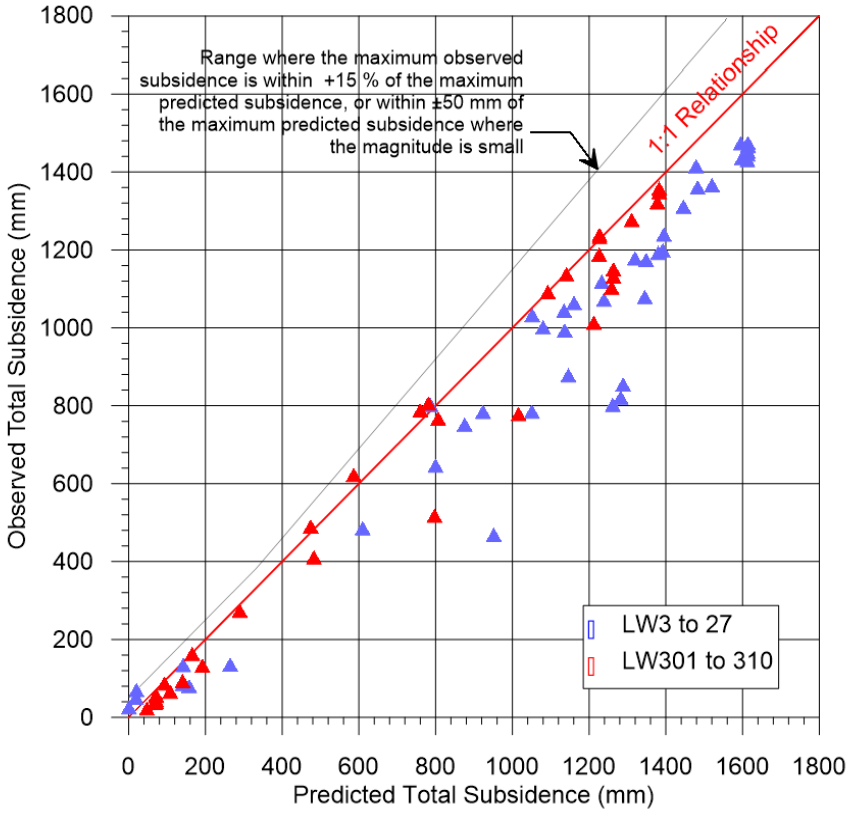


Chart 1 Comparison Between the Maximum Observed and Maximum Predicted Total Conventional Subsidence for Longwalls 3 to 27 and Longwalls 301 to 310 at Metropolitan Colliery

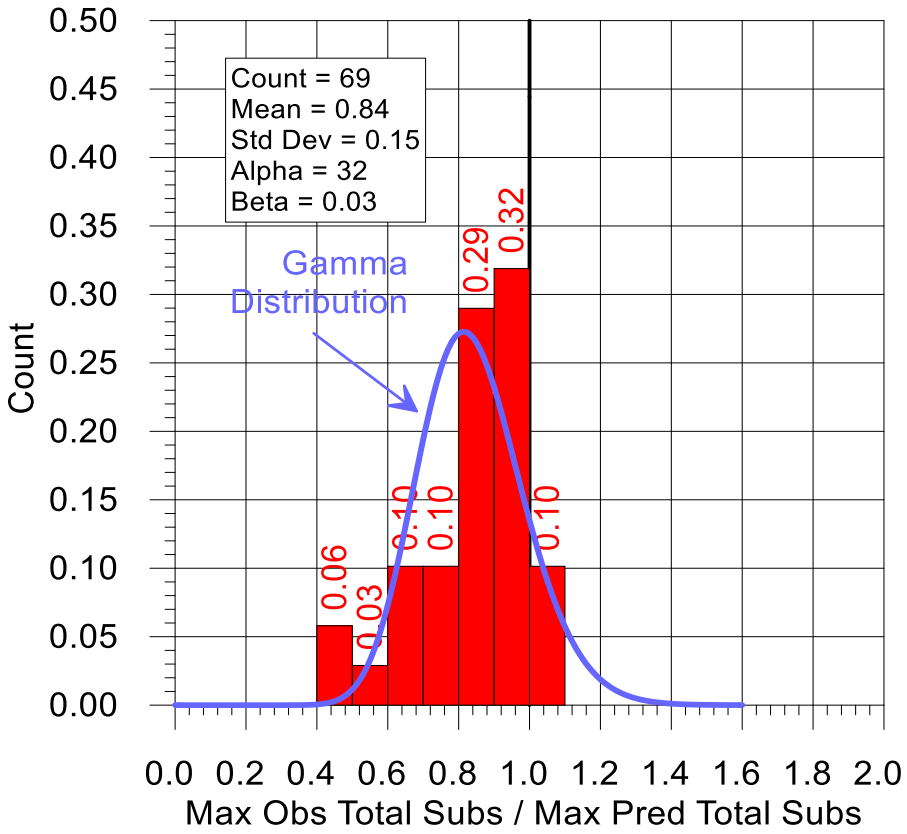


Chart 2 **Histogram of Maximum Observed/Maximum Predicted Total Vertical Subsidence with Gamma Distribution**

An analysis of the maximum observed versus maximum predicted vertical subsidence was undertaken by MSEC (Appendix A). The mean of the maximum observed divided by the maximum predicted vertical subsidence for the project shown in Chart 2 is 0.84, indicating that, on average, observed subsidence is 16 percent (%) less than predicted for the project. Based on the results of survey data to date and comparison with predicted conventional subsidence parameters, the profiles of vertical displacement adequately reflect the predictions. The overall subsidence effects of the project do not exceed predictions by more than 15% (Appendix A).

6.2 WATER MANAGEMENT

The Metropolitan Coal Longwalls 308-310 Water Management Plan was prepared to manage the potential environmental consequences of the Metropolitan Coal Longwalls 308-310 Extraction Plan on watercourses (including the Woronora Reservoir), aquifers, and catchment yield in accordance with Condition 6, Schedule 3 of the Project Approval.

The Metropolitan Coal Longwalls 311-316 Water Management Plan was prepared to manage the potential environmental consequences of the Metropolitan Coal Longwalls 311-316 Extraction Plan on watercourses (including the Woronora Reservoir), aquifers, and catchment yield in accordance with Condition 6, Schedule 3 of the Project Approval.

The Longwalls 311-316 Water Management Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences associated with Longwalls 20-22, Longwalls 23-27, Longwalls 301-303, Longwall 304, Longwalls 305-307 and Longwalls 308-310.

ATC Williams Pty Ltd (ATC Williams) (Appendices B1 and B2) and SLR Consulting Australia Pty Ltd (SLR) (Appendices C1 and C2) have reviewed the environmental performance of the Project in relation to surface water and groundwater in the underground mining area and surrounds for the reporting period.

The surface water, groundwater and meteorological monitoring locations are shown on Figures 7 to 12.

Sections 6.2.1 to 6.2.11 provide a summary of the surface water and groundwater assessments for the reporting period.

Section 6.8 provides a summary of the assessments against the water resource and watercourse subsidence impact performance indicators and measures for the reporting period.

6.2.1 Stream Features

Visual inspections and photographic surveys of the Waratah Rivulet (from Pool P [downstream of Longwall 23] to the Woronora Reservoir's full supply level) and Eastern Tributary (from the full supply level of the Woronora Reservoir to the maingate of Longwall 26) were conducted within three months of the completion of Longwall 309 and 310.

The visual and photographic surveys conducted at the completion of each longwall provide a detailed photographic record of stream features. The visual and photographic surveys have recorded observations of mining impacts including surface cracking, iron staining, gas releases and water discoloration/opacity. A summary of the observations for the reporting period is provided for the Waratah Rivulet (Table 7) and Eastern Tributary (Table 8). The location of mapped pools on the Waratah Rivulet and Eastern Tributary are provided in Appendix D.

During the reporting period, weekly inspections have also been undertaken where gas releases occur, and monthly inspections have been undertaken of the Eastern Tributary between the full supply level of the Woronora Reservoir and the Longwall 26 maingate to document surface cracking and iron staining. The results of these inspections are included in Table 8.

Visual inspections and photographic surveys of the Eastern Tributary (from the Woronora Reservoir full supply level to the Longwall 26 maingate) will continue to be conducted monthly while Longwall 311 extraction is within 450 m of the stream. Visual inspections and photographic surveys will also be conducted along the Waratah Rivulet (from Pool P to the full supply level of the Woronora Reservoir) within three months of the completion of Longwall 311.

Table 7
Monitoring of Stream Features – Waratah Rivulet Downstream of the Longwall 23 Maingate

Stream Feature	Summary of Observations
Surface Cracking and Drainage Behaviour	Metropolitan Coal's visual inspections downstream of the Longwall 23 maingate on the Waratah Rivulet indicate no mine-induced surface cracking and no observed changes to the natural drainage behaviour of the pools. The performance indicator, *No change to the natural drainage behaviour of Pools P, Q, R, S, T, U, V and W*, was not exceeded during the reporting period.
Surface Flow/ Pool Water Levels	Water levels in pools on the Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir (i.e. in Pools P, Q, R, S, T, U, V and W) have been monitored using a continuous water level sensor and logger (Figure 7 and Appendix D). The recorded water levels in Pools P, T, U, V and W have remained at or above the pools' previously recorded minimums. The recorded water levels in Pools Q, R and S have remained above that required to maintain water over the downstream rock bar. The monitoring results for the reporting period are further discussed in Section 6.2.3 and Appendices B1 and B2. The performance indicators, *Analysis of water level data for Pools P, T, U, V and W indicates the water level is at or above the pool's previous minimum*, and *Analysis of water level data for Pools Q, R and S indicates the water levels are above that required to maintain water over the downstream rock bar*, were not exceeded during the reporting period.
Iron Staining/ Flocculent	No change in iron staining was observed between Pools P to W on the Waratah Rivulet as a result of mining during the reporting period. Natural seeps and associated iron staining (as recorded by baseline mapping) continue to be recorded within this reach. The performance indicator, *Visual inspection of the Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir does not show significant changes in the extent or nature of iron staining that isn't also occurring in the Woronora River (control site)*, was not exceeded during the reporting period.
Gas Releases	Gas releases continued to be observed and monitored on the Waratah Rivulet at Pool P (in February, March, October and December 2024) and Pool U (in October 2024). No environmental effects resulting from the gas releases (such as riparian vegetation dieback or dead fish) have been observed. The performance indicator, *Gas releases in Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir have not increased beyond those observed up to the commencement of Longwall 301 extraction*, was exceeded at Pool P in the reporting period during March and October 2024. Assessments against the gas release subsidence impact performance measure were undertaken by Associate Professor Barry Noller (the University of Queensland), which concluded that the performance measure has not been exceeded during the reporting period (Appendix E).
Water Discoloration/ Opacity	Pools along the Waratah Rivulet were generally observed to be clear, sometimes showing a green opacity.

Table 8
Monitoring of Stream Features – Eastern Tributary Downstream of the Longwall 26 Maingate

Stream Feature	Summary of Observations
Surface Cracking and Drainage Behaviour	Metropolitan Coal's visual inspections of Pools ETAS, ETAT and ETAU (and associated rock bars) indicate no mine-induced surface cracking has been observed at Pools ETAS and ETAT during the reporting period and no increase in the occurrence of cracking has been observed at Pool ETAU. There have been no observed changes to the natural drainage behaviour of Pools ETAS, ETAT or ETAU during the reporting period The performance indicator, *No change to the natural drainage behaviour of Pools ETAS, ETAT and ETAU*, was not exceeded during the reporting period.
Surface Flow/ Pool Water Levels	As previously reported in the 2016 to 2023 Metropolitan Coal Annual Reviews, mine subsidence resulted in the diversion of flows or change to the natural drainage behaviour of Pools ETAG to ETAR between the full supply level of the Woronora Reservoir and the Longwall 26 maingate, (Figure 7 and Appendix D). As of December 2024, mining had not resulted in the diversion of flows or change to the natural drainage behaviour of Pools ETAS, ETAT and ETAU (Figure 7 and Appendix D). Water levels in Pool ETAU and in Pools ETAS/ETAT (since May 2018) have been monitored using a continuous water level sensor and logger (Figure 7 and Appendix D). The monitoring results are discussed in Section 6.2.3 and in Appendices B1 and B2 and indicate the natural drainage behaviour of Pools ETAS/ETAT and ETAU have not been impacted by mine subsidence. The performance indicator, *Analysis of water level data for Pool ETAS/ETAT and Pool ETAU indicates the water levels are above that required to maintain water over the downstream rock bar*, was not exceeded during the reporting period.
Iron Staining/ Flocculent	As previously reported in the 2016 to 2023 Metropolitan Coal Annual Reviews, mine subsidence resulted in the exceedance of the Eastern Tributary performance measure in relation to iron staining (emphasis added): *Negligible environmental consequences over at least 70% of the stream length (that is no diversion of flows, no change in the natural drainage behaviour of pools, **minimal iron staining** and minimal gas releases)*. During the reporting period, iron staining continued to be observed along the reach of the Eastern Tributary between the full supply level of the Woronora Reservoir and the Longwall 26 maingate and was most evident in the reach from Pool ETAQ to Boulderfield ETAU.
Gas Releases	No gas releases were observed on the Eastern Tributary during the reporting period. No environmental effects resulting from the gas releases (such as riparian vegetation dieback or dead fish) have been observed. The performance indicator, *Gas releases in Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26 have not increased beyond those observed up to the commencement of Longwall 301 extraction*, was not exceeded during the reporting period.
Water Discoloration/ Opacity	Orange in colour where iron staining occurred. Pools along the Eastern Tributary observed with a green opacity.

The results of the stream inspections (Tables 7 and 8) are consistent with the potential subsidence impacts described in the Metropolitan Coal Project Environmental Assessment (Project EA) (Helensburgh Coal Pty Ltd [HCPL], 2008), the Preferred Project Report (HCPL, 2009) and the Metropolitan Coal Water Management Plans, including cracking and dilation of bedrock which has resulted in the localised diversion of a portion of the surface flow through either:

- **diversion into subterranean flows**, where water travels via new mining induced fractures and opened natural joints in the bedrock into near-surface dilated strata beneath the bedrock, ultimately re-emerging at the surface downstream; or
- **leakage through rock bars**, where the rate of leakage from pools through rock bars to the downstream reaches of the stream is increased by new mining induced fractures.

The Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans indicated that the effects of underflow would be localised to the subsidence affected reaches of streams. Underflow has been observed to result in lower water levels in pools as they become hydraulically connected with the fracture network. During prolonged dry periods when flows recede to low levels, the number of instances where loss of flow continuity between pools occurs increases with a greater proportion of the flow being conveyed entirely in the subsurface fracture network.

The Preferred Project Report and Metropolitan Coal Water Management Plan indicated that valley closure values of greater than 200 mm were predicted at pools/rock bars on the Waratah Rivulet upstream of the maingate of Longwall 23, downstream to rock bar ETAL on the Eastern Tributary, and on Tributary B. The NSW Planning Assessment Commission's Report for the Metropolitan Coal Project (NSW Planning Assessment Commission, 2009) indicates the Panel considered 'negligible consequence' for a watercourse to mean, *'no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases'*, and was assumed to be achieved in circumstances where predicted valley closure was less than 200 millimetres (mm).

Up until December 2016, the monitoring of water levels/drainage behaviour of pools on the Eastern Tributary between the maingate of Longwall 26 and the full supply level of the Woronora Reservoir was consistent with predictions. In the Longwalls 20-22 Extraction Plan Subsidence Assessment it was recognised that fracturing resulting in surface flow diversion could be observed at a site where the predicted total closure is less than 200 mm, although none had been observed to date. The report also noted that reference to the 200 mm predicted total closure value should be viewed as an indication of low probability (10%) of impact rather than certainty. In the Longwalls 23-27 Extraction Plan Subsidence Assessment, additional case studies were added to the pool impact model, including cases where loss of pool water levels had occurred at less than 200 mm predicted total closure. Similar to the previous database for Longwalls 20-22, the updated database showed that based on a maximum predicted total closure of 200 mm, the proportion of pools that experienced loss of pool water levels was around 10%.

In December 2016 and January 2017, a number of pools with predicted closure values of less than 200 mm experienced loss of pool water levels. This resulted in the exceedance of the negligible environmental consequences performance measure for the Eastern Tributary in relation to diversion of flows and drainage behaviour. The impacts are considered to be anomalous in that more than 15% of pools on the Eastern Tributary have experienced loss of pool water levels at predicted closure values of less than 200 mm. However, the combined data that is available to MSEC for the Southern Coalfield (including the Waratah Rivulet and Eastern Tributary results) indicates that less than 10% of all pools have experienced the diversion of flow at predicted closure values of less than 200 mm, consistent with previous assessments of potential pool impacts. On their own, the impacts for the Eastern Tributary are outside of the predictions of the empirical based model.

Metropolitan Coal's actions in relation to the Eastern Tributary Incident are described in Section 13.1. No additional pools downstream of the Longwall 26 maingate to those identified previously as being impacted (in terms of drainage behaviour) have been impacted during the reporting period.

The key potential subsidence impacts and environmental consequences in relation to bed gradients, scouring and stream alignment described in the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans included:

- Potential changes in bed gradients could occur, however, were anticipated to be small relative to the existing grades.
- An increased potential for scouring of the stream bed and banks (at locations where the predicted tilts considerably increase the natural pre-mining stream gradients). The potential for scouring is greatest in stream sections with alluvial deposits. Since the streambed of the Waratah Rivulet and the Eastern Tributary is predominantly erosion-resistant Hawkesbury Sandstone, scouring was expected to be very low.
- Subsidence fracturing of bedrock has the potential to cause dislodgement of rock fragments during high flow events.
- The potential for changes to stream alignment as a result of mine subsidence effects was considered to be low.
- Minor stream bank erosion, where changes in channel gradients result in increases in flow energy. It would be expected that bank erosion would be relatively minor and comprise a slow retreat of the bank until a new dynamic equilibrium is reached.

The results of the stream inspections have generally been consistent with these predictions. On the Waratah Rivulet (in a section of the stream over Longwall 21) and Eastern Tributary (in a section of the stream over Longwalls 20 and 21) increased ponding from changes in bed gradients has previously resulted in the prolonged inundation of the adjacent riparian vegetation which has resulted in some vegetation dieback on a local scale as described in Section 6.3.3.

As described in the Southern Coalfield Panel Report (Department of Planning [DoP], 2008) and the NSW Planning Assessment Commission's Report for the Metropolitan Coal Project (NSW Planning Assessment Commission, 2009), under certain conditions the cracking of stream beds and underlying strata has the potential to result in changes in water quality, particularly ferruginous springs and/or development of iron bacterial mats. Experience at Metropolitan Coal prior to Project Approval indicated that areas of the substratum can be covered by iron flocculent material for several hundred metres downstream of mine subsidence fractures.

Metropolitan Coal has monitored the extent of iron staining through visual and photographic surveys and assessed the extent of iron staining against the subsidence impact performance measures as follows:

- *Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P).*
- *Negligible environmental consequences over at least 70% of the stream length (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26.*

From January to December 2024, iron staining continued to be observed along the reach of the Eastern Tributary between the full supply level of the Woronora Reservoir and the Longwall 26 maingate and was most evident in the reach from Pool ETAQ to Boulderfield ETAU.

Prior to approval of the Project in 2009, no gas releases had been observed along the Waratah Rivulet, Eastern Tributary or other tributaries over the Metropolitan Coal lease, either before or during mining. Notwithstanding, the Project EA, Preferred Project Report, and Metropolitan Coal Water Management Plans recognised there was the potential for gas releases to occur.

During the reporting period 1 January 2024 to 20 October 2024, monitoring of gas releases was undertaken in accordance with the Metropolitan Coal Longwalls 308-310 Water Management Plan. From 21 October 2024 to 31 December 2024, monitoring of gas releases was undertaken in accordance with the Metropolitan Coal Longwalls 311-316 Water Management Plan.

The performance indicator, *Gas releases in Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir have not increased beyond those observed up to the commencement of Longwall 301 extraction*, was exceeded at Pool P during March and October 2024. No gas releases observed on the Eastern Tributary exceeded the performance indicators. Assessments against the performance measure have been undertaken by Associate Professor Barry Noller (the University of Queensland) and concluded that the performance measure has not been exceeded (Appendix E).

6.2.2 Surface Water Flow

Waratah Rivulet stream flow data (GS 2132102; Figure 7) is analysed to assess whether a statistically significant reduction in the quantity of water entering Woronora Reservoir in the post-mine period relative to the pre-mine period has occurred, that has not also occurred in the control catchment(s).

The quantity of water entering the Woronora Reservoir is not considered to be significantly different post-mining compared to pre-mining if the median of the ratios (of 14 day sums of monitored flow) for the 'sliding' 12 month period does not fall below the 20th percentile of the baseline data.

Chart 3 shows a plot of the sliding 12 month median of the ratio of 14 day sums of monitored and modelled flow at Waratah Rivulet (GS 2132102) to 31 December 2024.

For the Project EA, a comprehensive analysis of stream flow data and data on the yield behaviour of Woronora Reservoir indicated that past mining at Metropolitan Coal had no discernible effect on the inflow to, or yield from, the reservoir. Surface water flow monitoring indicates there has been a negligible reduction in the quantity of water resources reaching the Woronora Reservoir during the reporting period.

The results show that the moving 12 month median of the 14 day filtered low flow ratio remained above the 35th percentile for the duration of the reporting period. In accordance with the Metropolitan Coal Longwalls 308-310 and Longwalls 311-316 Water Management Plan TARP, this equates to a Level 1 significance from 1 January to 31 December 2024.

As such, it is considered that the performance indicator relating to the quantity of water entering Woronora Reservoir from Waratah Rivulet has not been exceeded and an assessment against the performance measure is not required.

Chart 4 shows the flow monitoring data that is available since gauging station construction on the Eastern Tributary (GS 300078; Figure 7) in September 2012 compared to model predictions. The results for the reporting period indicate that flow has been continuous at the gauging station and that it has been generally consistent with, or above, model predictions (Chart 4). The 2021 Metropolitan Coal Surface Water Review (Hydro Engineering & Consulting [HEC], 2022) identified that the streamflow recorded at the gauging station has been increasingly higher than the model predictions from mid-2018.

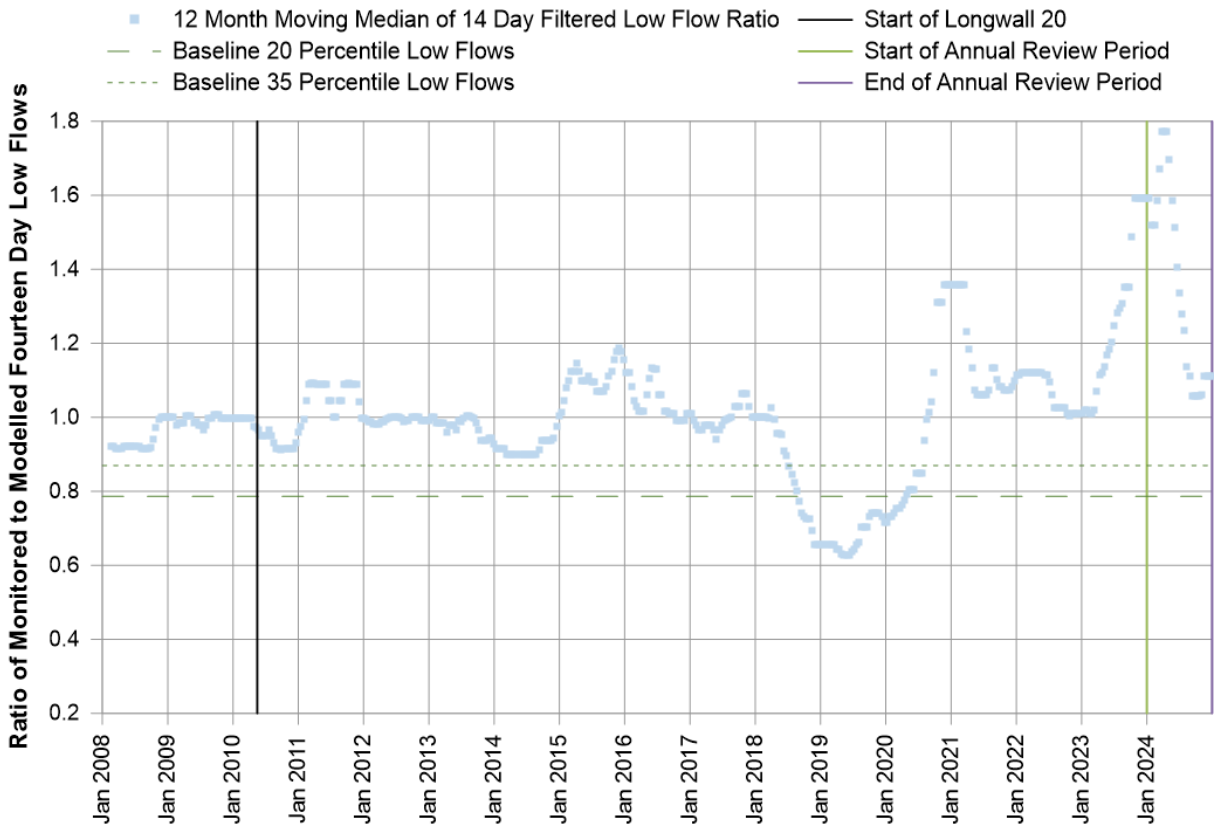


Chart 3 **One Year Sliding Median for the Ratios of the 14 Day Sums of Monitored and Modelled Flow Rates at Waratah Rivulet (GS 2132102)**

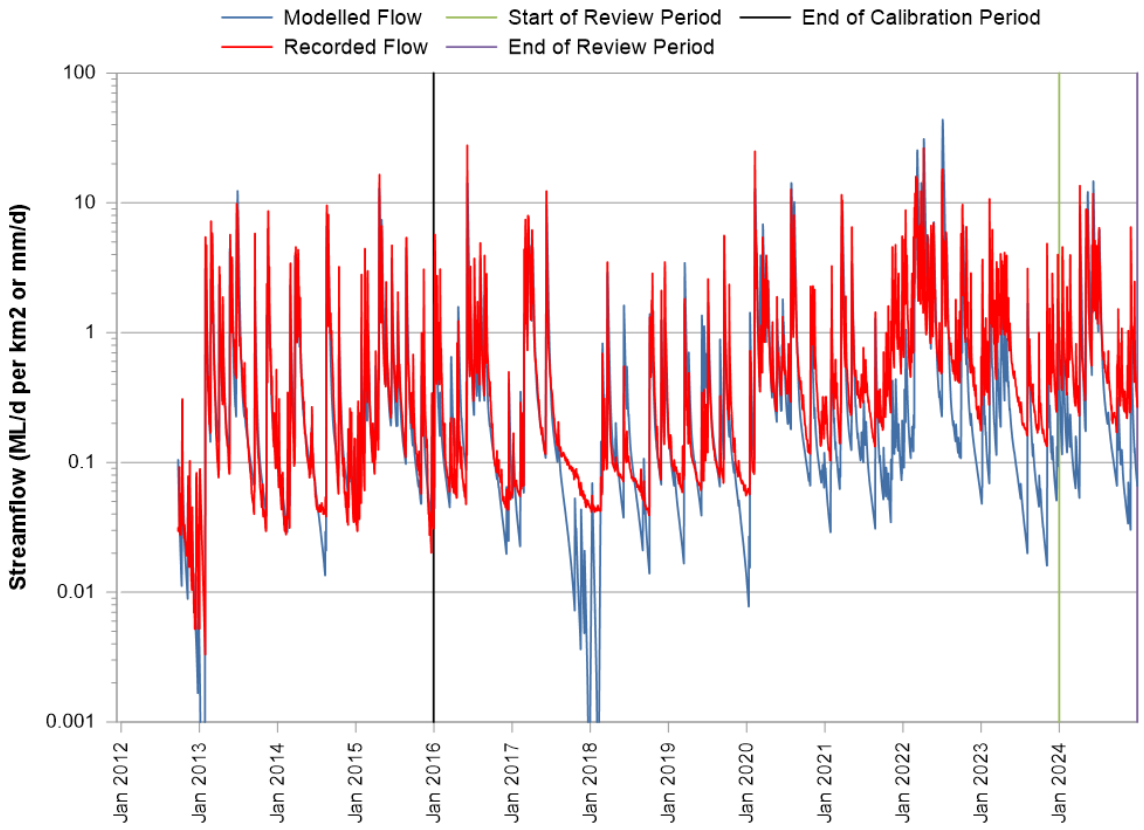


Chart 4 **Monitored and Model Predicted Flows – Eastern Tributary Upstream of Woronora Reservoir**

Key outcomes of the review of the recorded streamflow at GS 300078 are:

1. The most likely cause of the higher recorded data is the method by which recorded streamflow has been extrapolated above the capacity of the flow measuring flume. When the method is adjusted (using quadratic extrapolation of the flume rating curve), recorded streamflow data more closely matches recorded data.
2. A controlled hazard reduction burn was conducted within the Metropolitan Special Area and the catchment of GS 300078 on 29 April 2021. For a period of approximately 10 months following, the divergence between the hydrographs increases and this behaviour is considered related to the effects of the burn, which likely increased the rate of catchment runoff. However, this behaviour appears to have diminished since the onset of higher rainfall in approximately March 2023.
3. During periods of flow recession dating back to spring 2017, the modified streamflow record somewhat exceeds modelled flow. It is considered that this may be related to increased baseflow occurring due to subsidence-induced stream bed fracturing upstream of GS 300078 leading to flow diversion through the fracture network which increases flow routing.

This indicates that flows reaching the Woronora Reservoir have not been reduced by mining (Appendices B1 and B2).

6.2.3 Pool Water Levels

The water level in a number of pools on the Waratah Rivulet, Eastern Tributary, Tributary B and Woronora River (Figure 7) has been either manually monitored on a daily basis[1] or monitored using a continuous water level sensor and logger.

During the reporting period, all pools on the Waratah Rivulet (Pools A, B, C, E, F, G, G1, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V and W) remained above their cease to flow levels or historical minimums for the duration of the reporting period.

There were no exceedances of the performance indicator, *Analysis of water level data for Pools P, T, U, V and W indicates the water level is at or above the pool's previous minimum* from January to December 2024. Metropolitan Coal's visual inspections of Pools P, Q, R, S, T, U, V and W downstream of the maingate of Longwall 23 indicate no mine-induced surface cracking and no observed changes to the natural drainage behaviour of the pools (Metropolitan Coal, pers. comm). The visual inspection results equate to a Level 1 significance level.

On the Eastern Tributary, water levels in Pools ETG, ETJ, ETM, ETU, ETW, ETAF, ETAG, ETAH, ETAI/ETAJ/ETAK[2], ETAL, ETAM, ETAN, ETAO, ETAP, ETAQ, ETAR, ETAS/ETAT[3] and ETAU are monitored using a continuous water level sensor and logger (Figure 7).

A review of the Eastern Tributary water level graphs as shown in Charts 5 to 12, indicates that water level records are consistent with historical records and that the pool continued to flow for the duration of the reporting period. The majority of monitored pools on the Eastern Tributary recorded an increase in water level in response to high rainfall experienced during April, May, June and July 2024. (Appendices B1 to B2).

[1] Specifically, Pools B, C, E, G, G1, H and I on Waratah Rivulet.

[2] Only small rock bars separate Pools ETAI, ETAJ and ETAK, with the pools joining to become the one large pool as water levels rise. Pool ETAK is controlled by a more substantial rock bar. Readings from the water level sensor situated in Pool ETAI is considered to also be representative of the water level in Pools ETAJ and ETAK.

[3] Due to the nature of rock bar ETAS, Pool ETAS and Pool ETAT typically record the same level. A continuous water level sensor and logger was installed at Pool ETAT. Water level data for Pools ETAS/ETAT is available from 24 May 2018.

Consistent with historical behaviour, the water level at Pool RTP1 on Tributary B rose in response to significant rainfall periods and declined below the sensor level during periods of below average rainfall. Pool RTP1 was recorded as dry during visual inspections in January, March, April and May 2024. Water level records for Pools RTP2, SR1, SR2 and SP1 show an increase in pool level in response to high rainfall experienced from April to July 2024 (Appendices B1 and B2).

As described in Section 6.2.1, the Eastern Tributary pool water level monitoring results for the reporting period were consistent with the potential subsidence impacts and environmental consequences described in the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans in that data that is available to MSEC for the Southern Coalfield (including the Waratah Rivulet and Eastern Tributary results) indicates that less than 10% of all pools have experienced the diversion of flow at predicted closure values of less than 200 mm, consistent with previous assessments of potential pool impacts. On their own, the impacts for the Eastern Tributary are outside of the predictions of the empirical based model.

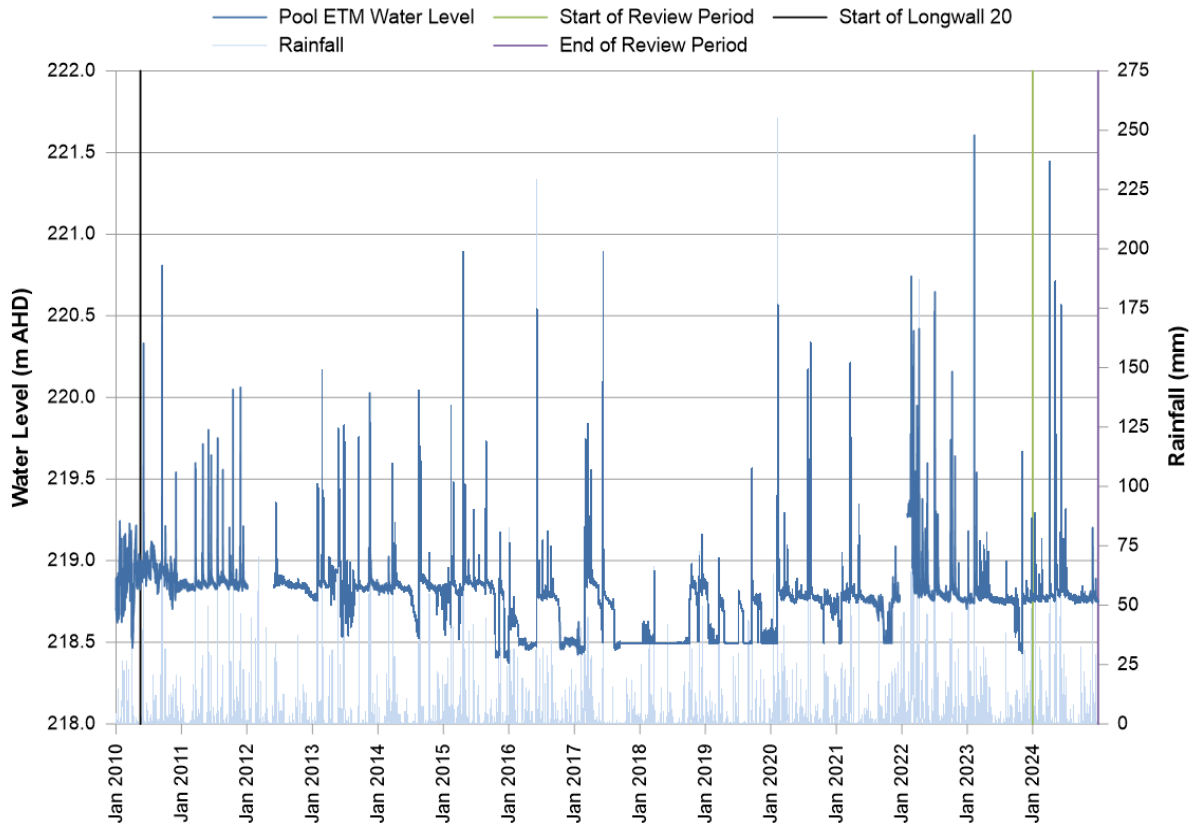


Chart 5 Pool ETM

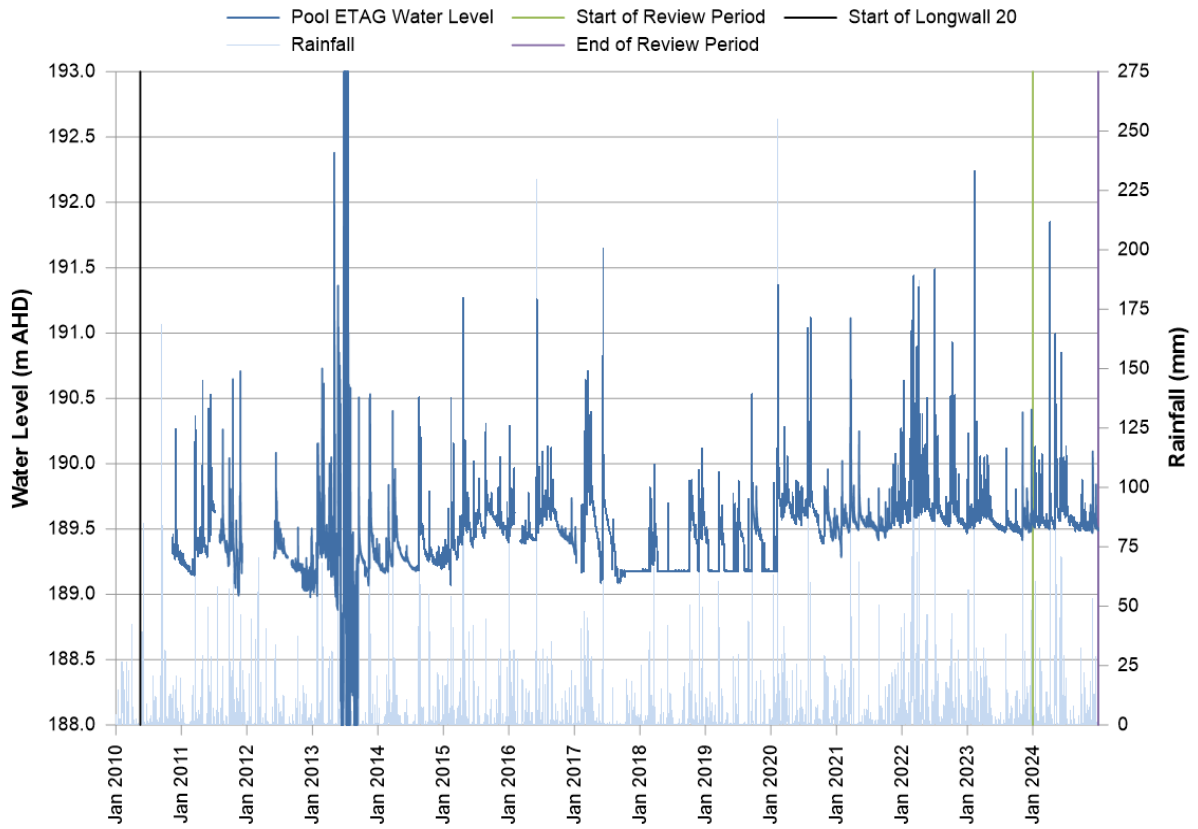


Chart 6 Pool ETAH

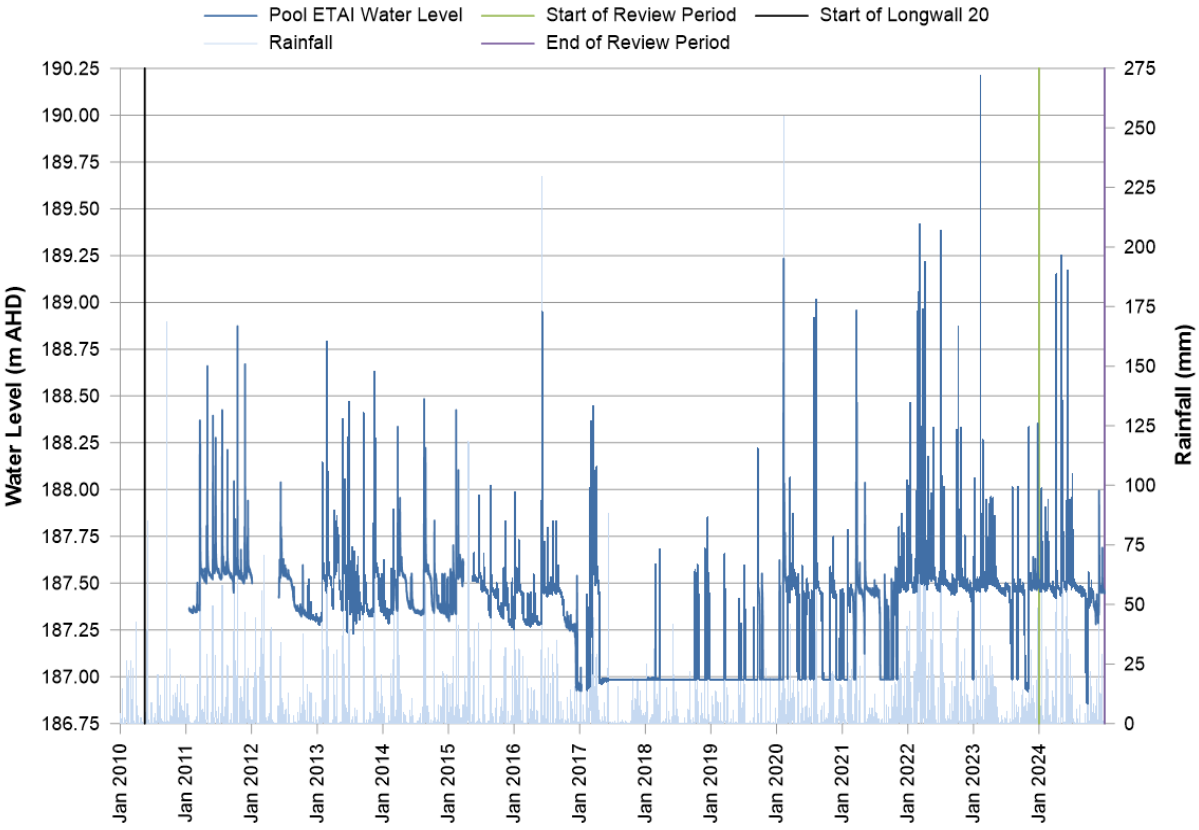


Chart 7 Pool ETAI

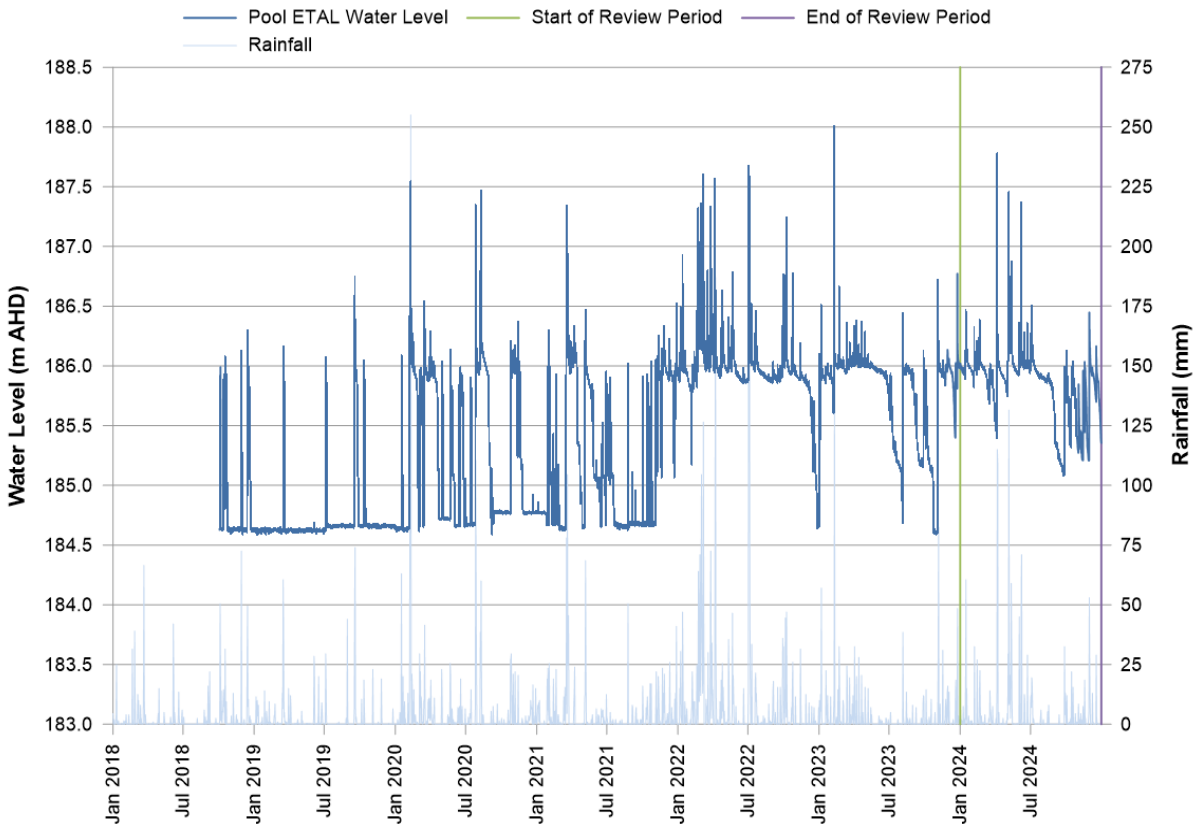


Chart 8 Pool ETAL

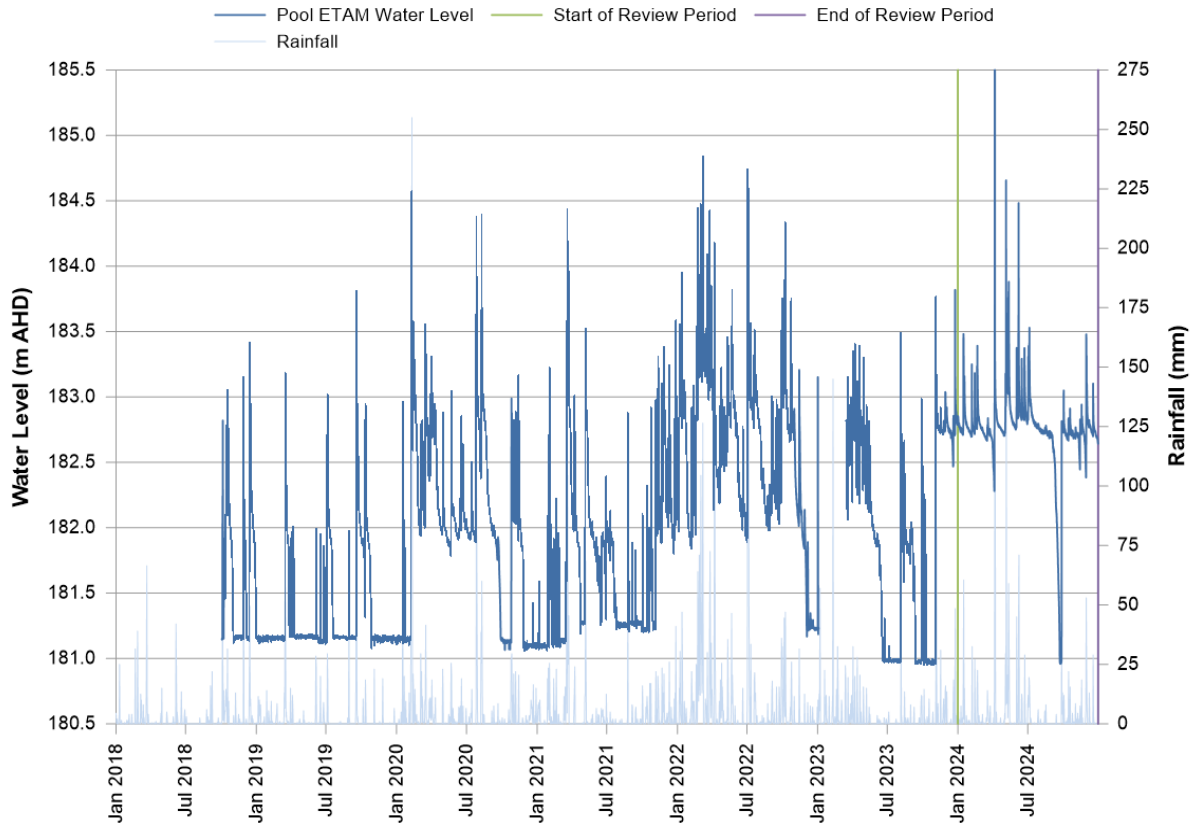


Chart 9 Pool ETAM

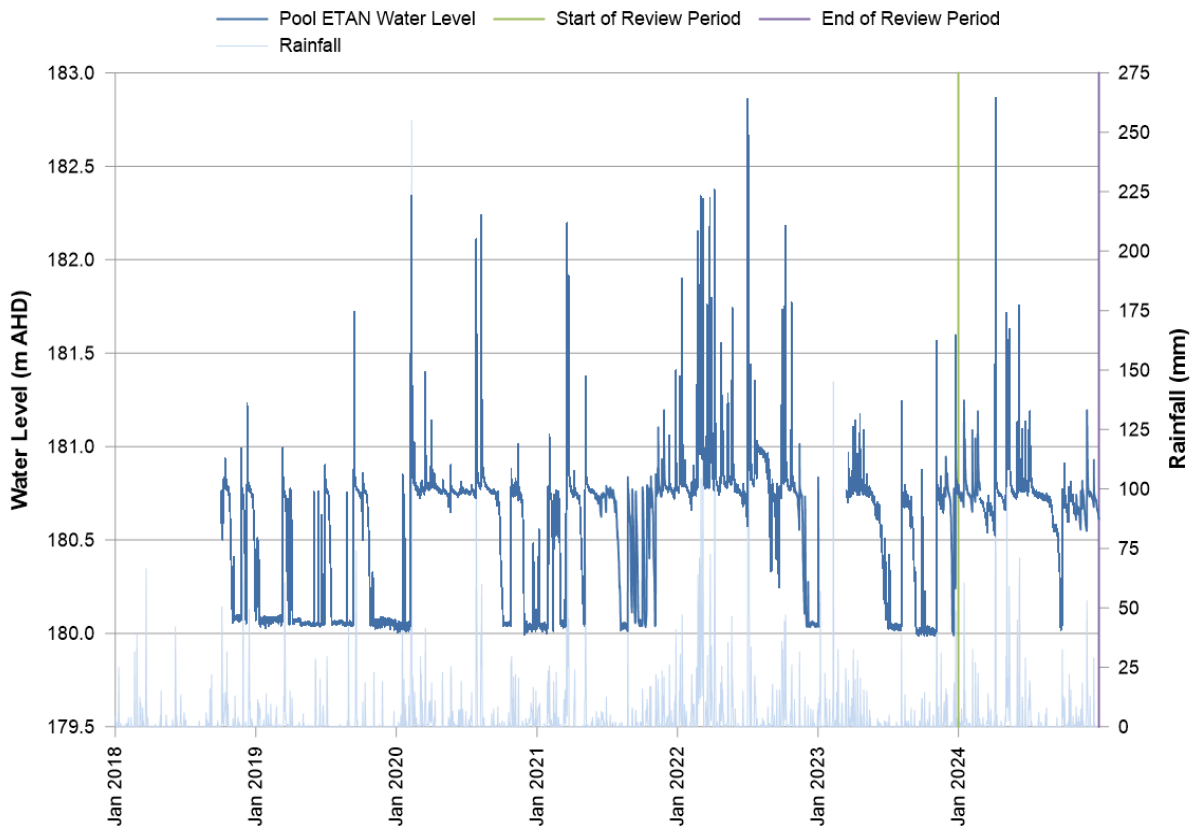


Chart 10 Pool ETAN

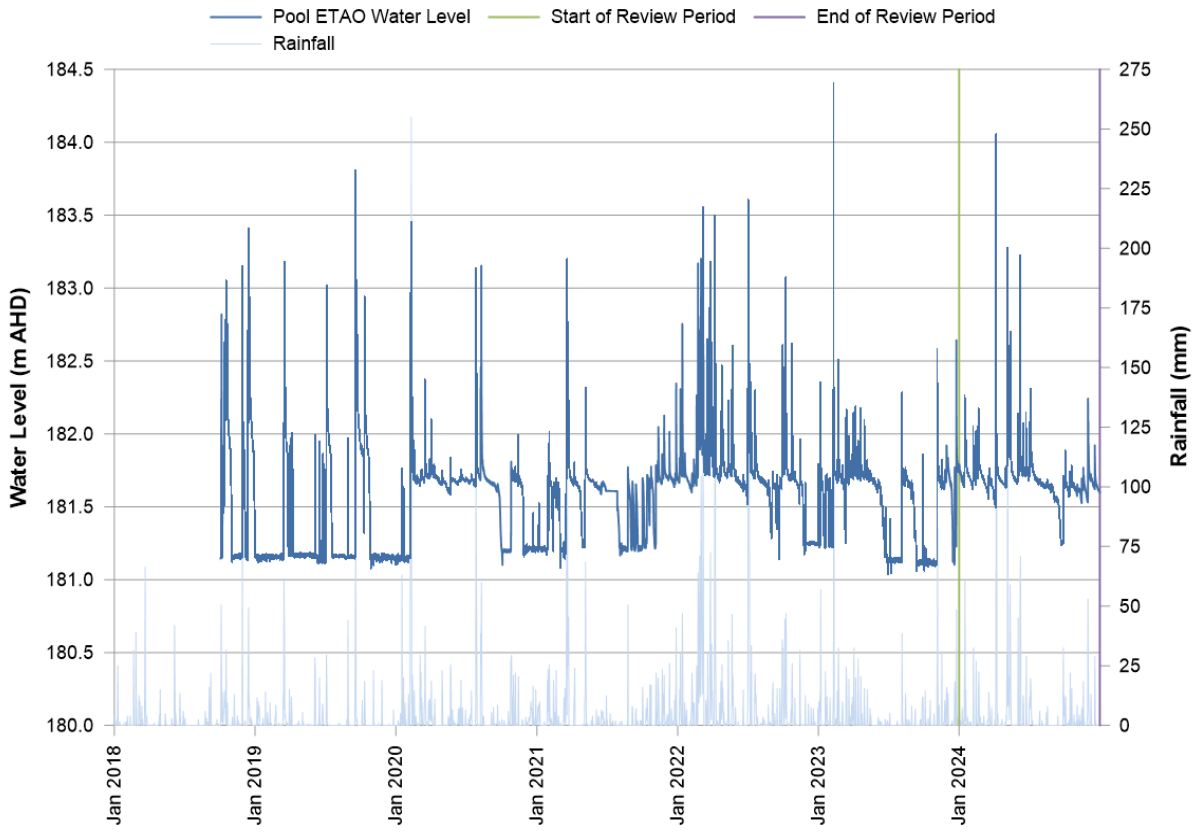


Chart 11 Pool ETAO

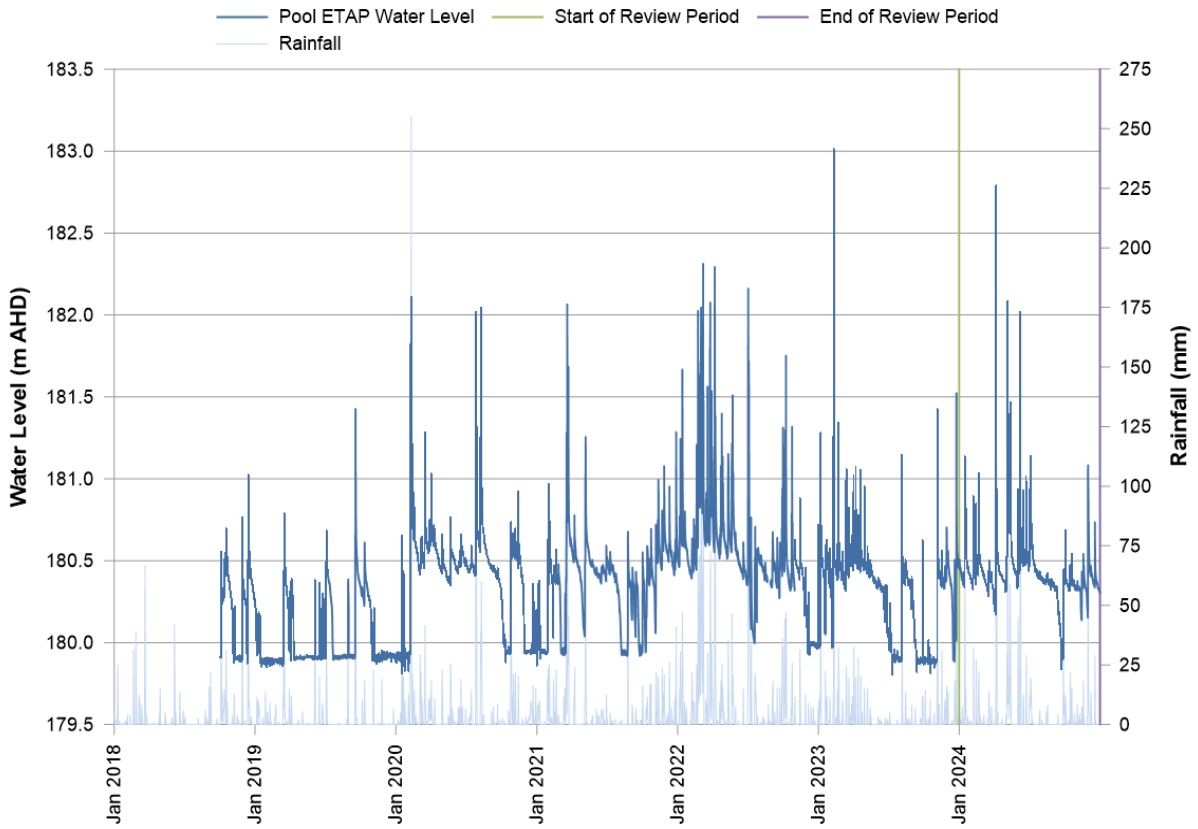


Chart 12 Pool ETAP

6.2.4 Stream Water Quality

Surface water quality sampling has been conducted monthly in the Waratah Rivulet (sites WRWQ2, WRWQ6, WRWQ8, WRWQ9, WRWQM, WRWQN, WRWQP, WRWQR, WRWQT, WRWQU, WRWQV, WRWQW), Eastern Tributary (sites ETWQF, ETWQJ, ETWQN, ETWQU, ETWQW, ETWQAF, ETWQAH, ETWQAQ, ETWQAU), Tributary B (site RTWQ1), Tributary D (site UTWQ1), Far Eastern Tributary (site FEWQ1), Honeysuckle Creek (site HCWQ1), Bee Creek (site BCWQ1), Woronora Reservoir Tributaries (SR1, SR2 and SP1) and Woronora River (WOWQ1 and WOWQ2) (Figure 8) in accordance with the Metropolitan Coal Longwalls 308-310 and Longwalls 311-316 Water Management Plan.

In October 2016, Metropolitan Coal increased the frequency of water quality sampling at select sites on the Eastern Tributary (sites ETWQF, ETWQN, ETWQAF, ETWQAG, ETWQAH, ETWQAI, ETWQAK, ETWQAQ and ETWQAU) and at site WOWQ2 on the Woronora Reservoir from monthly to weekly in response to the Eastern Tributary Incident. Weekly sampling continued throughout the reporting period.

Trends in the monitoring data to date for key parameters (pH, electrical conductivity [EC], dissolved iron, dissolved manganese, dissolved aluminium, total iron, total manganese and total aluminium) are summarised in Table 9 and shown on Charts 13 to 52 (Appendices B1 and B2). Historical trends in the monitoring data for the key parameters (pH, EC, dissolved iron, dissolved manganese, dissolved aluminium, total iron, total manganese and total aluminium) are summarised in Appendix B2.

Water quality data has been analysed for key water quality parameters of relevance to water supply and the effects of subsidence, namely iron, manganese and aluminium at site WRWQ9 on Waratah Rivulet, site ETWQ AU on Eastern Tributary and at control site WOWQ2 on the Woronora River.

The performance indicator, *Changes in the quality of water entering Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations that are not also occurring at control site WOWQ2,* is considered to have been exceeded if data analysis indicates a significant change in the quality of water post-mining of Longwall 20. Specifically, if[4]:

- any water quality parameter exceeds the adjusted baseline mean plus two standard deviations for two consecutive months; or
- over a three month period the water quality parameter exceeds the adjusted mean plus two standard deviations in the first month, the adjusted mean plus one standard deviation in the next month and the adjusted mean plus two standard deviations in the third month; or
- the six month mean of the water quality parameter exceeds the adjusted baseline mean plus one standard deviation for two consecutive assessment periods (i.e. over two six monthly reports); and
- there was not a similar exceedance of the trigger at the control site.

Total iron, manganese and aluminium concentrations have been assessed against the Sydney Catchment Authority and Sydney Water Corporation Raw Water Supply Agreement (WaterNSW, 2013) (Appendix B2). The water quality standard applicable to metals concentrations (assumed to be for total concentration) is as follows:

- total iron = 1 milligram per litre (mg/L)
- total aluminium = 0.4 mg/L
- total manganese = 0.1 mg/L

[4] Note each ‘mean’ is calculated as a geometric mean.

Table 9
Summary of Results for Key Water Quality Parameters During the Reporting Period

Stream(s)	pH	EC	Dissolved and Total Iron	Dissolved and Total Manganese	Dissolved and Total Aluminium
Waratah Rivulet (sites WRWQ2, WRWQ6, WRWQ8, WRWQ9, WRWQM, WRWQN, WRWQP, WRWQR, WRWQT, WRWQU, WRWQV and WRWQW) (Charts 13 to 28)	• pH values recorded for upper to middle reach sites predominately range between 6 and 8. • No historically high values were recorded during the reporting period.	• EC at all sites were generally low concentrations compared to historical records. • Since 2020, EC values have demonstrated an overall decreasing trends, with the exception of brief periods of elevated values in mid to late 2021 and early to mid-2023. • No historically high values were recorded during the reporting period.	• Dissolved iron concentrations at all upper to middle reach sites from mid-2024 increased to approximately 1.4 mg/L, except WRWQ2, which remained below 0.4 mg/L for the duration of the reporting period. • A new historical maximum of dissolved iron was recorded for WRWQ6 and WRWQM (1.43 and 1.22 mg/L, respectively) in September 2024. • Dissolved iron concentrations at all lower reach sites increased during the reporting period, however concentrations remained within the range of historical values for all sites. • Total iron concentrations for all lower reach sites were increased from mid-2023 to early 2024, before declining by approximately 0.4 mg/L between April to July 2024. • Total iron concentrations recorded were within historical range for upper, middle and lower reach sites.	• Dissolved manganese concentrations were generally elevated for upper and middle reach sites with concentrations ranging up to 0.8 mg/L in comparison to lower reach sites with concentrations below 0.2 mg/L. • Total manganese concentrations for the Waratah Rivulet sites are limited to 2024. Based on available records, upper to middle reach sites were generally elevated in comparison to lower reach sites. • Total manganese concentrations at upper to middle reach sites range up to approximately 0.2 mg/L, while lower reach sites were less than 0.1 mg/L.	• Dissolved aluminium concentrations at upper, middle and lower reach sites was generally less than 0.15 mg/L throughout the period of record. • Dissolved aluminium concentrations increased slightly during April to July and December 2024, however, were within the range of historical values. • Total aluminium records for Waratah Rivulet sites are limited to 2024, however, based on available records concentrations were variable and range up to approximately 1.2 mg/L.

Table 9 (Continued)
Summary of Results for Key Water Quality Parameters During the Reporting Period

Stream(s)	pH	EC	Dissolved and Total Iron	Dissolved and Total Manganese	Dissolved and Total Aluminium
Woronora River (sites WOWQ1 and WOWQ2, control stream) (Charts 29 to 36)	• Slightly acidic pH levels. • pH levels at both sites were within the range of historical values.	• Values at WOWQ2 exhibited more variability than values recorded at WOWQ1. • All sites were within the range of historic values.	• Both dissolved and total iron concentrations were generally below 2 mg/L at both WOWQ1 and WOWQ2, although WOWQ2 concentrations were slightly higher than WOWQ1. • Dissolved iron concentrations remained low and relatively consistent with historical trends at both sites during the reporting period. • Total iron concentrations remained consistent with historical records during the reporting period, with higher variability evident than that of dissolved iron.	• Dissolved manganese concentrations were slightly elevated at WOWQ2 during summer months and slightly declined during the remainder of reporting period. • Dissolved manganese concentrations were within the range of historical values during 2024 for both sites.	• Dissolved aluminium concentrations at all sites were within the range of historical concentrations during the reporting period. • Total aluminium concentrations for WOWQ2 were available for the majority of 2024 and generally ranged between 0.05 and 2 mg/L.
Eastern Tributary (sites ETWQF, ETWQJ, ETWQN, ETWQU, ETWQW, ETWQAF, ETWQAH, ETWQAQ and ETWQAU)[1] (Charts 37 to 44)	• Slightly acidic to near neutral conditions. • pH values were within the range of historical values at all sites.	• EC values were generally consistent, with majority of values ranging between 100 and 200 microsiemens per centimetre. • Values recorded during the reporting period were generally consistent with historical values.	• Dissolved iron concentrations were generally at or below 1 mg/L for all sites except ETWQ AQ. • Total iron concentrations ranged between 1-2 mg/L at all sites except ETWQ AQ. • Consistent with historical behaviour, dissolved and total iron concentrations recorded at ETWQ AQ were variable and elevated in comparison to other sites on the Eastern Tributary.	• Dissolved manganese concentrations were generally consistent with the majority of records at less than 0.5 mg/L during the reporting period. • Total manganese concentrations were less than 1 mg/L for the period of record.	• Dissolved aluminium concentrations generally increased (likely coinciding with rainfall events) form mid-2024, however were within the range of historical values for the duration of the reporting period. • Total aluminium concentrations are similar to dissolved concentrations, although are slightly elevated in comparison.

Table 9 (Continued)
Summary of Results for Key Water Quality Parameters During the Reporting Period

Stream(s)	pH	EC	Dissolved and Total Iron	Dissolved and Total Manganese	Dissolved and Total Aluminium
Bee Creek (site BCWQ1, control stream), Honeysuckle Creek (site HCWQ1, control stream), Far Eastern Tributary (site FEWQ1), Tributary B (site RTWQ1) and Tributary D (site UTWQ1) (Charts 45 to 52)	• Bee Creek and Honeysuckle Creek had slightly acidic to acidic pH levels. • Far Eastern Tributary and Tributary D generally had circumneutral pH levels. • Tributary B had near neutral to slightly alkaline pH levels. • Overall, the pH levels were consistent with historical values.	• The values recorded during the reporting period were consistent with historical values.	• Total and dissolved iron concentrations were within the range of historical values at all site during the reporting period.	• Dissolved manganese concentrations were consistently low (less than 0.1 mg/L) at sites HCWQ1 and BCWQ1 during reporting period, however, were within the range of historical values. • Total and dissolved manganese concentrations at all sites were within the range of historical values during the reporting period.	• Total and dissolved aluminium concentrations at all sites were within the range of historical values during the reporting period.
Western Tributaries of Waratah Rivulet (sites SP1, SR1 and SR2)	• Acidic pH levels were recorded at sites SP1, SR1 and SR2, ranging between pH levels of 4 and 6. • pH values were within the range of historical values at all sites.	• Values at all sites were generally consistent with historical values during the reporting period.	• Total and dissolved iron concentrations at all sites were within the range of historical values during the reporting period.	• Dissolved manganese concentrations at all sites were consistently at low concentrations (less than 0.01 mg/L). • Total manganese concentrations at all sites were less than 0.1 mg/L. • Total and dissolved manganese concentrations at all sites were within the range of historical values during the reporting period.	• Total and dissolved aluminium concentrations at all sites were within the range of historical values during the reporting period.

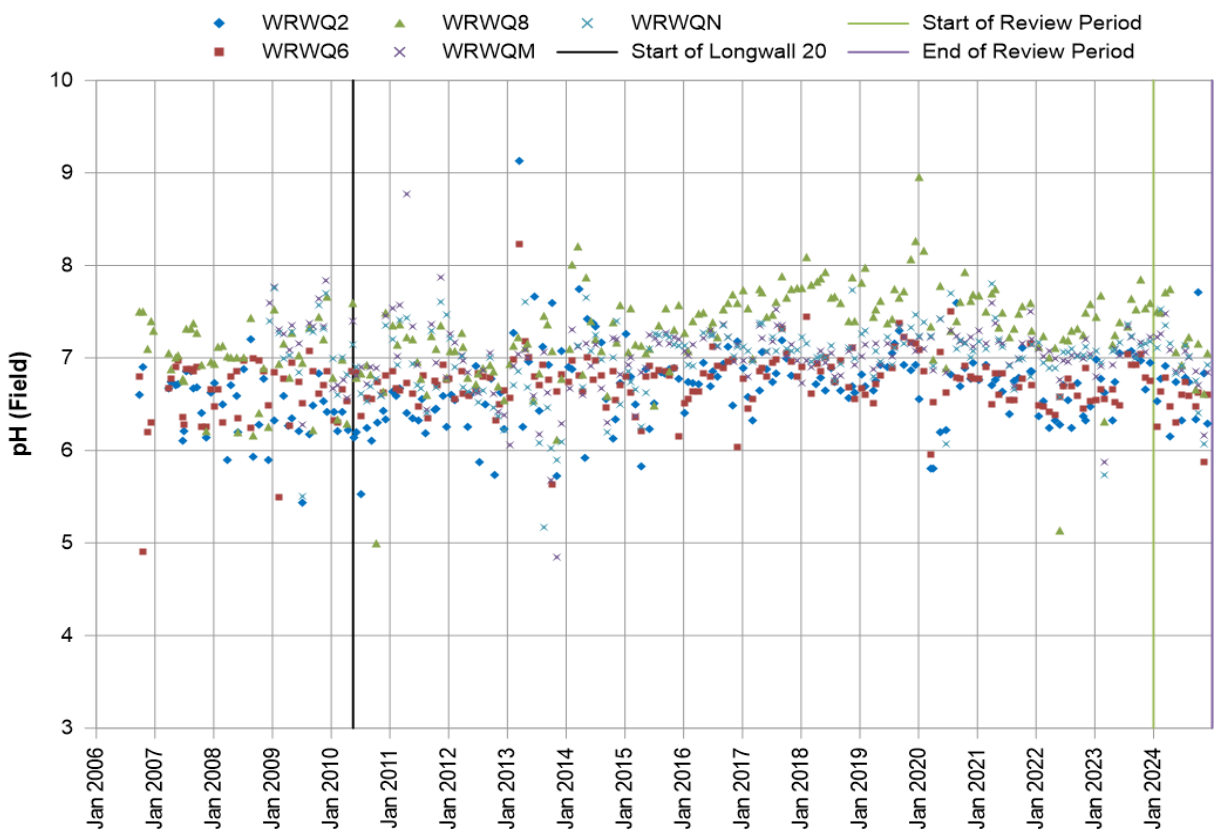


Chart 13 pH Levels Waratah Rivulet – Upper to Middle Reach Sites

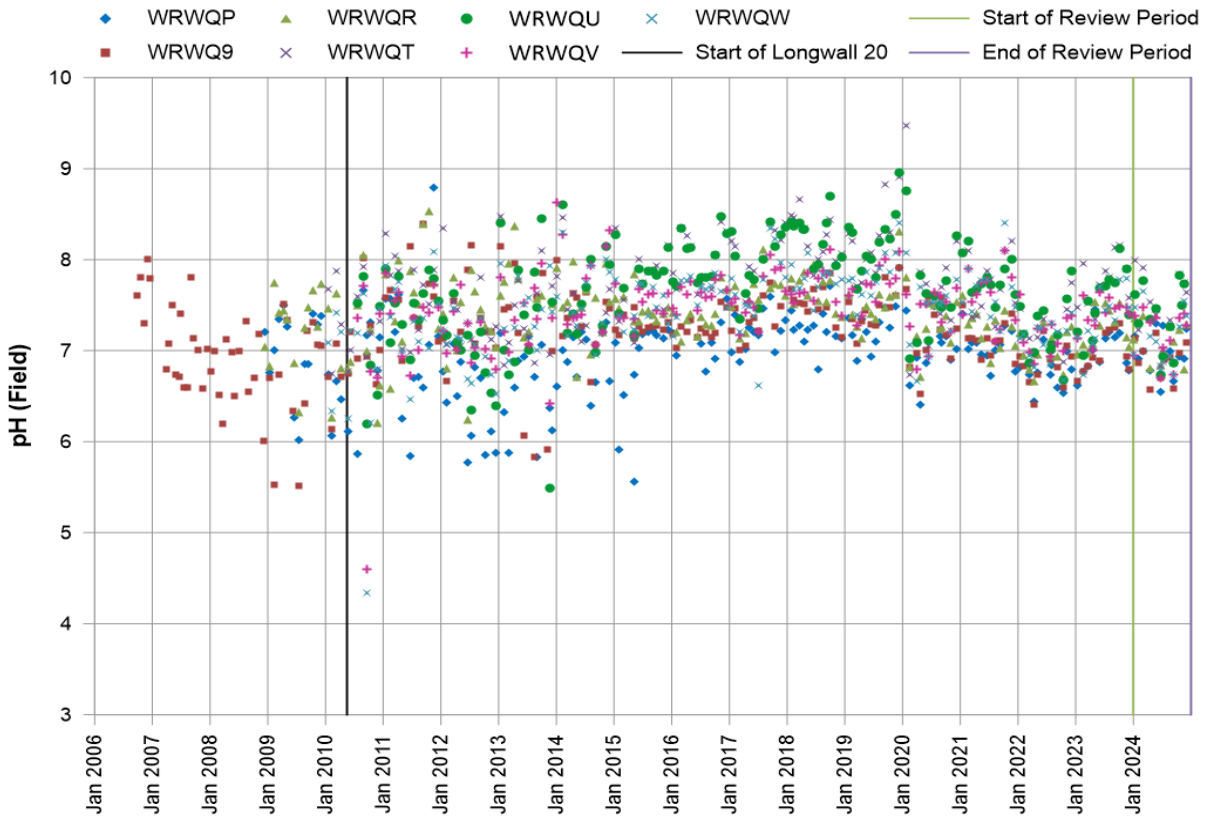


Chart 14 pH Levels Waratah Rivulet – Lower Reach Sites

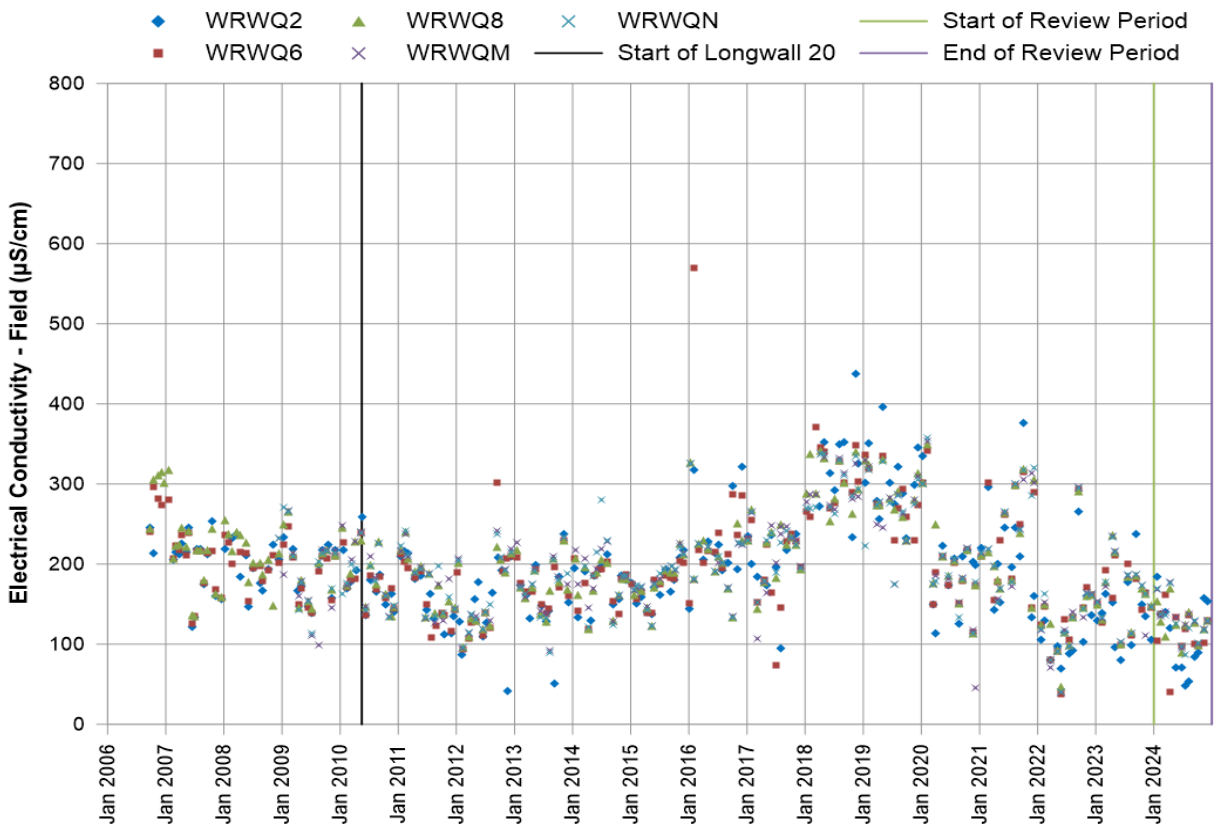


Chart 15 EC Waratah Rivulet – Upper to Middle Reach Sites

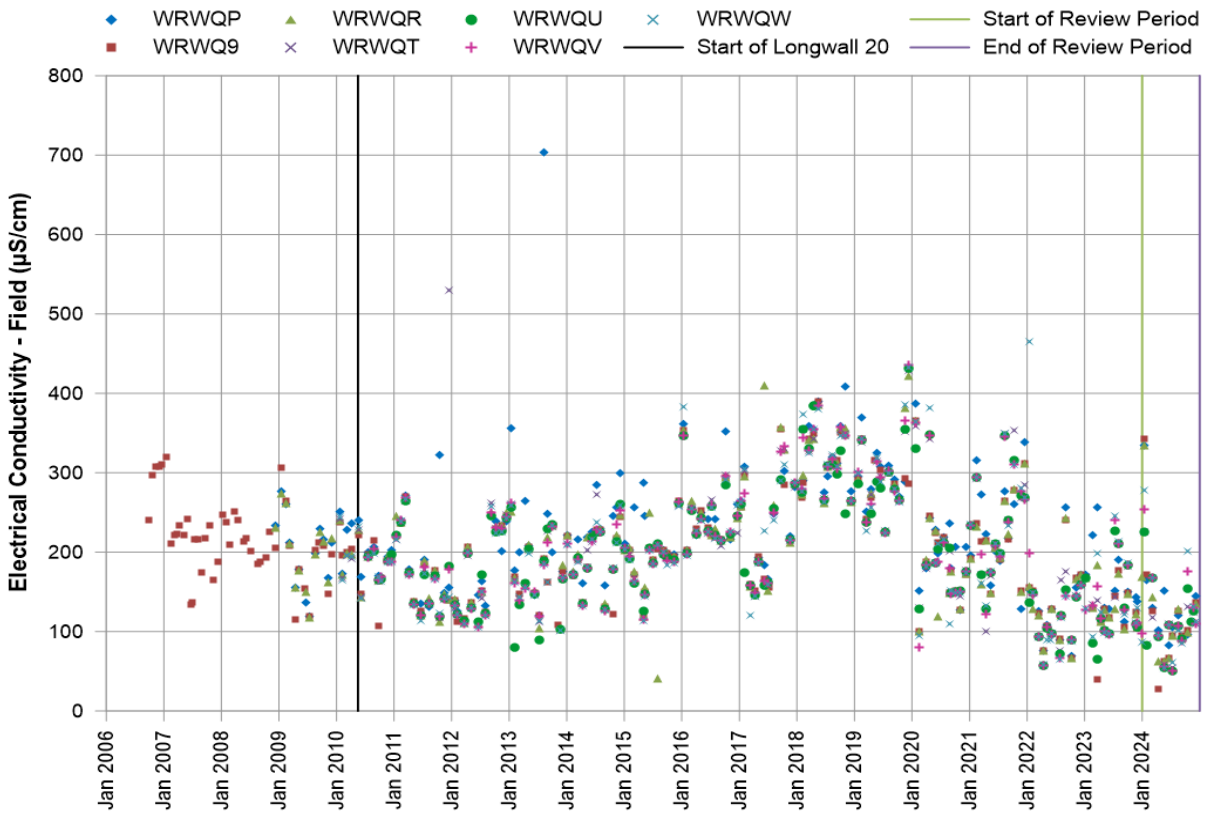


Chart 16 EC Waratah Rivulet – Lower Reach Sites

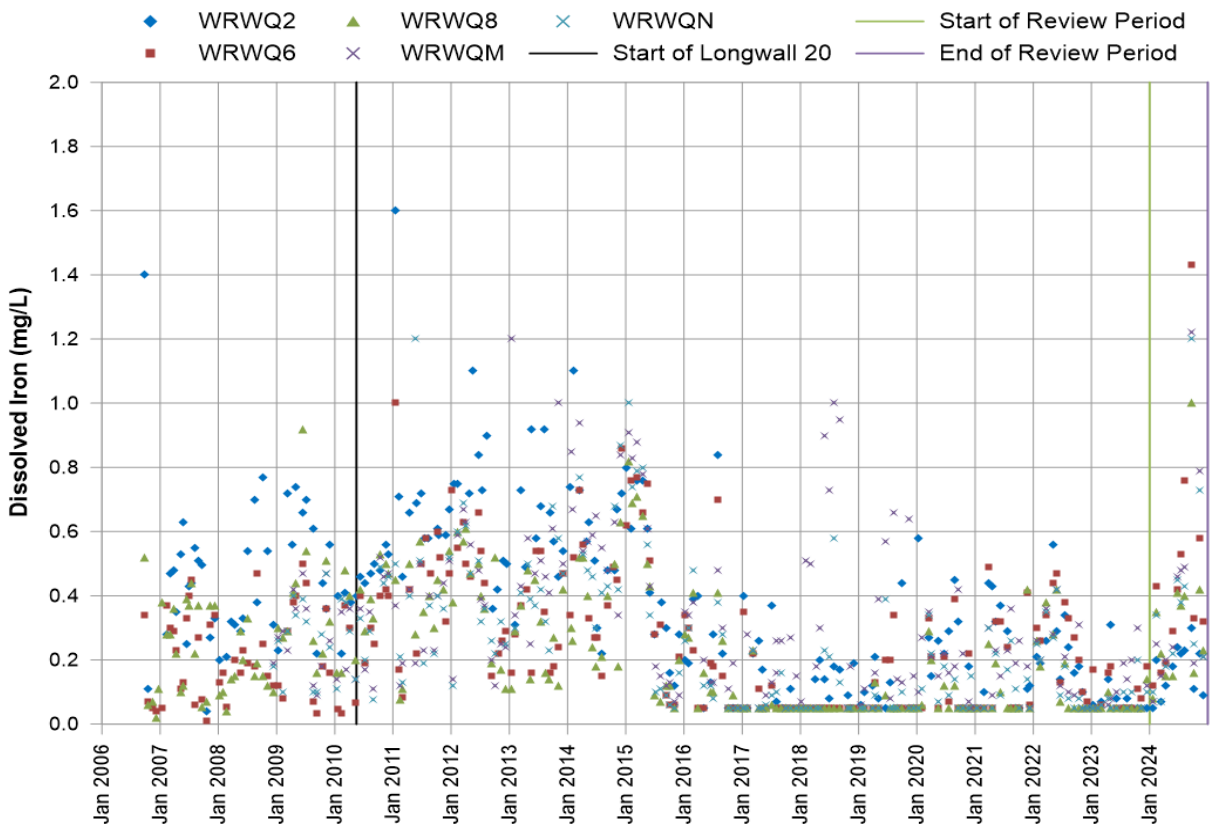


Chart 17 Dissolved Iron Waratah Rivulet – Upper and Middle Reach Sites

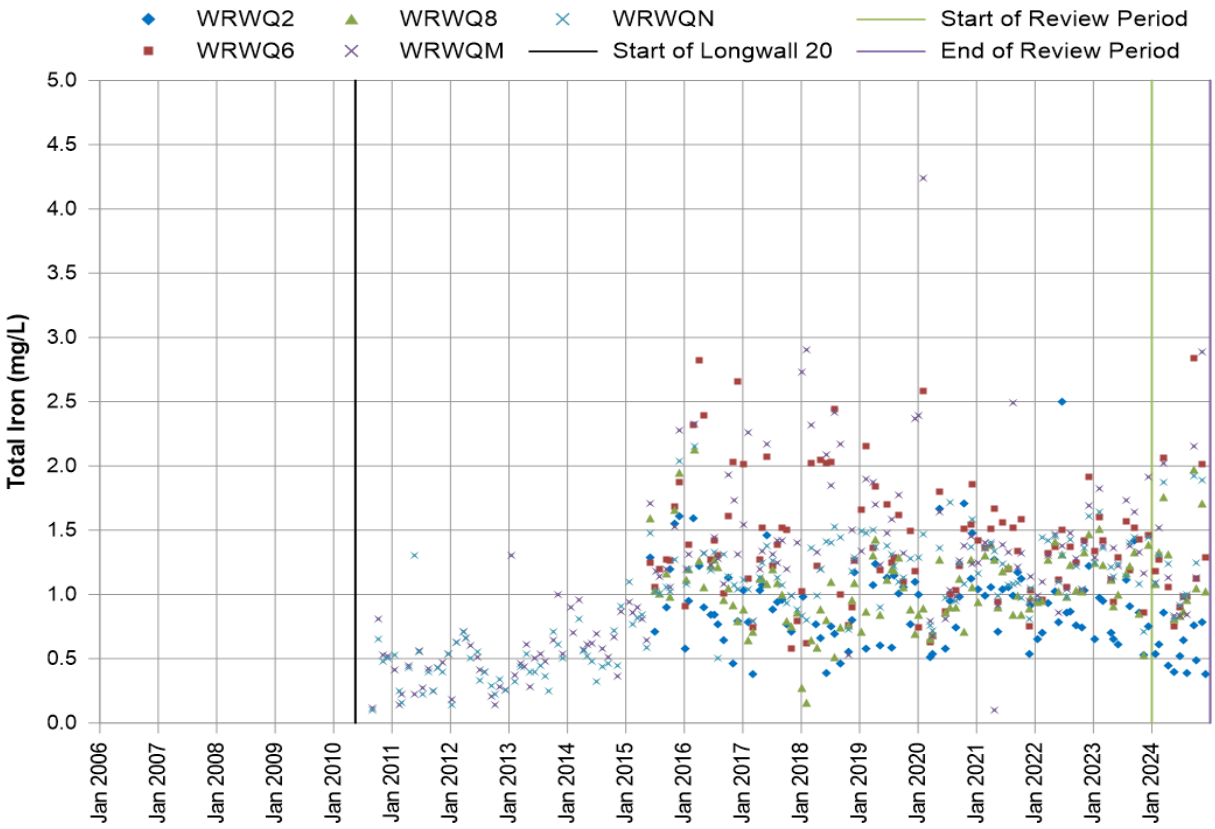


Chart 18 Total Iron Waratah Rivulet – Upper and Middle Reach Sites

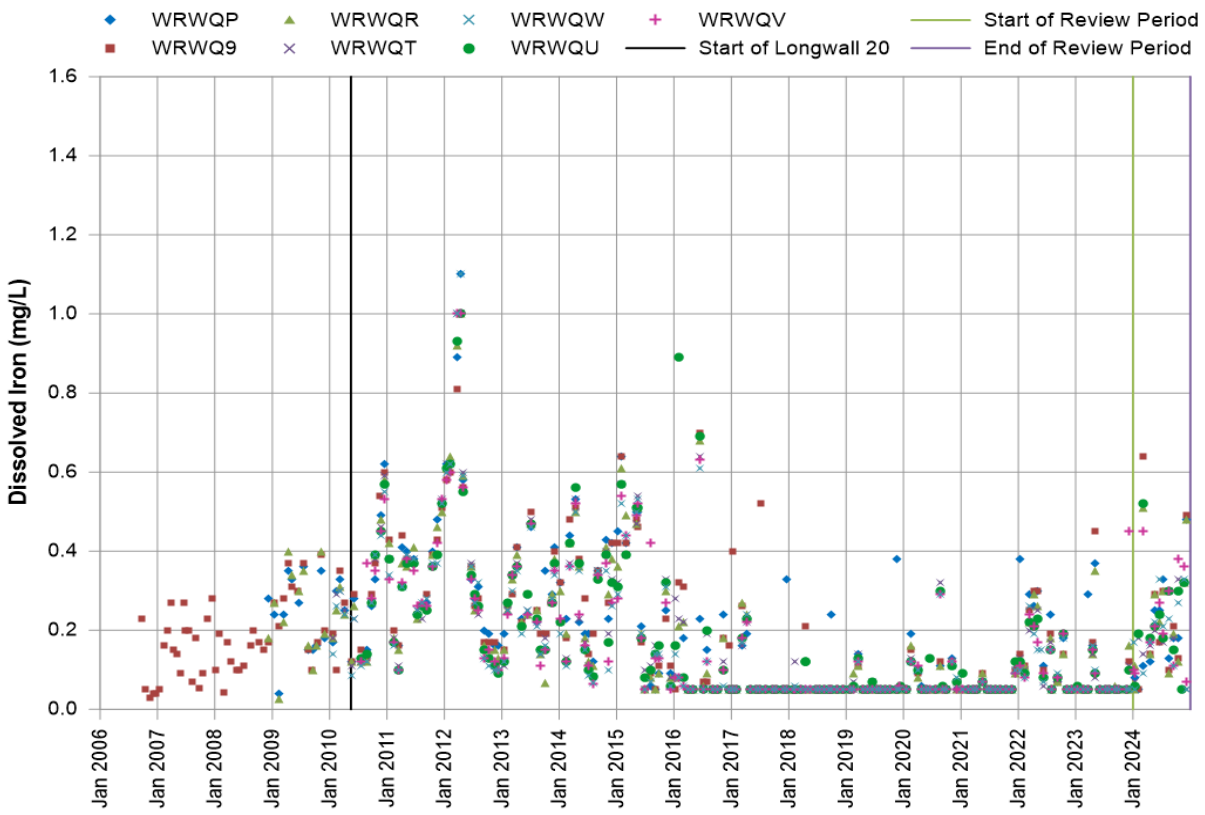


Chart 19 Dissolved Iron Waratah Rivulet – Lower Reach Sites

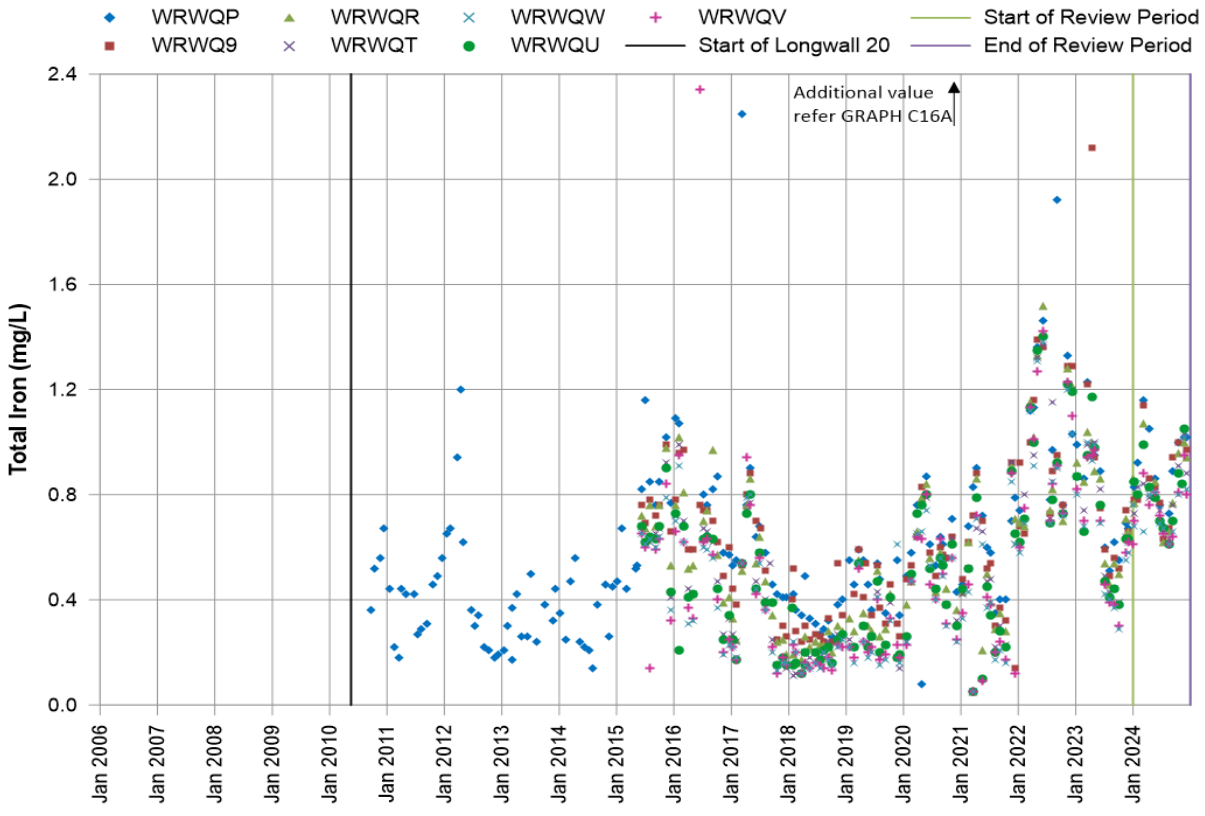


Chart 20a Total Iron Waratah Rivulet – Lower Reach Sites

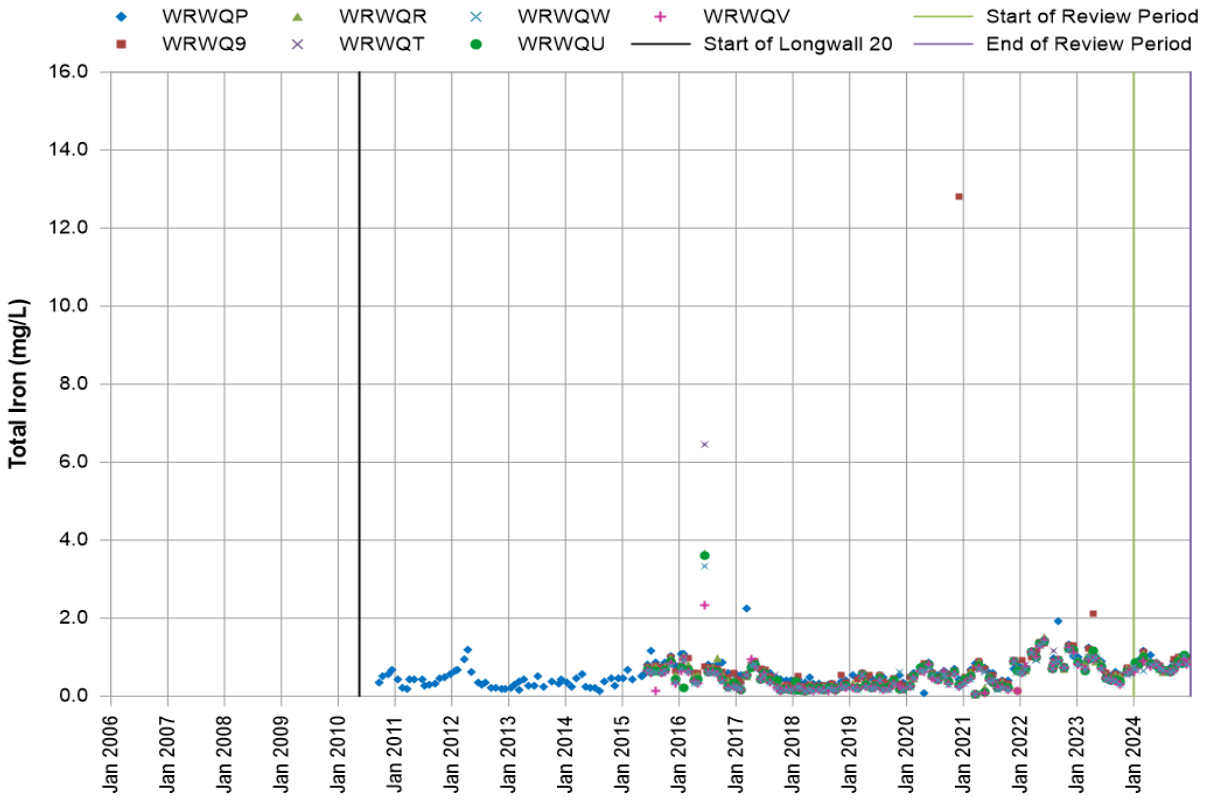


Chart 20b Total Iron Waratah Rivulet – Lower Reach Sites

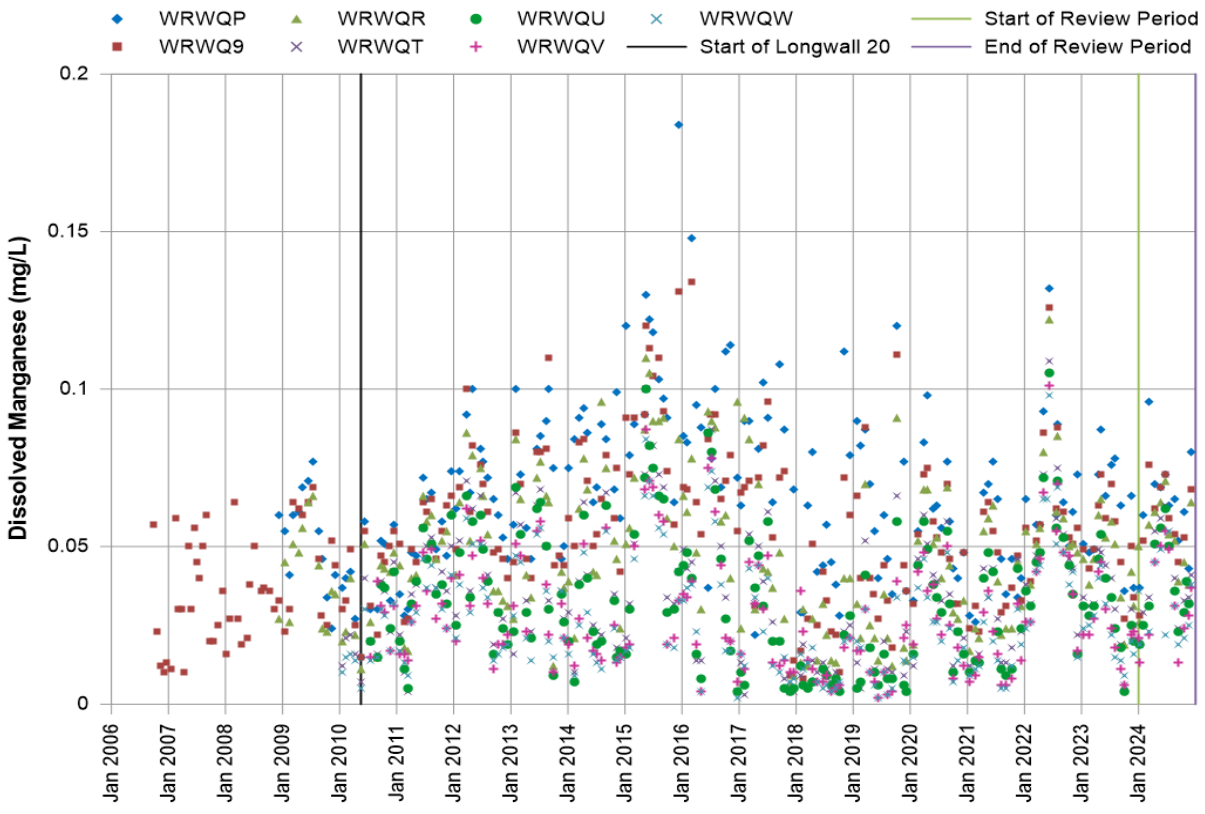


Chart 21 Dissolved Manganese Waratah Rivulet – Lower Reach Sites

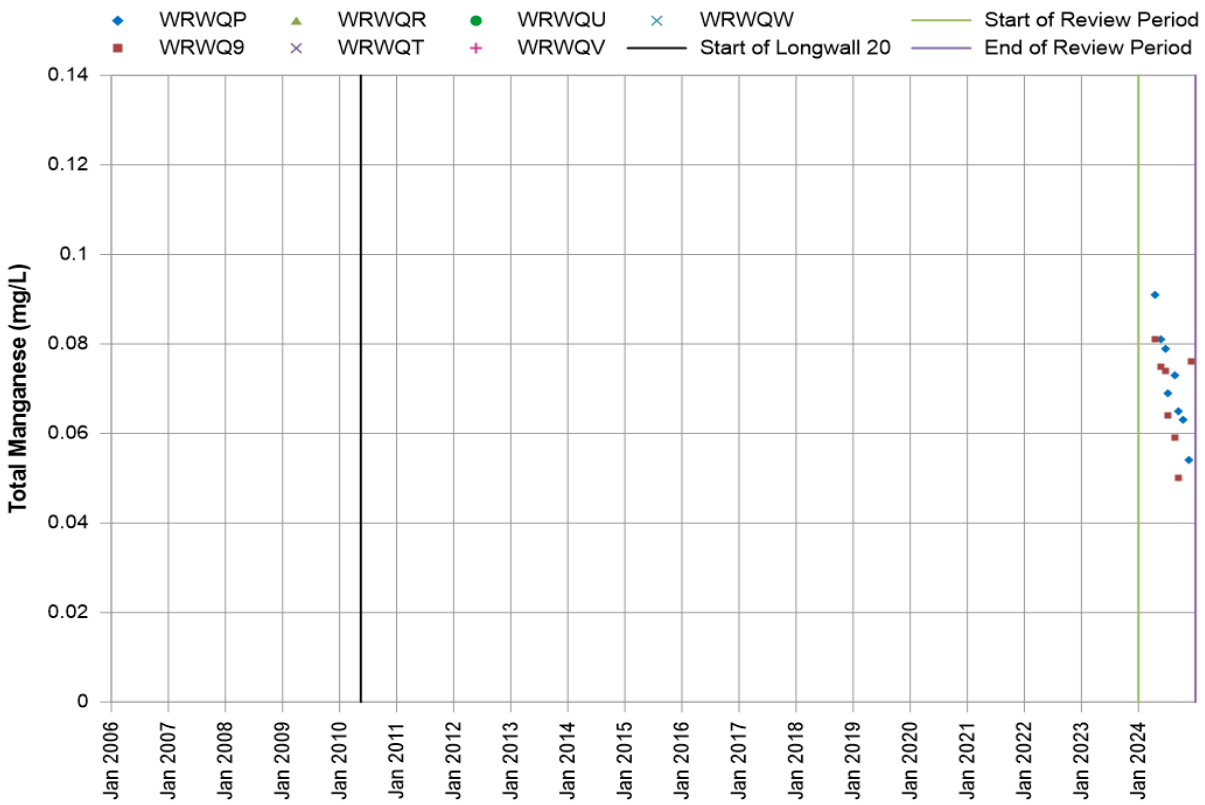


Chart 22 Total Manganese Waratah Rivulet – Lower Reach Sites

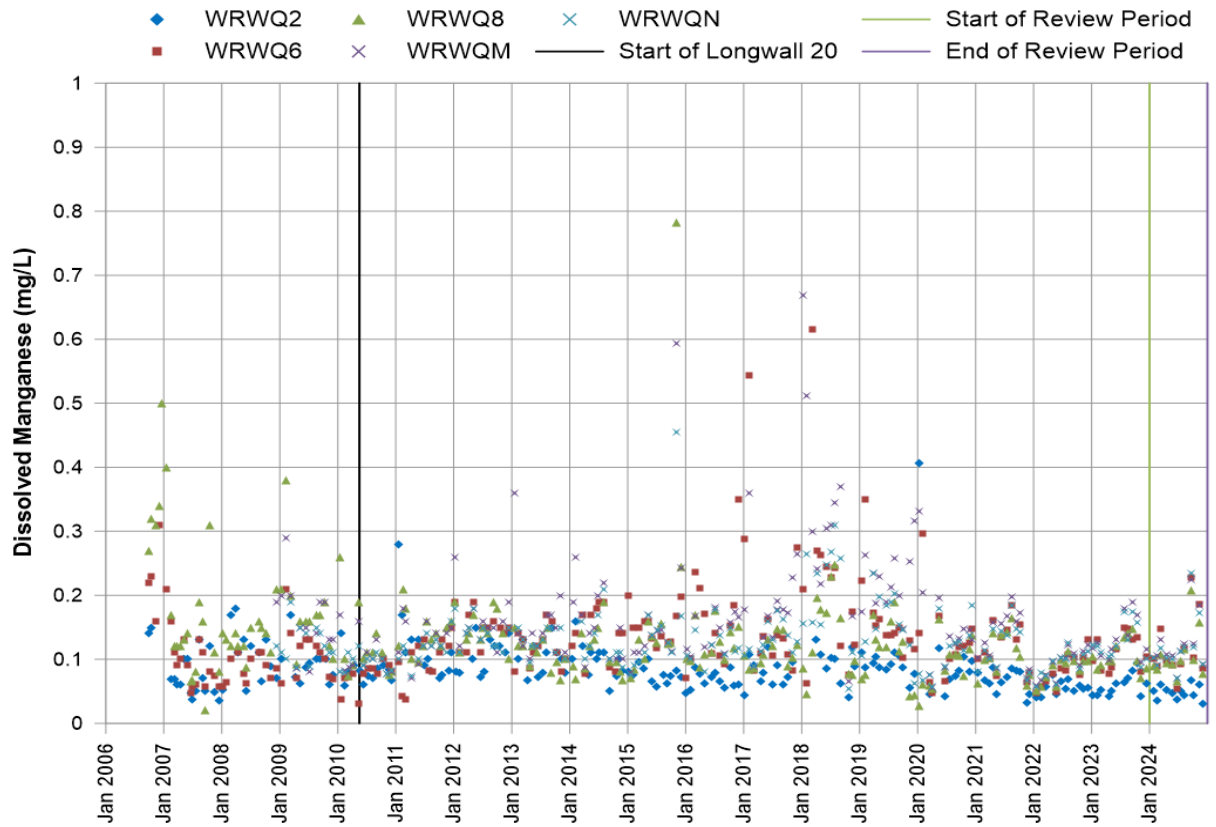


Chart 23 Dissolved Manganese Waratah Rivulet – Upper and Middle Reach Sites

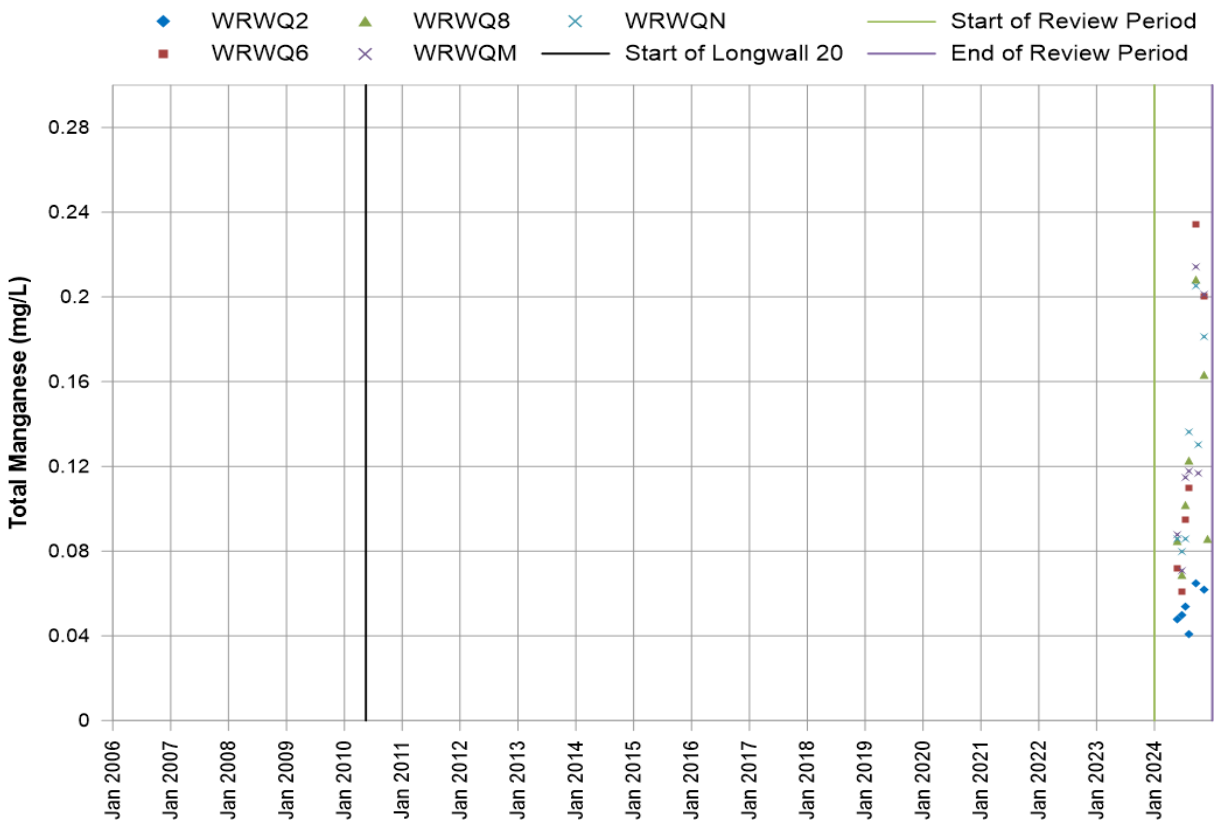


Chart 24 Total Manganese Waratah Rivulet – Upper and Middle Reach Sites

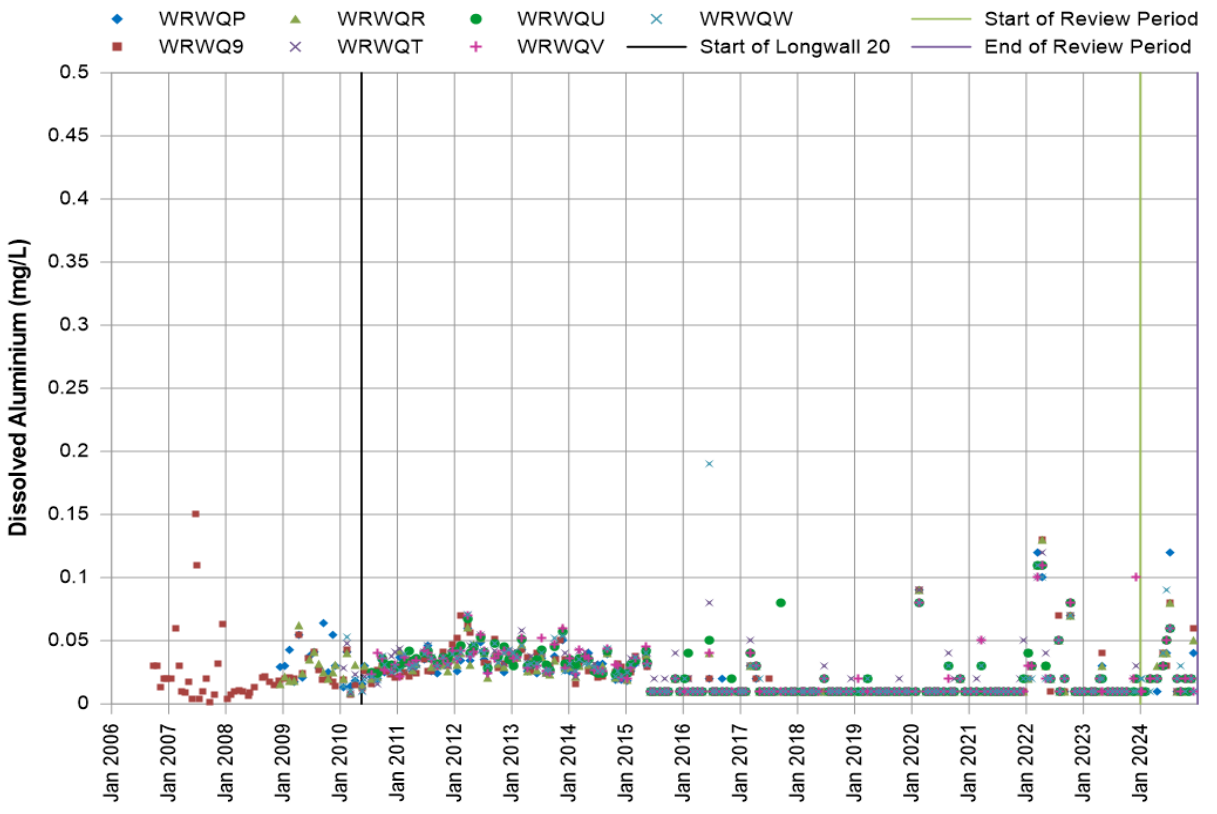


Chart 25 Dissolved Aluminium Waratah Rivulet – Lower Reach Sites

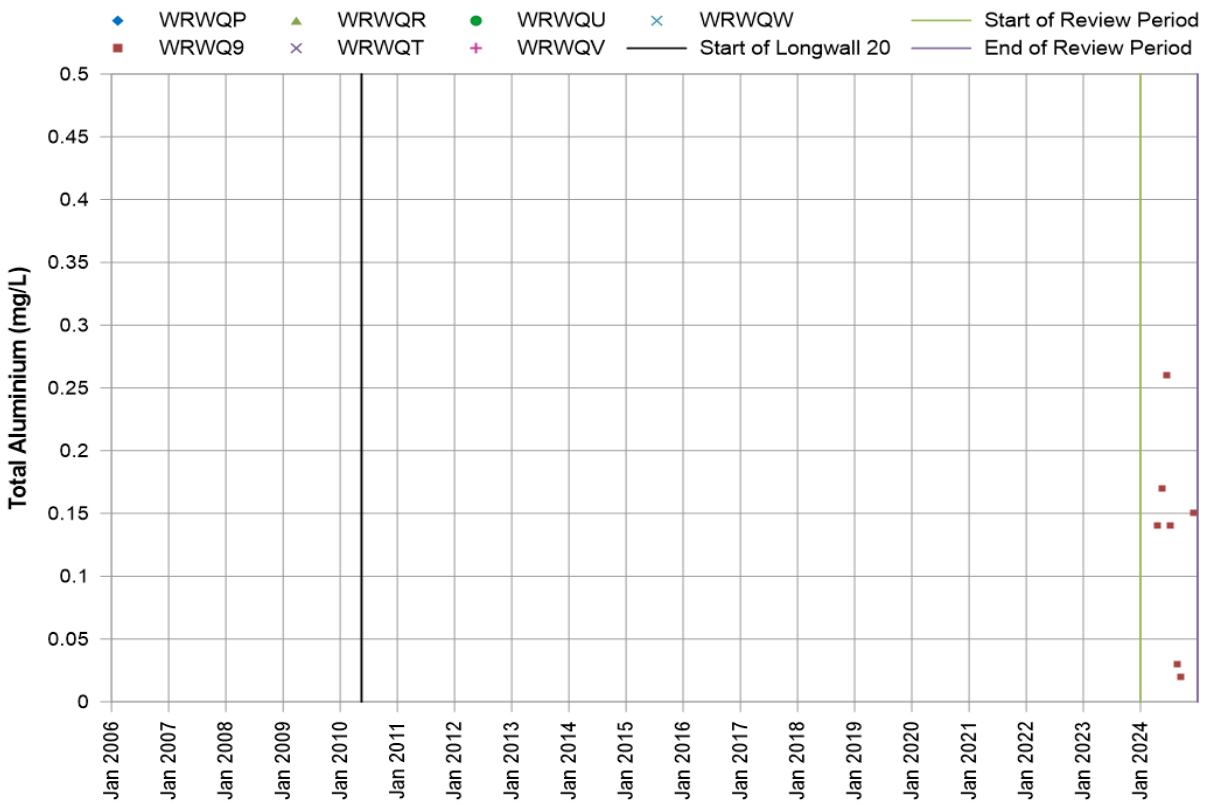


Chart 26 Total Aluminium Waratah Rivulet – Lower Reach Sites

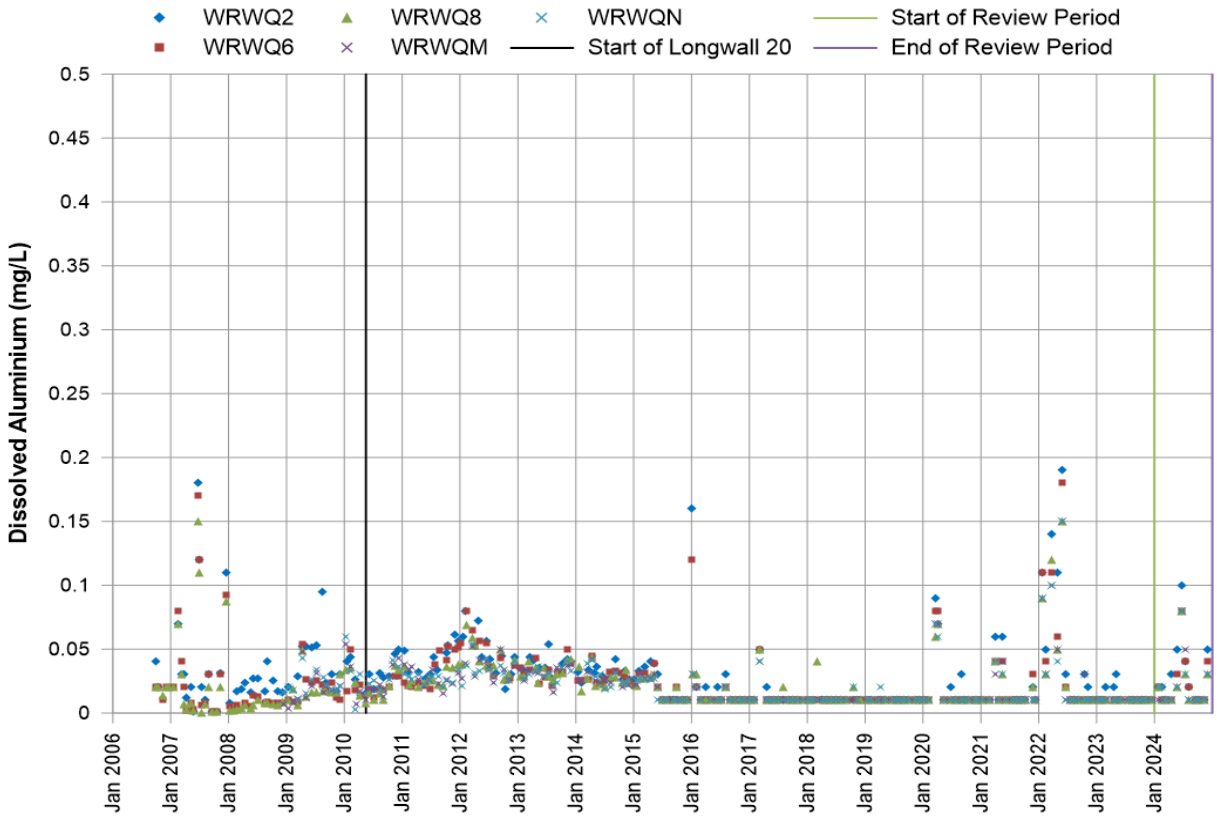


Chart 27 Dissolved Aluminium Waratah Rivulet – Upper and Middle Reach Sites

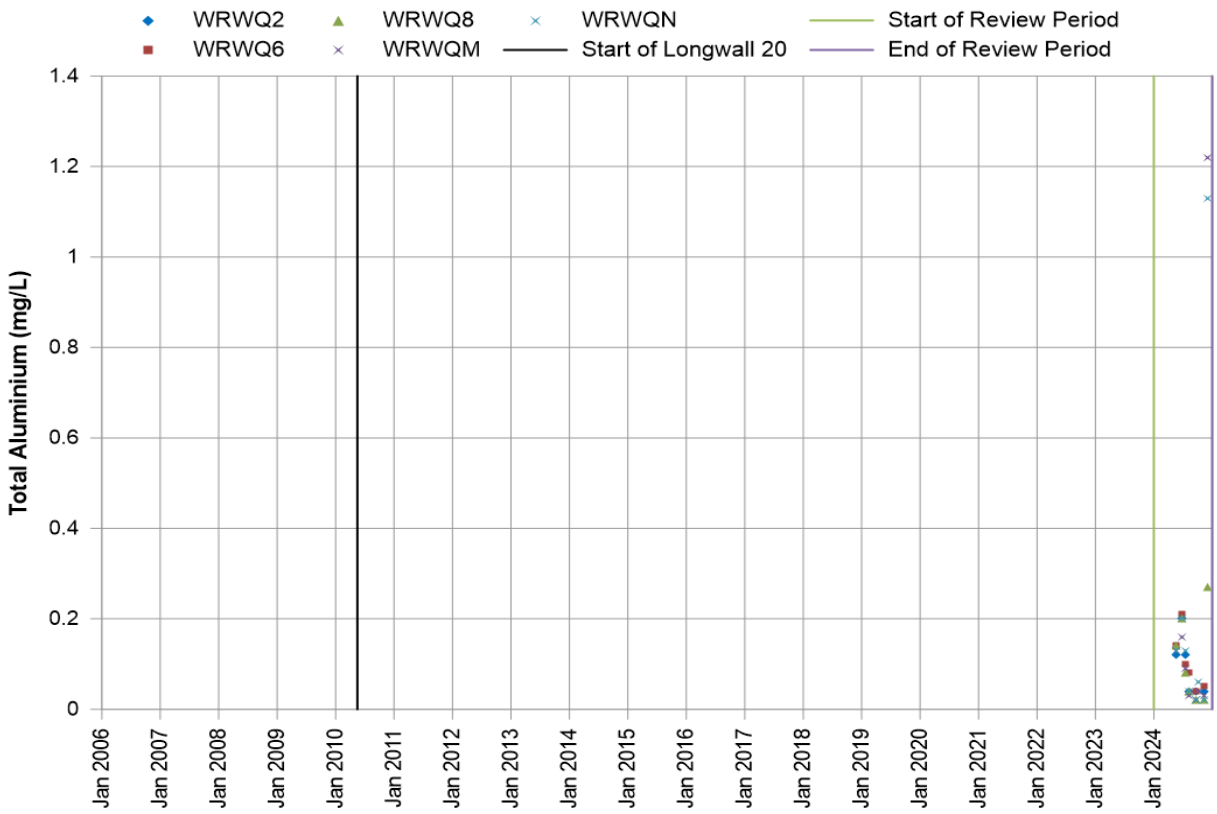


Chart 28 Total Aluminium Waratah Rivulet – Upper and Middle Reach Sites

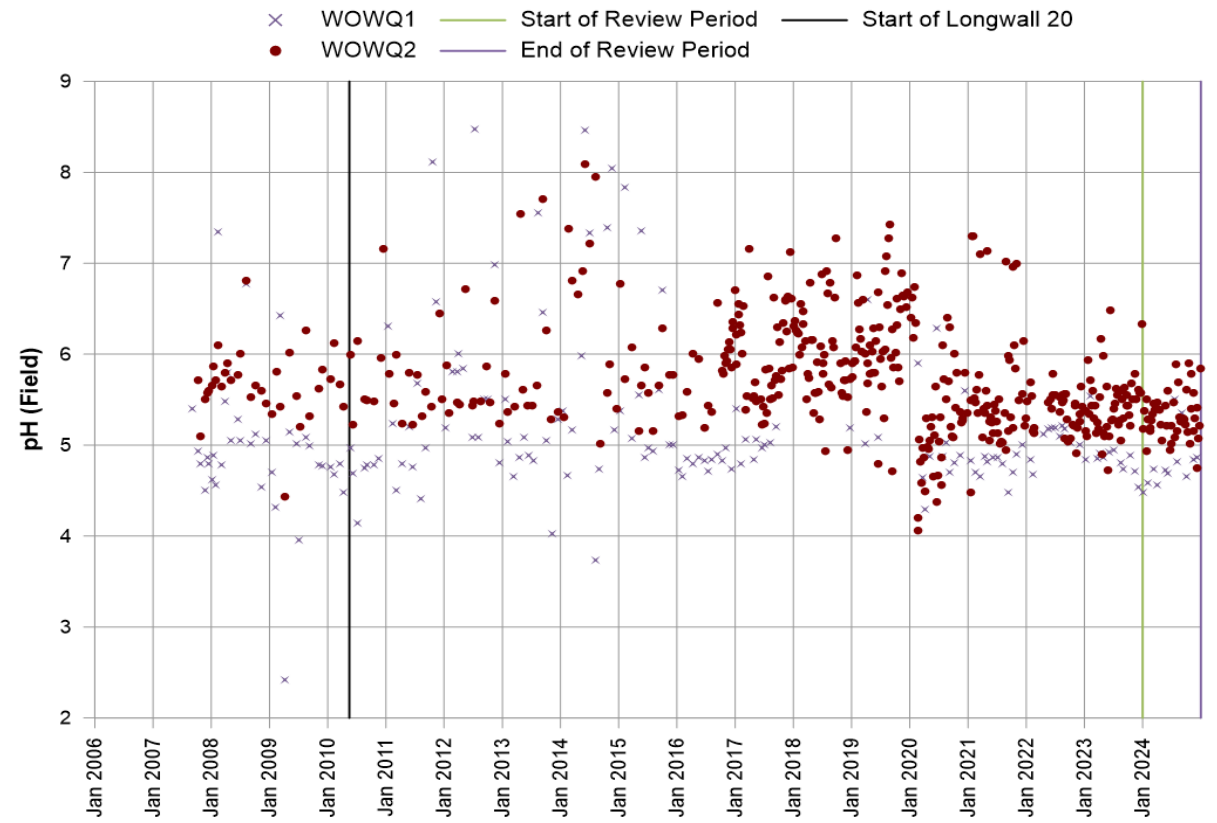


Chart 29 pH Levels Woronora River[5]

[5] WOWQ1 was dry between 23 October 2017 and 20 December 2018, in May 2019 and between 3 July 2019 and 12 December 2019 and hence no water quality samples were collected.

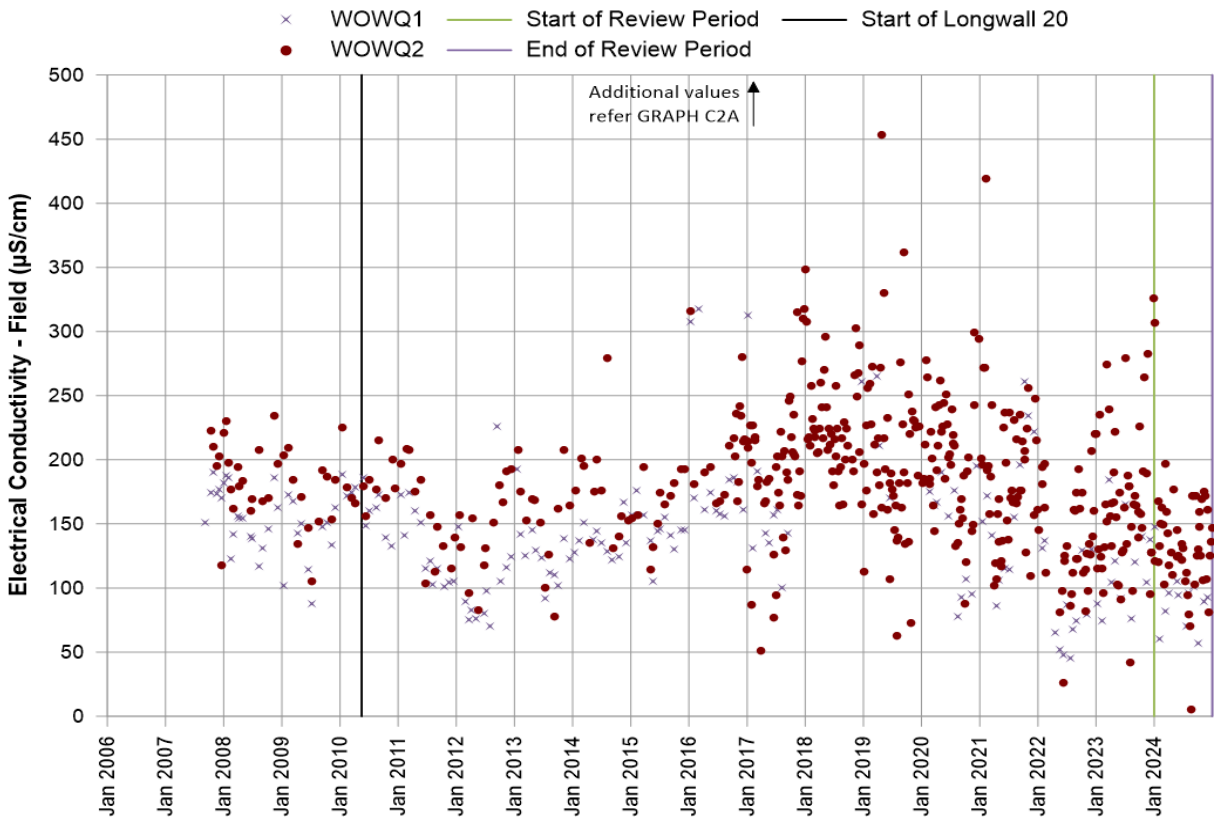


Chart 30a EC Woronora River

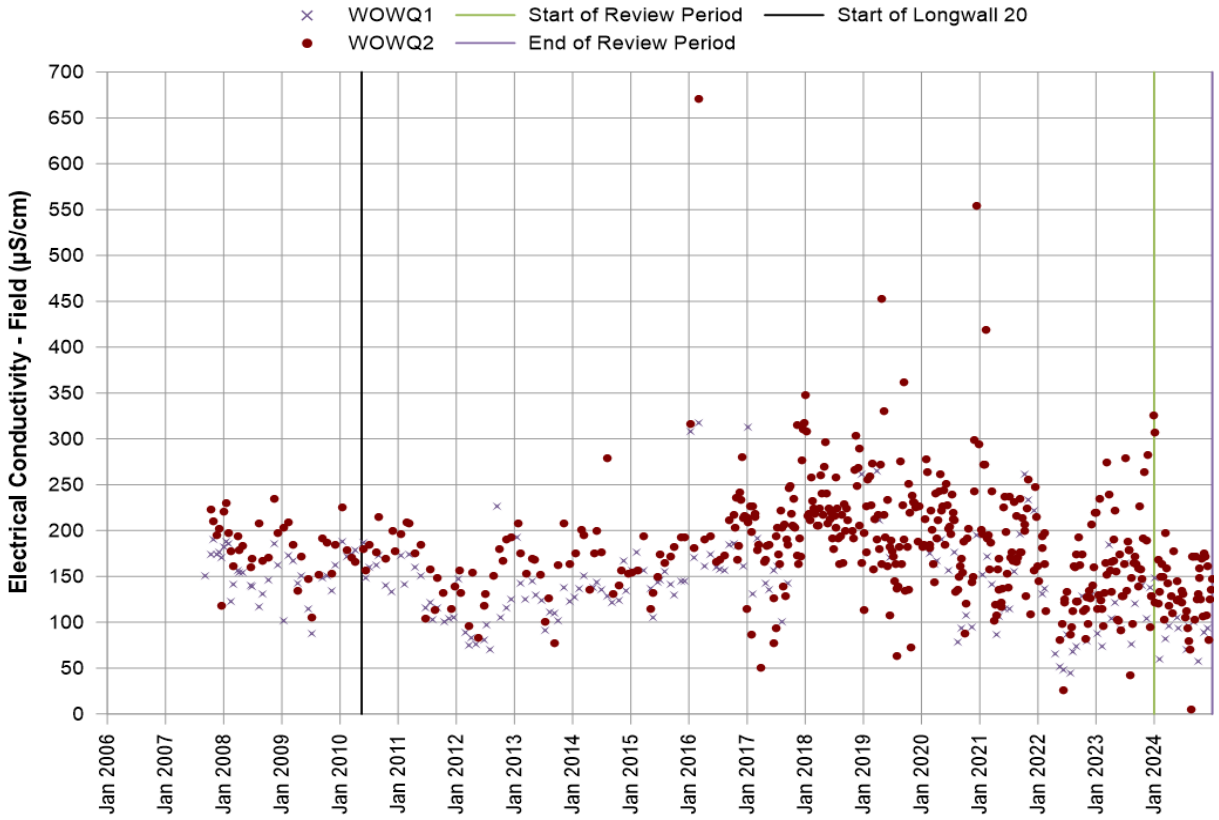


Chart 30b EC Woronora River

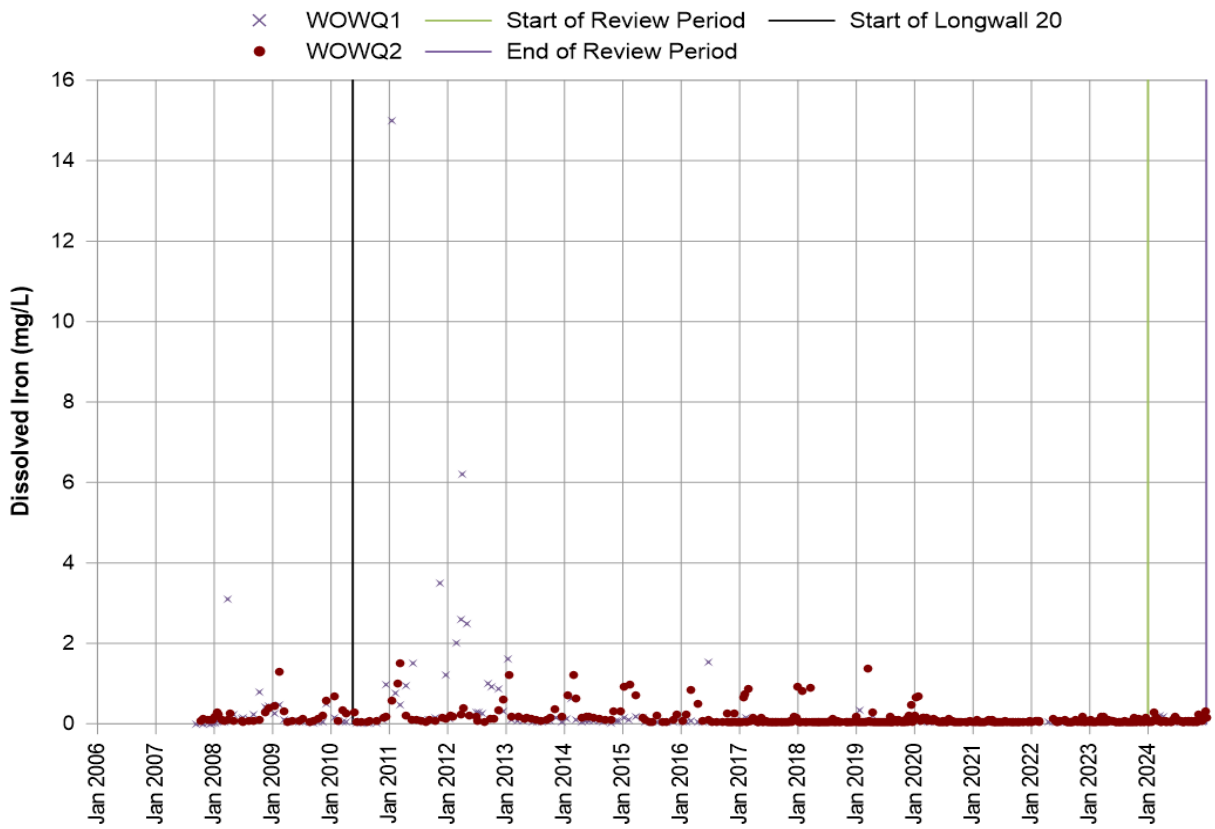


Chart 31 Dissolved Iron Woronora River

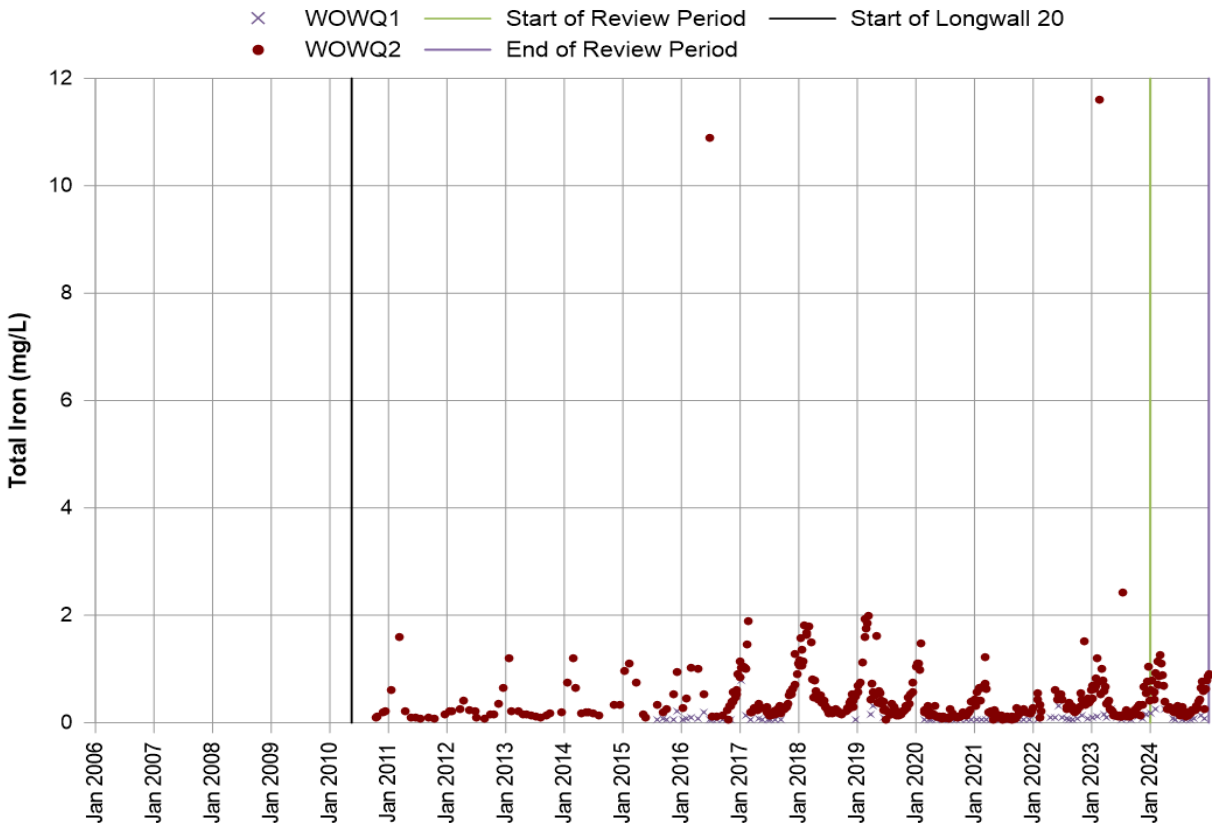


Chart 32 Total Iron Woronora River

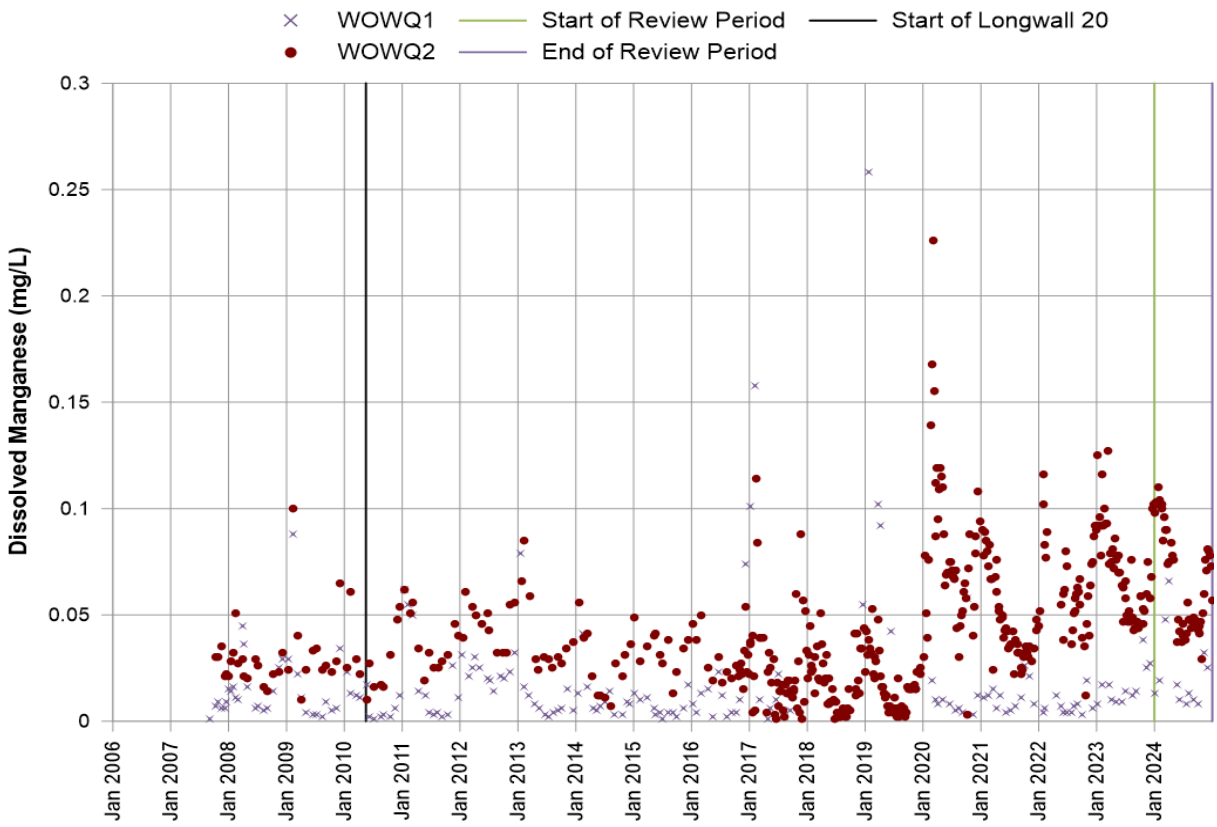


Chart 33 Dissolved Manganese Woronora River

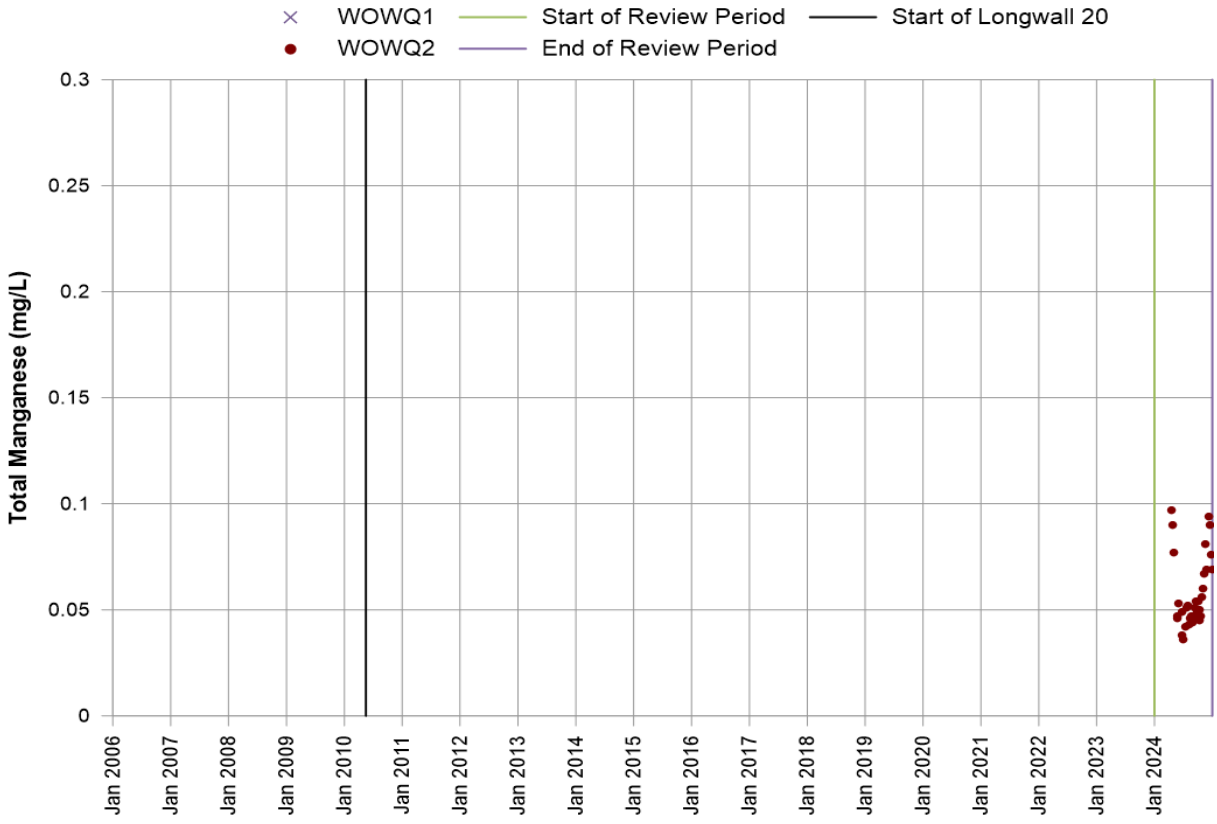


Chart 34 Total Manganese Woronora River

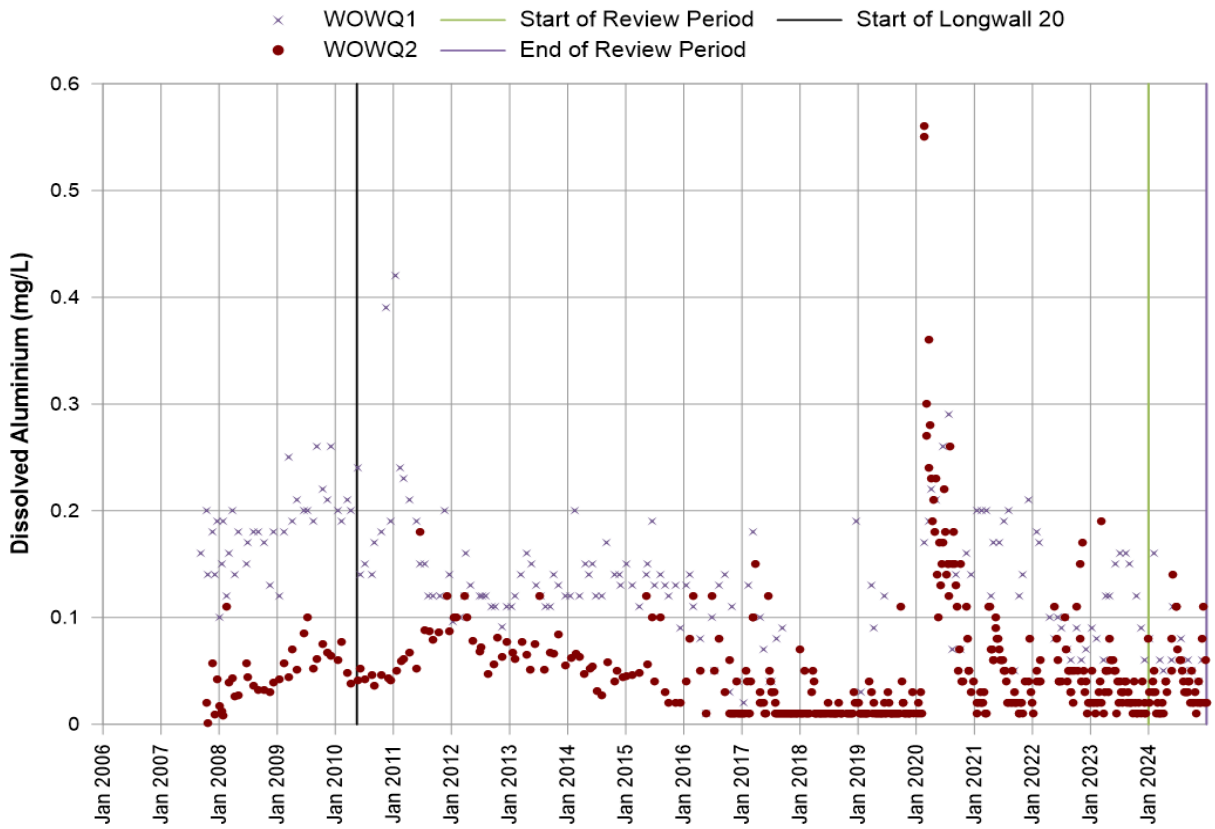


Chart 35 Dissolved Aluminium Woronora River

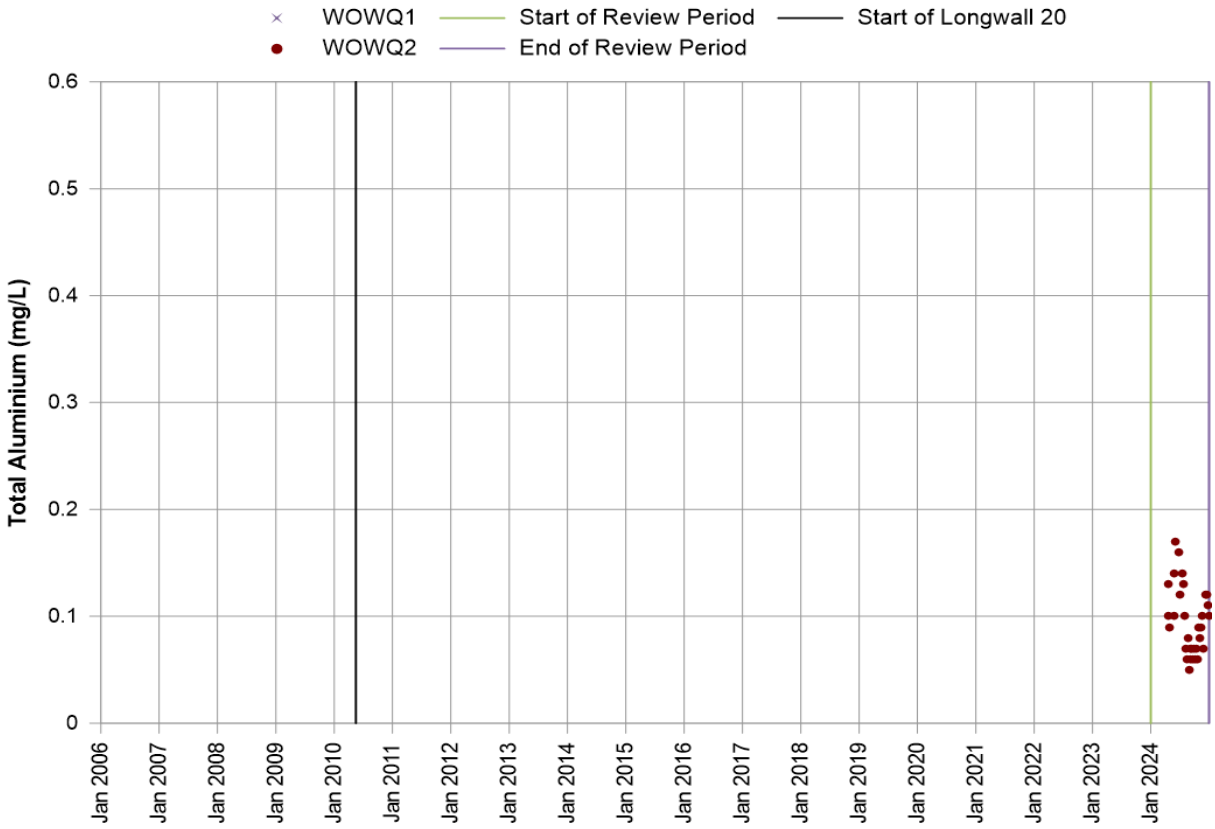


Chart 36 Total Aluminium Woronora River

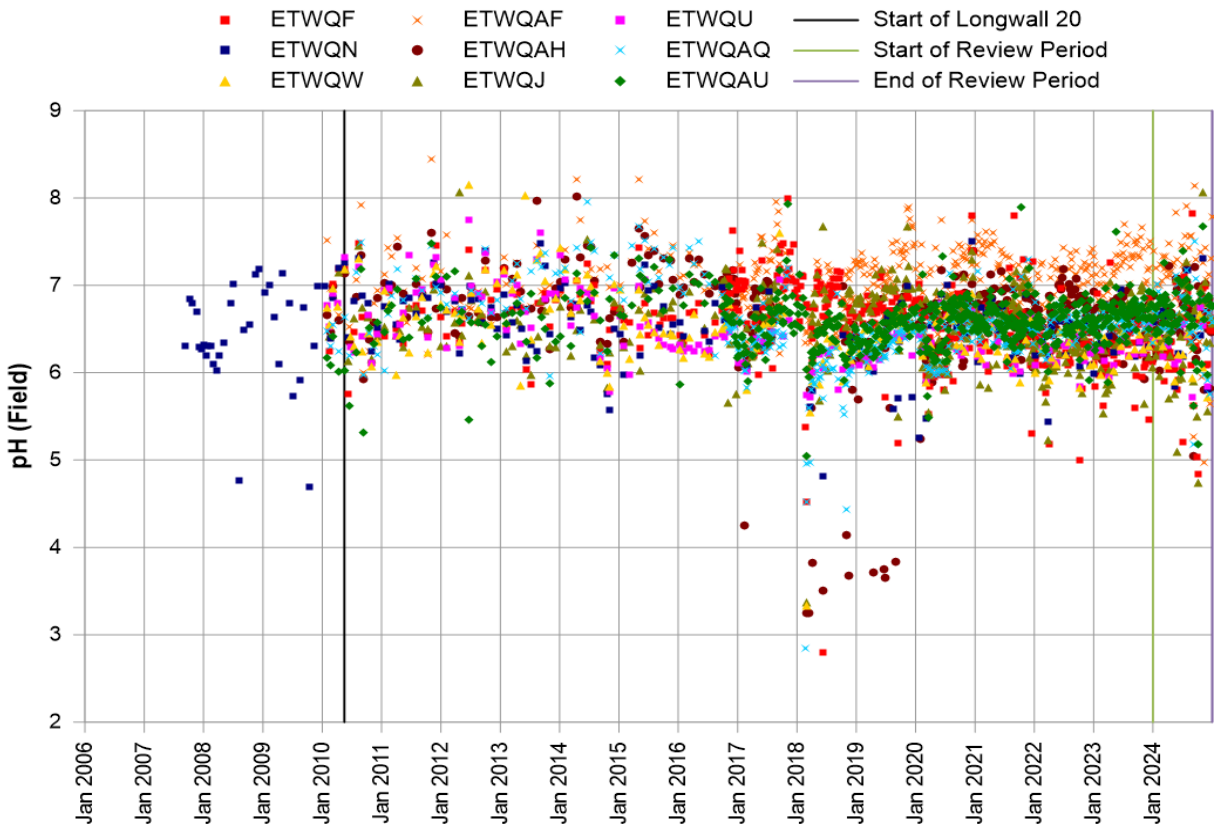


Chart 37 pH Levels Eastern Tributary

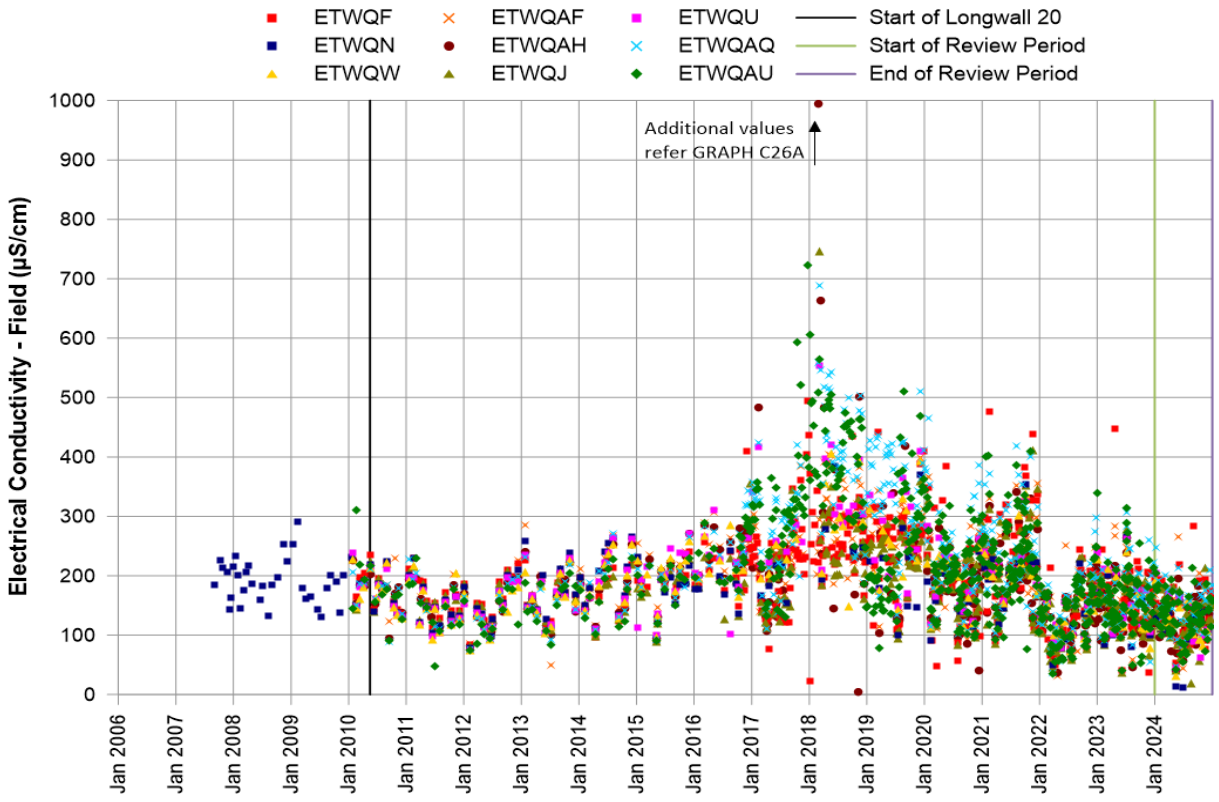


Chart 38a EC Eastern Tributary

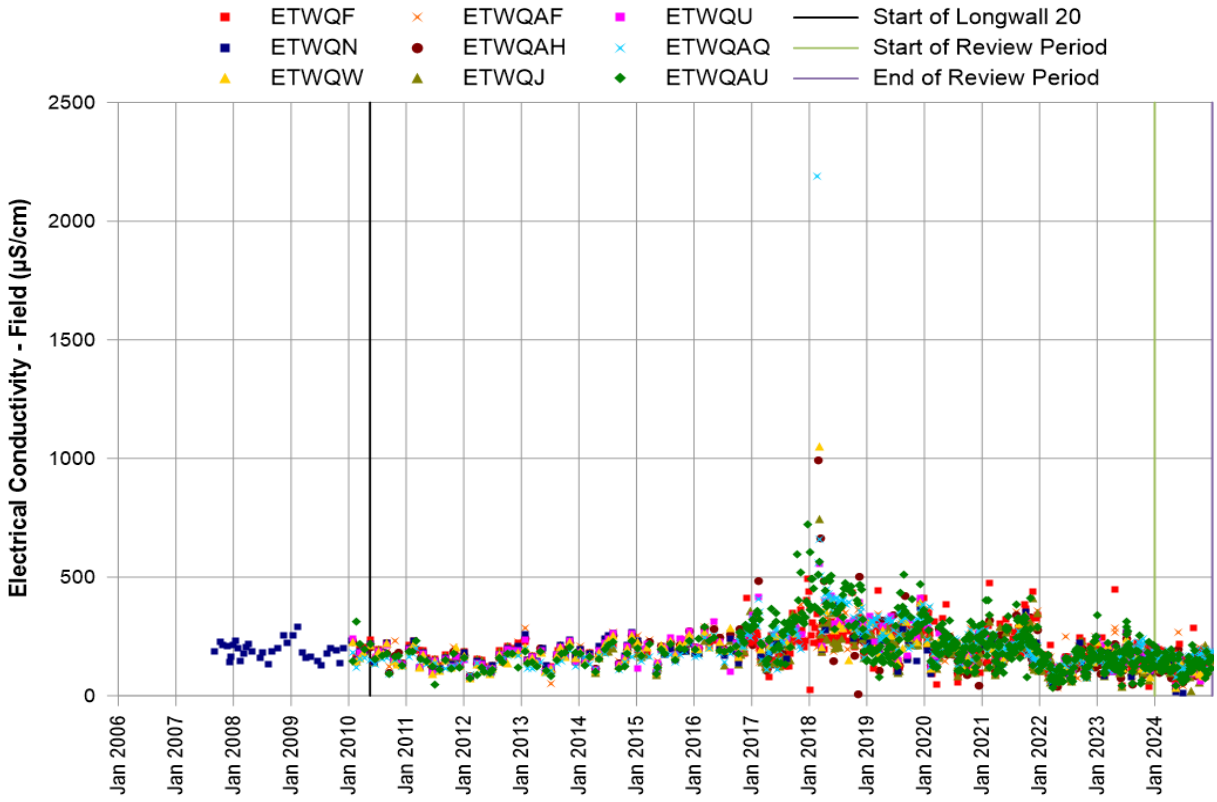


Chart 38b EC Eastern Tributary

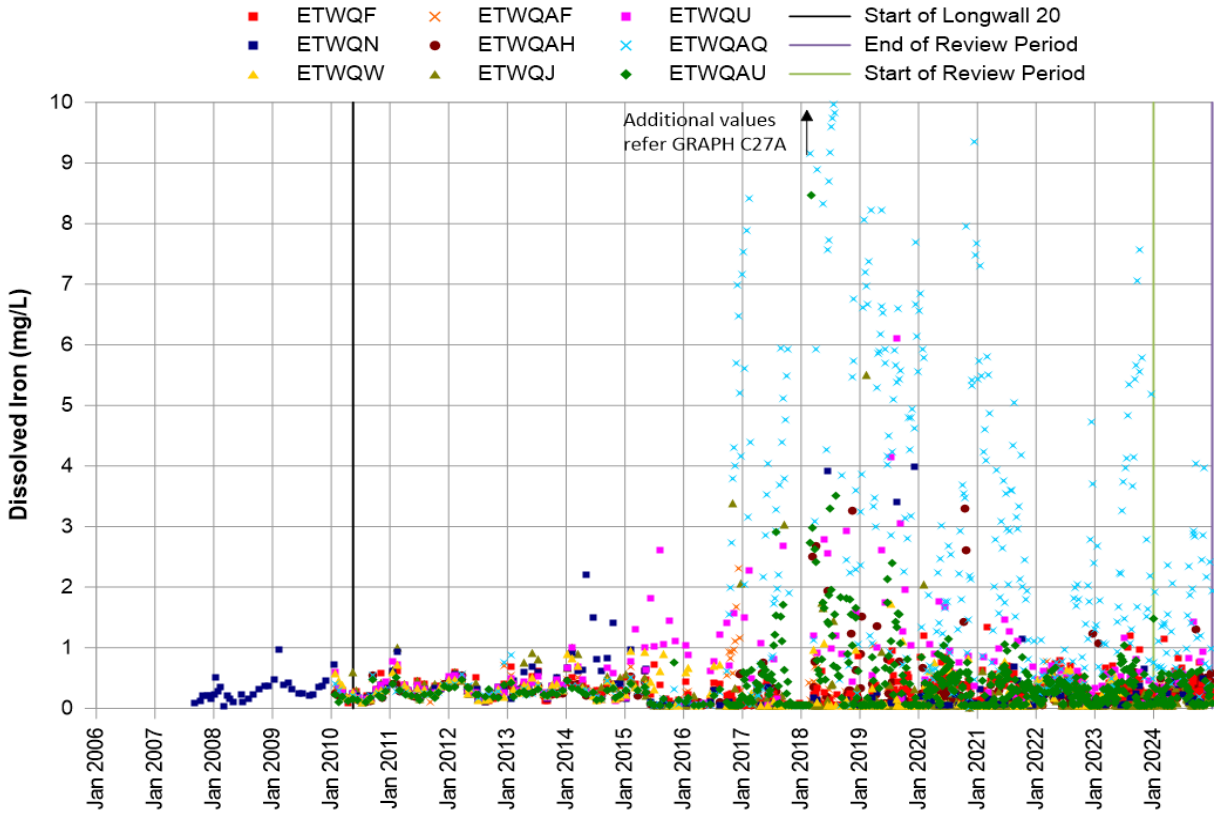


Chart 39a Dissolved Iron Eastern Tributary

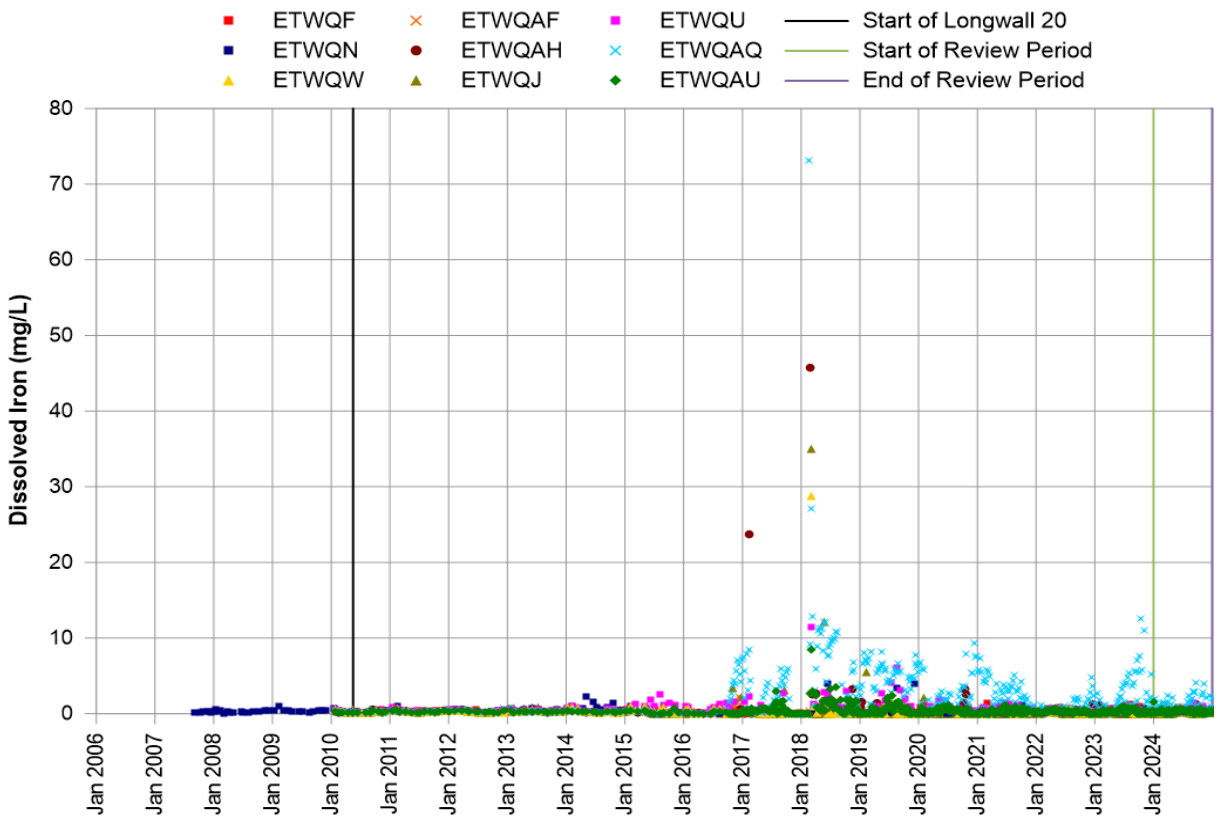


Chart 39b Dissolved Iron Eastern Tributary

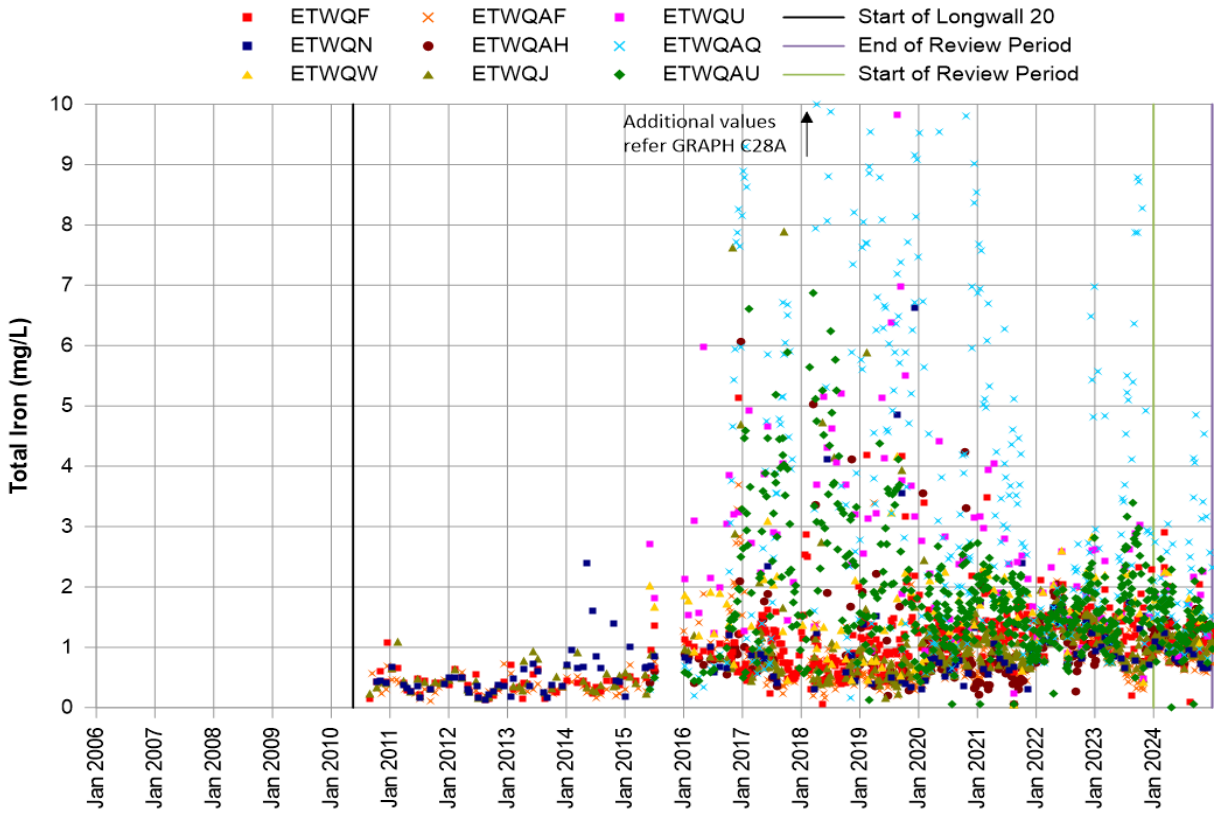


Chart 40a Total Iron Eastern Tributary

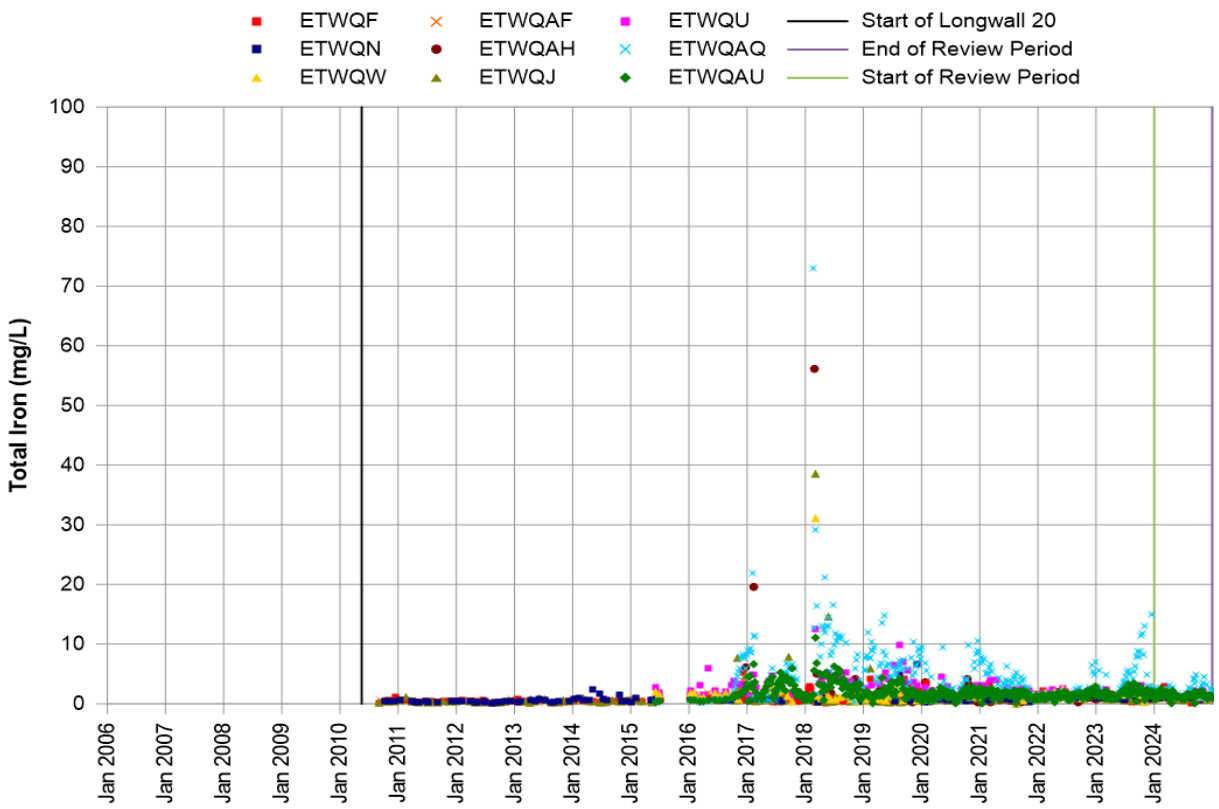


Chart 40b Total Iron Eastern Tributary

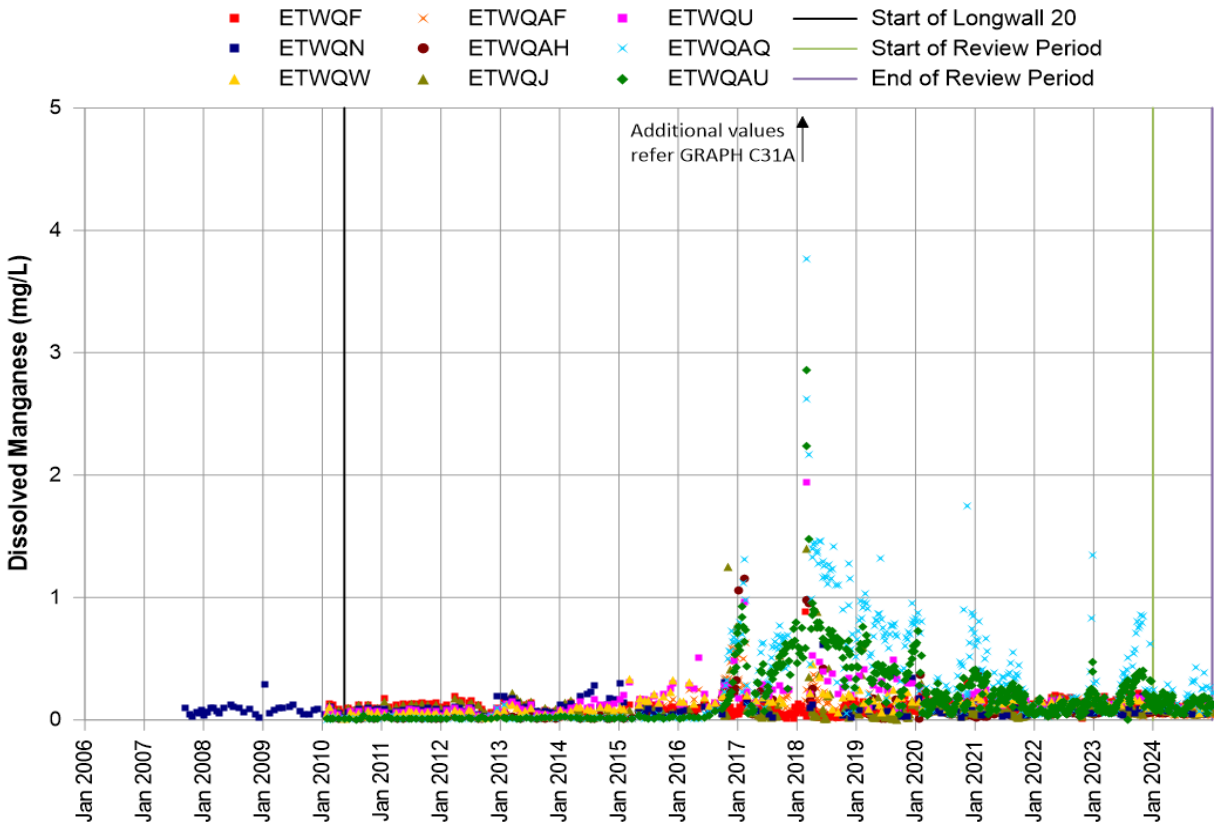


Chart 41a Dissolved Manganese Eastern Tributary

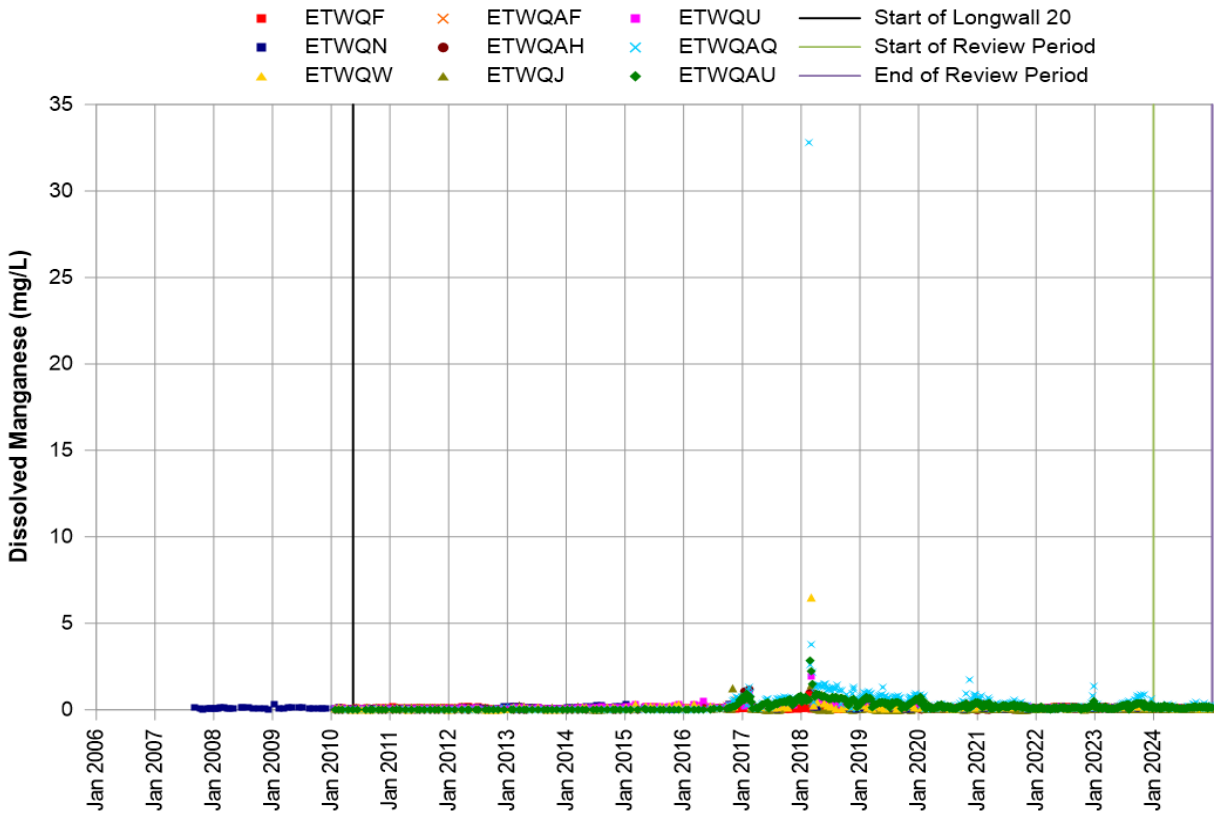


Chart 41b Dissolved Manganese Eastern Tributary

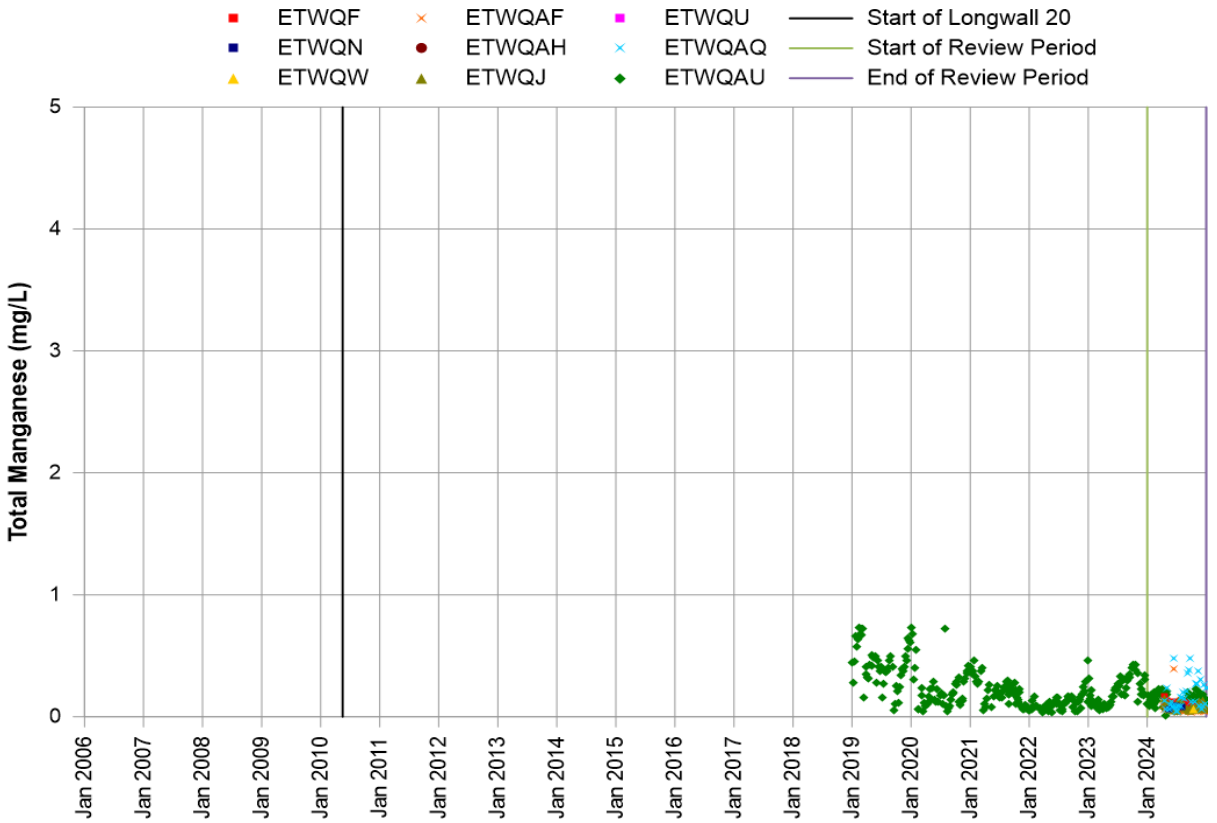


Chart 42 Total Manganese Eastern Tributary

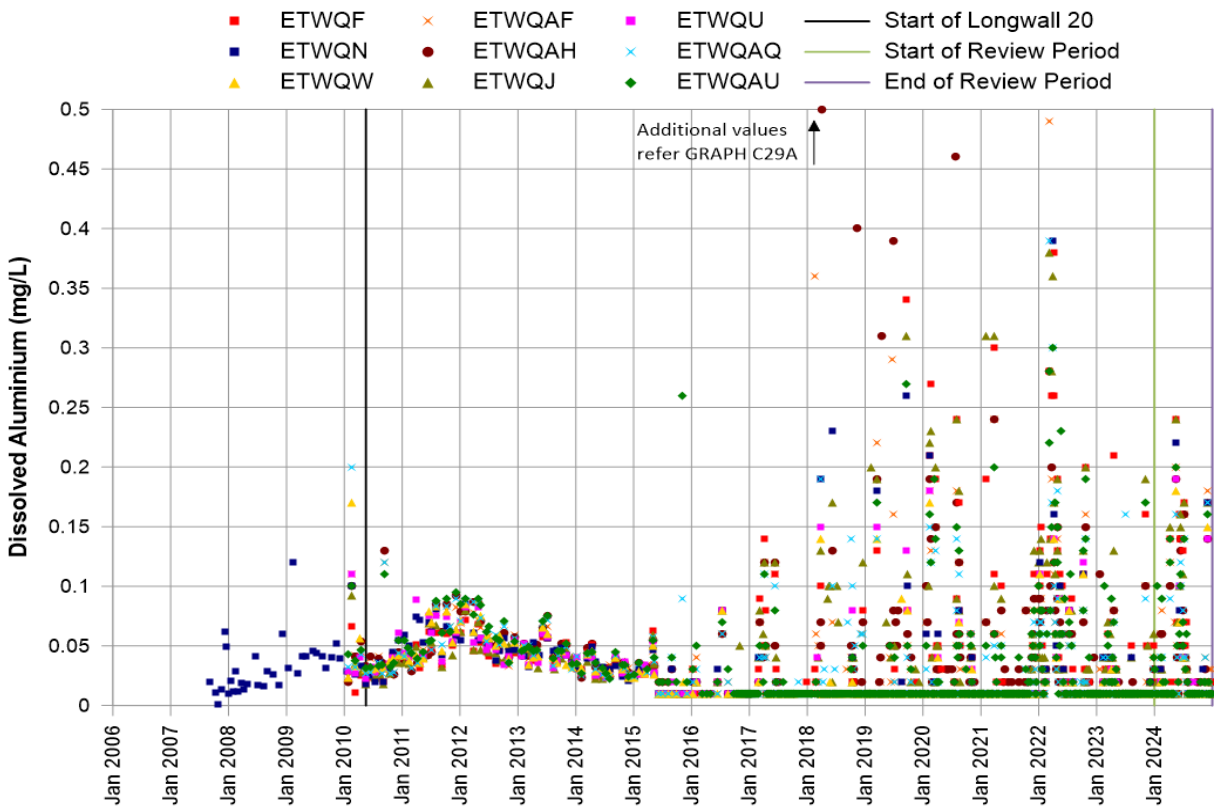


Chart 43a Dissolved Aluminium Eastern Tributary

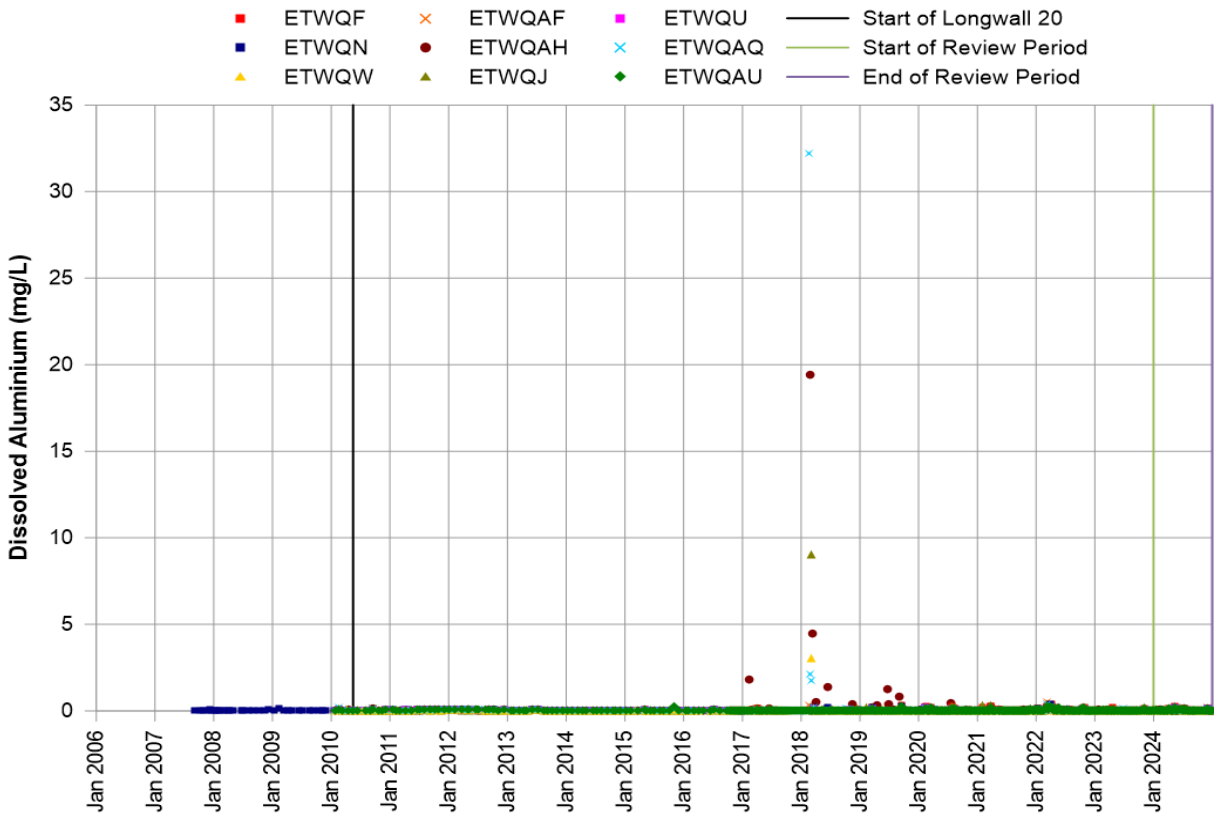


Chart 43b Dissolved Aluminium Eastern Tributary

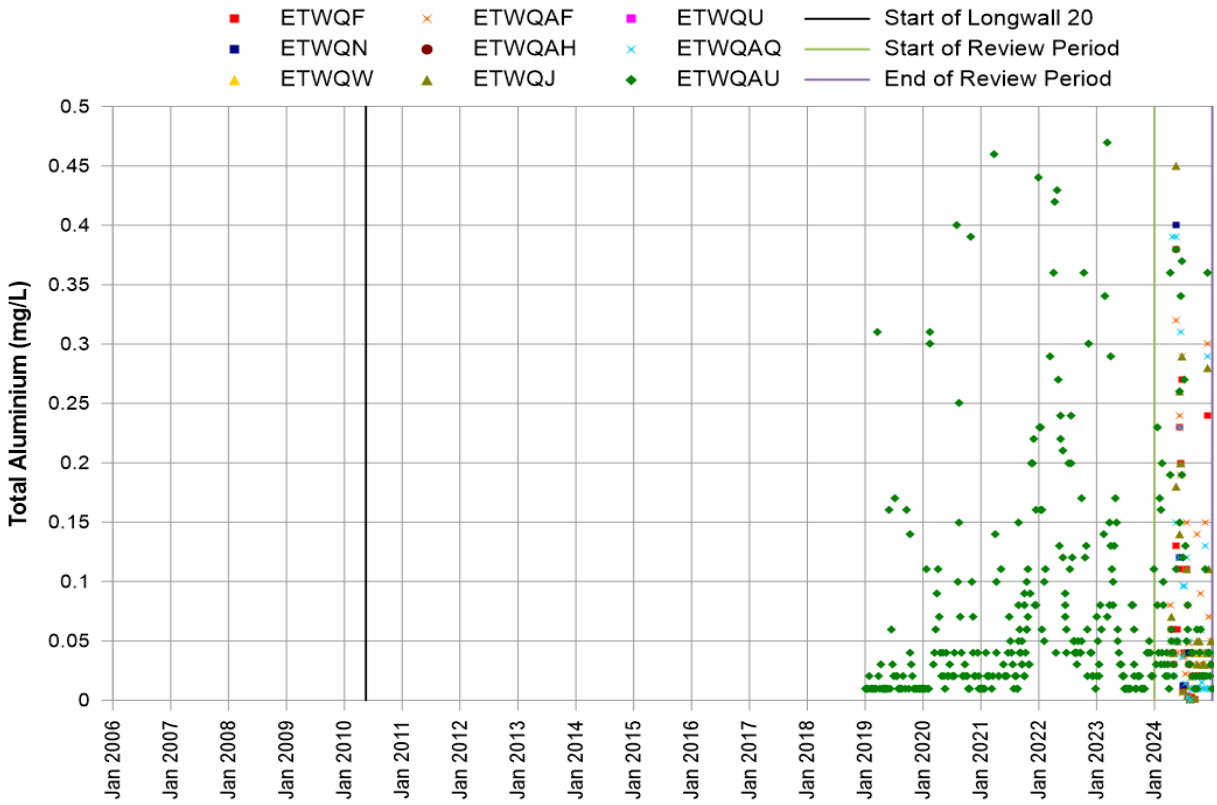


Chart 44 Total Aluminium Eastern Tributary

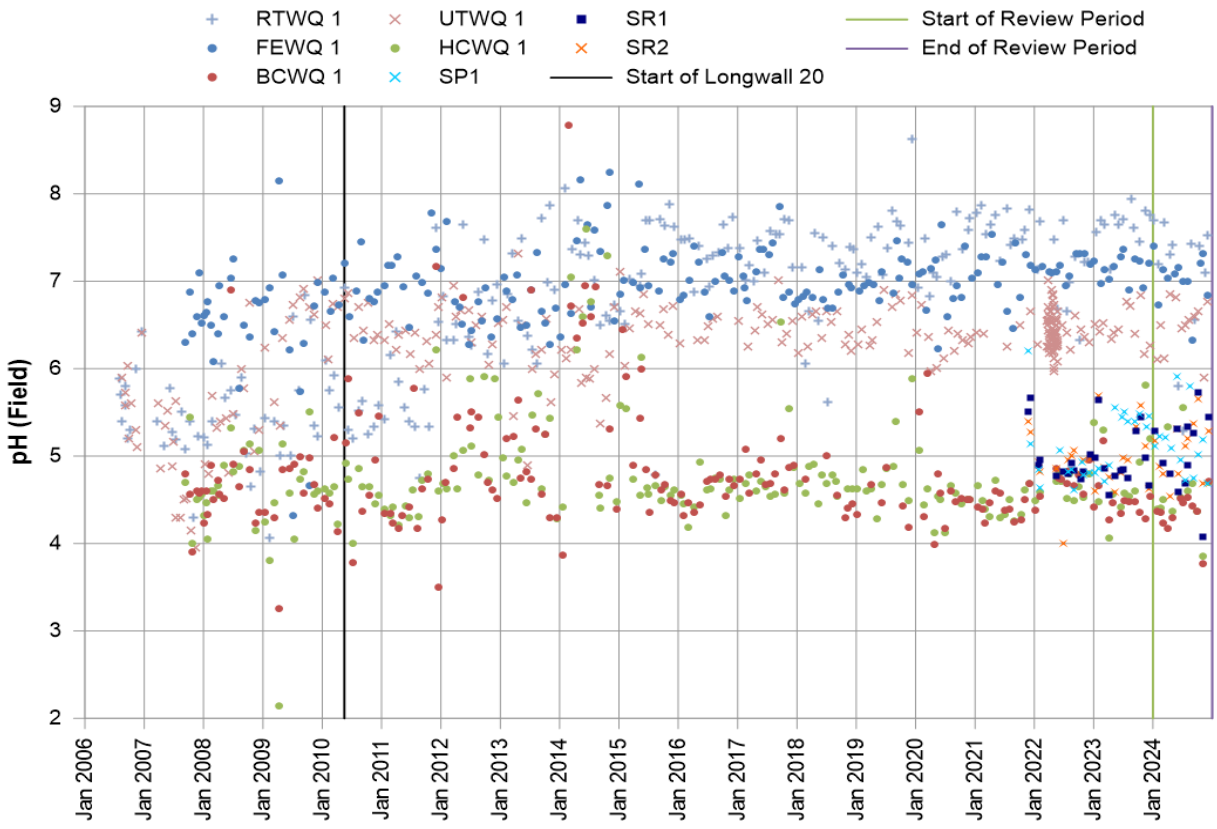


Chart 45 pH Levels Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek

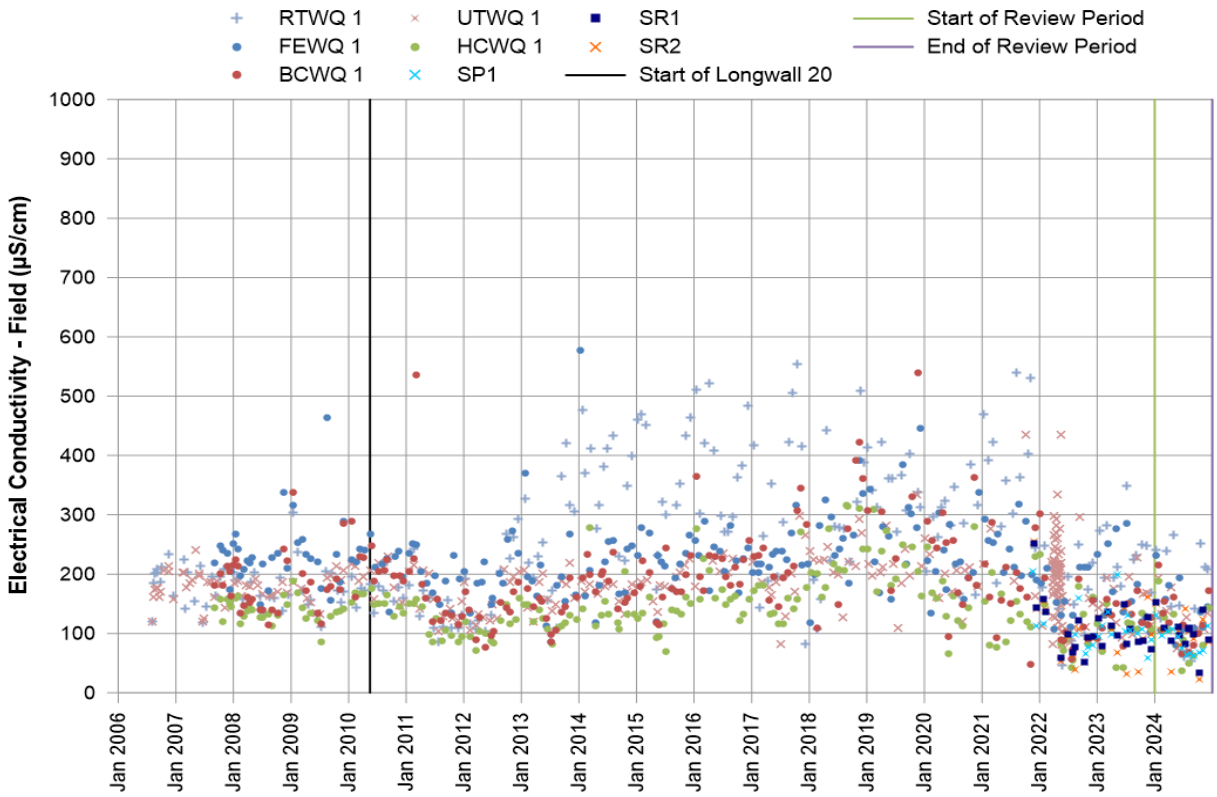


Chart 46 **EC Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek**

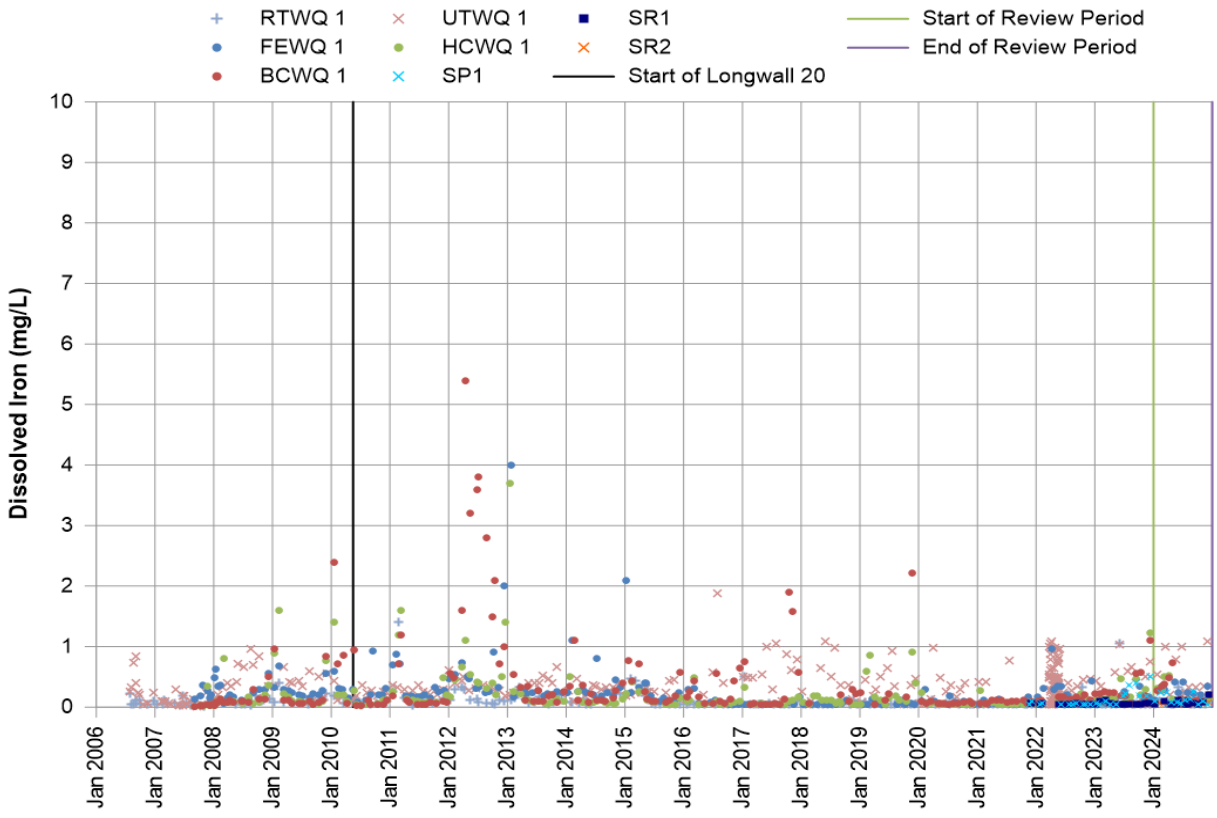


Chart 47 **Dissolved Iron Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek**

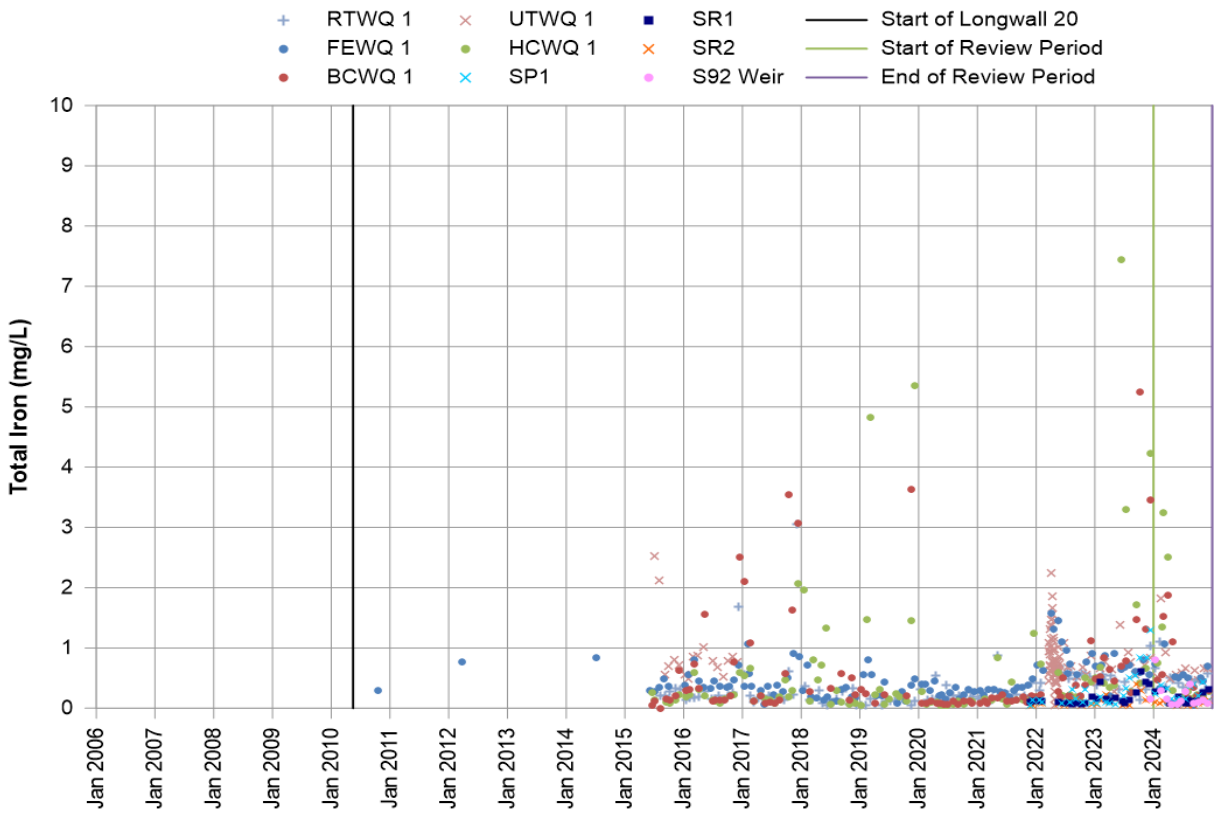


Chart 48 **Total Iron Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek**

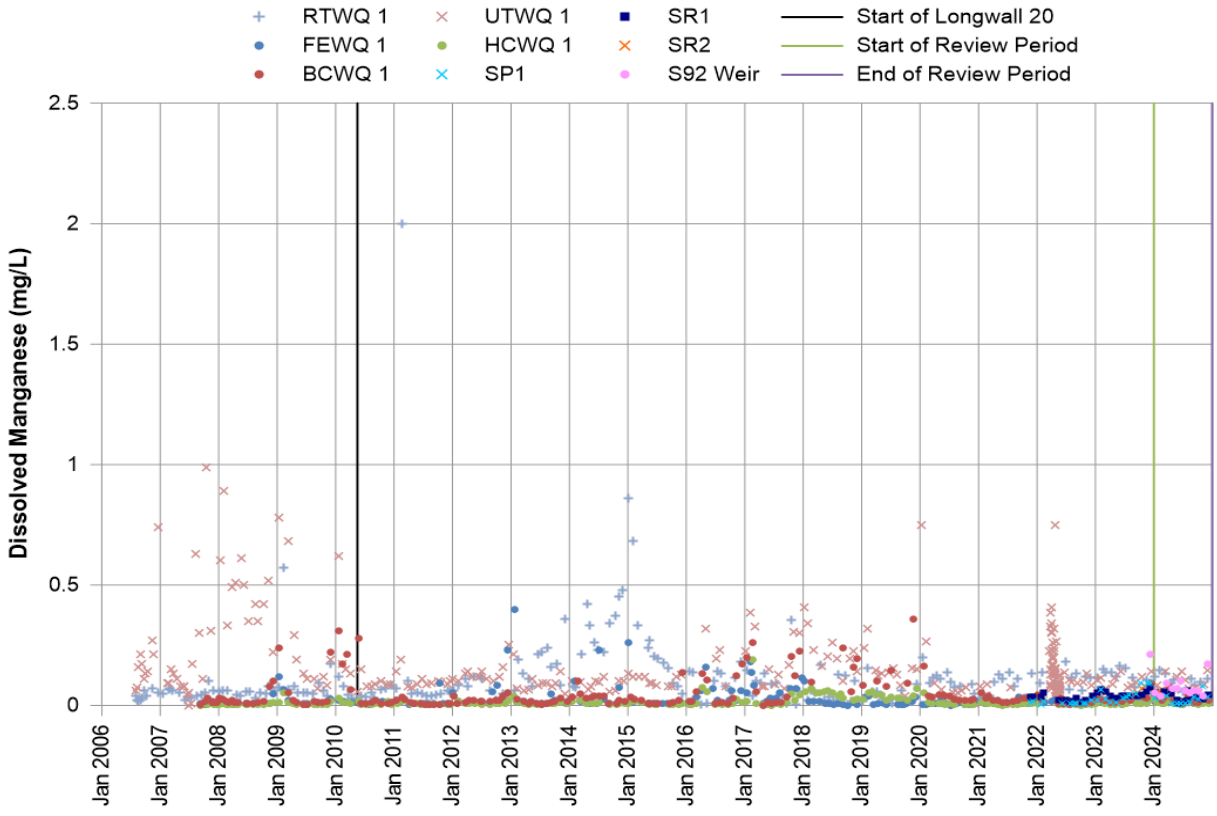


Chart 49 **Dissolved Manganese Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek**

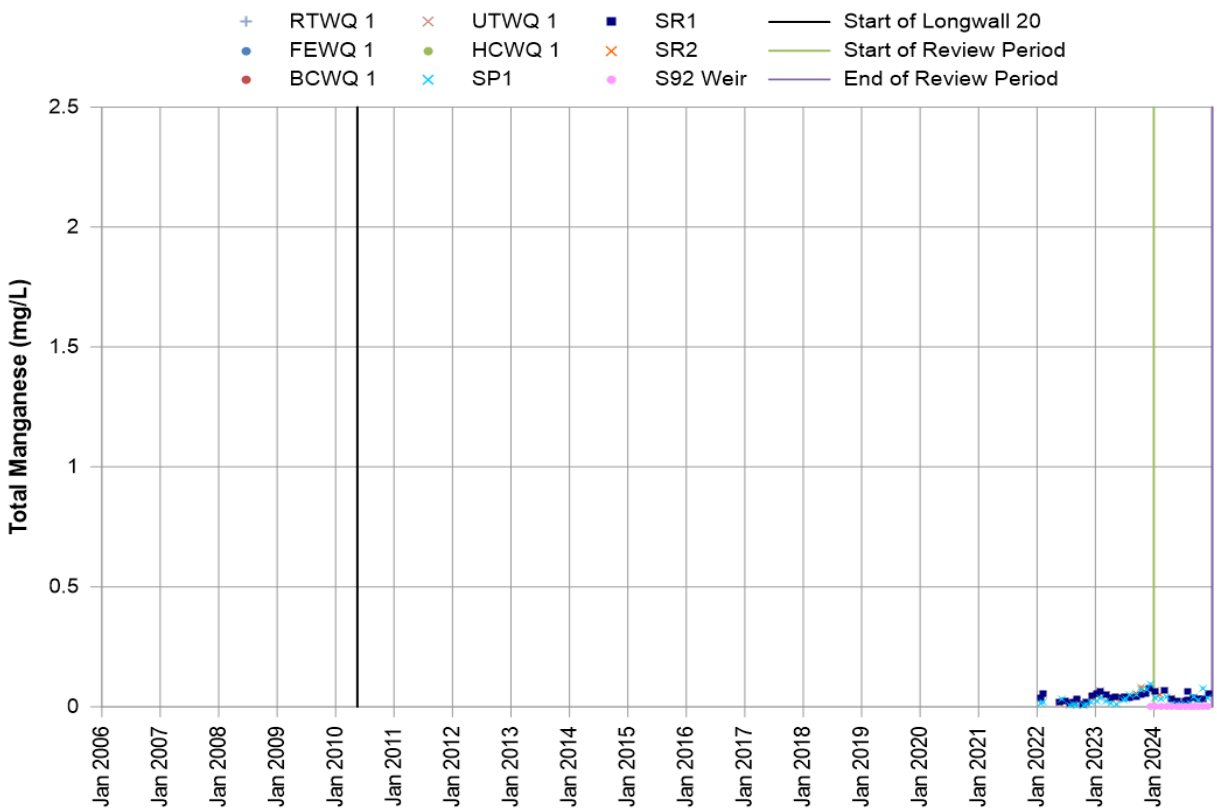


Chart 50 **Total Manganese Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek**

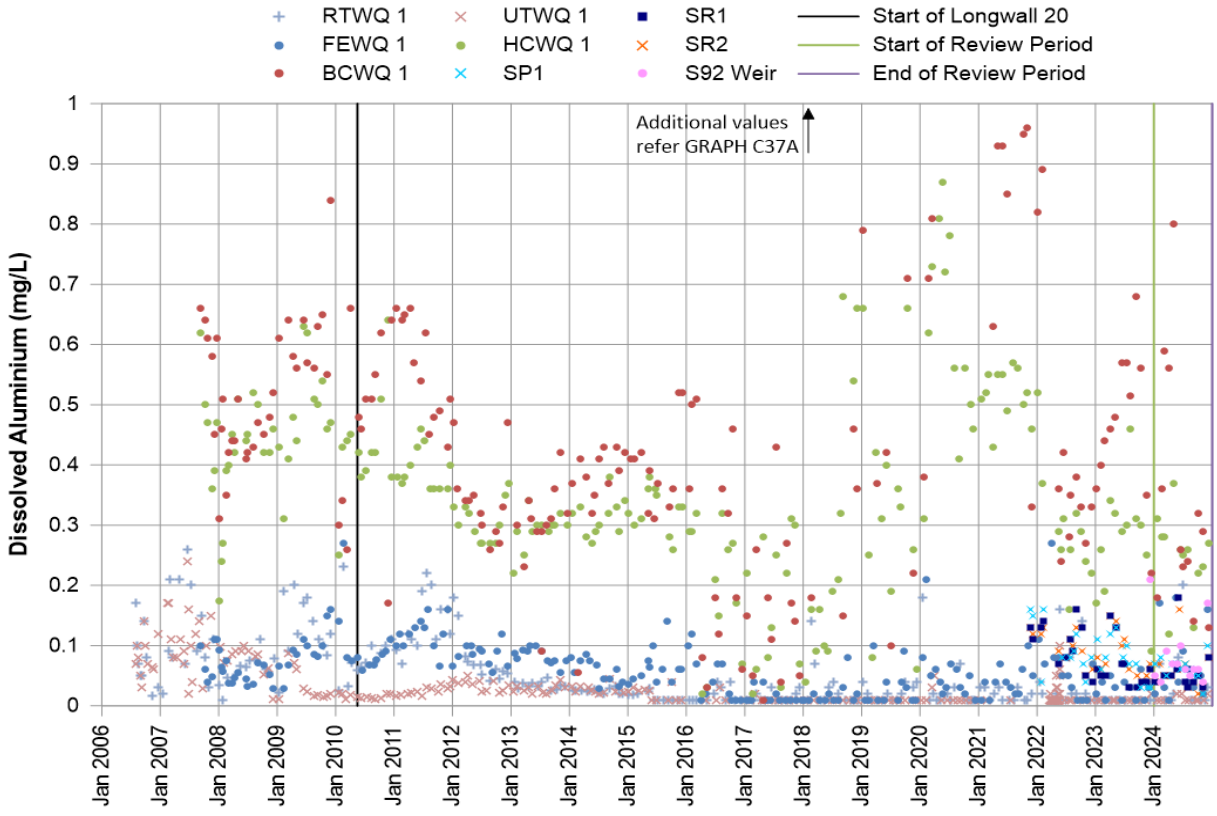


Chart 51a **Dissolved Aluminium Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek**

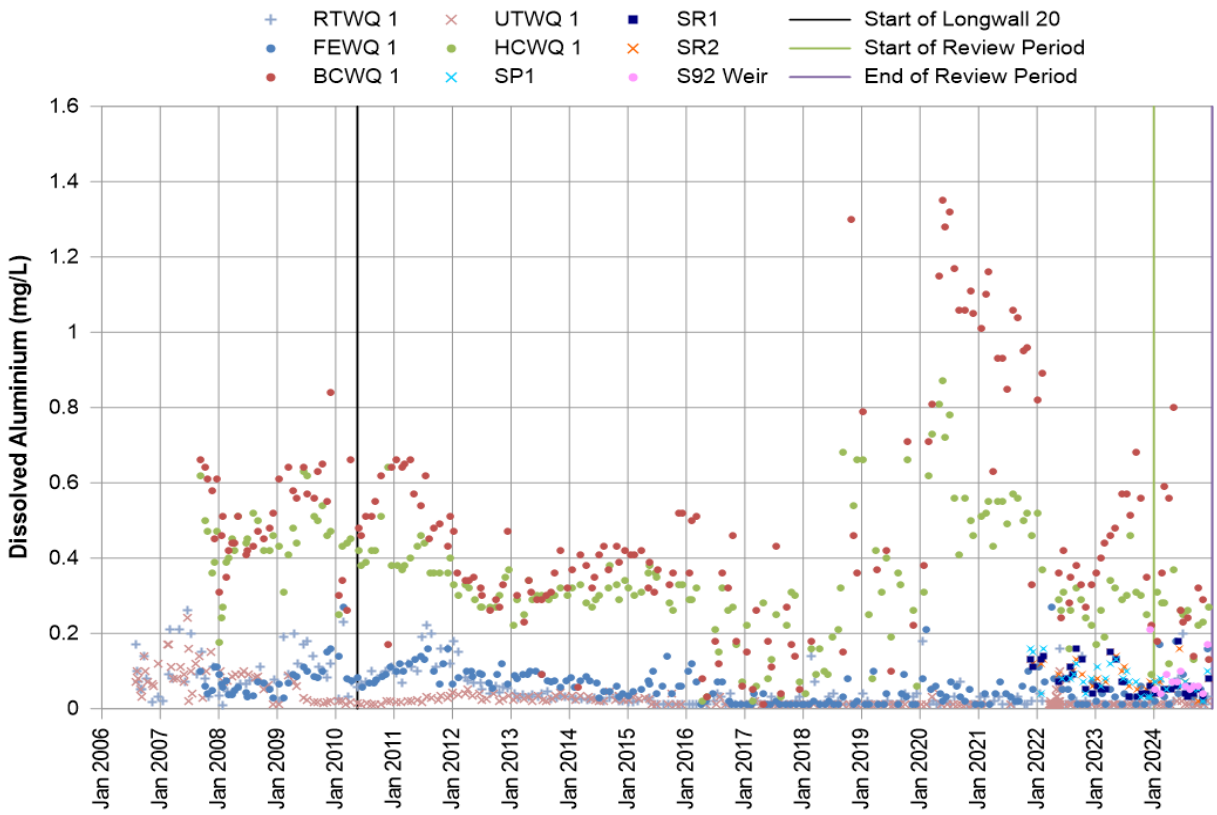


Chart 51b Dissolved Aluminium Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek

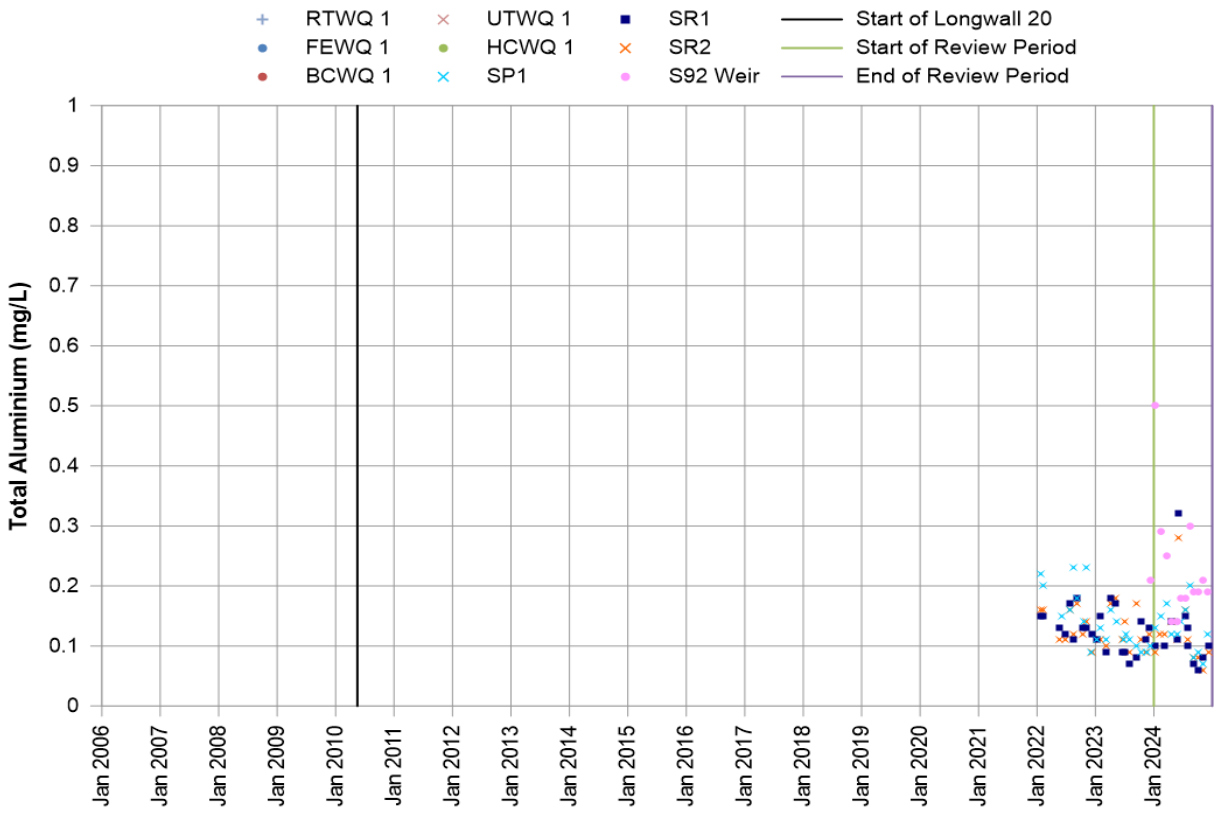


Chart 52 Total Aluminium Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek

Assessment of Water Quality at Site WRWQ9

There were no exceedances of the adjusted baseline mean plus two standard deviations for dissolved iron at site WRWQ9 on the Waratah Rivulet during the reporting period. The result equates to a Level 1 significance level for dissolved iron from January to December 2024 (Appendices B1 and B2).

There were no exceedances of the adjusted baseline mean plus two standard deviations for dissolved manganese at site WRWQ9 from January to December 2024. In comparison, there was an exceedance of the adjusted baseline mean plus two standard deviations for dissolved manganese at control site WOWQ2 on the Woronora River in January to March 2024 but no other months during the reporting period. The results equate to a Level 1 significance level from January to December 2024 (Appendices B1 and B2).

There were no exceedances of the adjusted baseline mean plus two standard deviation for dissolved aluminium at site WRWQ9 from January to December 2024. There were no exceedances of the adjusted baseline mean plus two standard deviations at control site WOWQ2 on the Woronora River for dissolved aluminium during the reporting period. This results in a Level 1 significance level January to December 2024, (Appendices B1 and B2).

Assessment of Water Quality at Site ETWQ AU

There were exceedances of the adjusted baseline mean plus two standard deviations for dissolved iron at site ETWQ AU during May, June and July 2024 (Charts 53a and 53b). From January to April 2024 and August 2024, the recorded dissolved iron concentrations were below the adjusted baseline mean plus two standard deviations. In comparison, there were no exceedances of the adjusted baseline mean plus two standard deviations at control site WOWQ2 on the Woronora River for dissolved iron. This equates to a Level 1 significance level in January to April and August to December 2024 and a Level 3 significance in May to July 2024, as there was not a similar exceedance at the control site WOWQ2 (Appendices B1 and B2).

The dissolved manganese concentrations continued to exceed the adjusted baseline mean plus two standard deviations at sampling site ETWQ AU for the duration of the reporting period (Charts 55a and 55b). The monthly dissolved manganese concentration at the control site WOWQ2 on the Woronora River exceeded the adjusted baseline mean plus two standard deviations for three months (January to March 2024) for dissolved manganese during the reporting period. Accordingly, the results equate to a Level 3 significance for dissolved manganese recorded at site ETWQ AU in January, February and April to December 2024, and Level 2 in March 2024 (Appendices B1 and B2).

There was an exceedance of the adjusted baseline mean plus two standard deviations for dissolved aluminium in May 2024 at sampling site ETWQ AU (Chart 57). There were no exceedances of the adjusted baseline plus two standard deviations at control site WOWQ2 on the Woronora River for dissolved aluminium. The results equate to a Level 1 significance level from January to April and June to December 2024 and a Level 2 significance in May 2024 (Appendices B1 and B2).

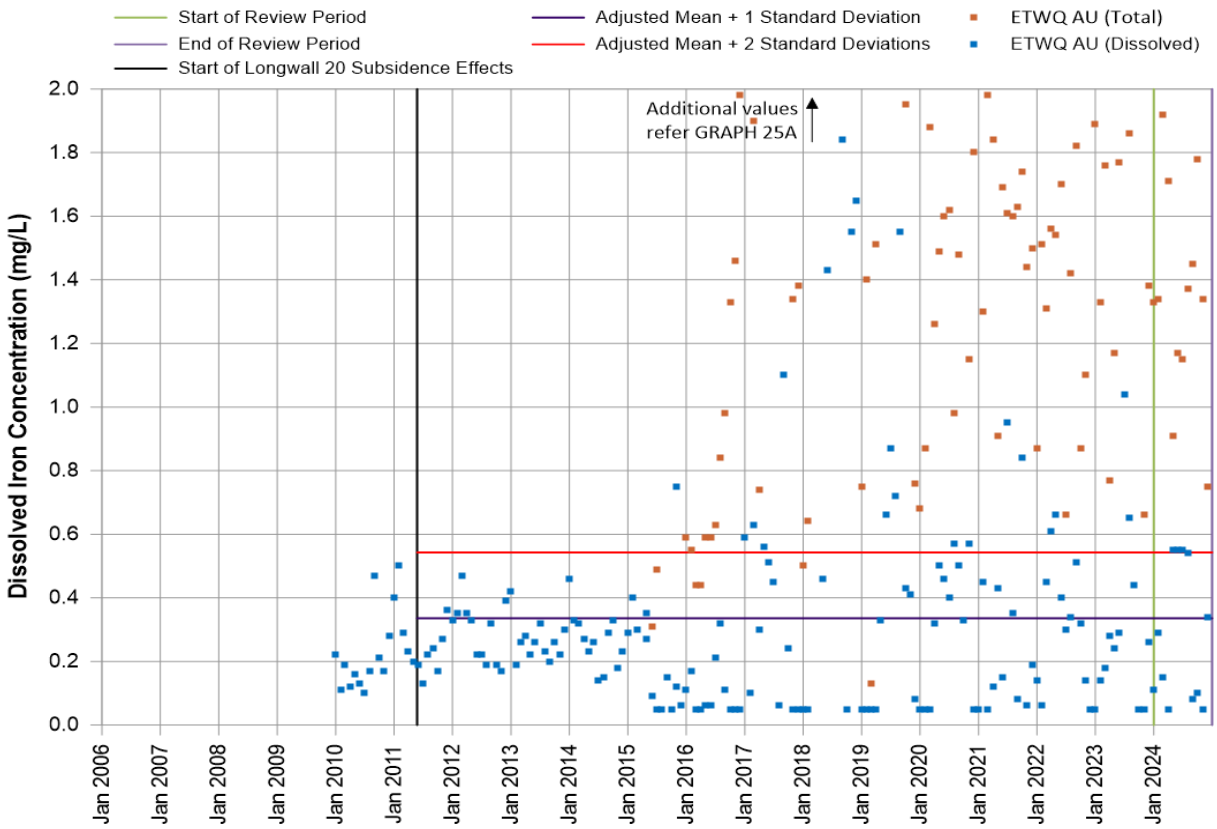


Chart 53a Iron Concentrations in Eastern Tributary at ETWQ AU

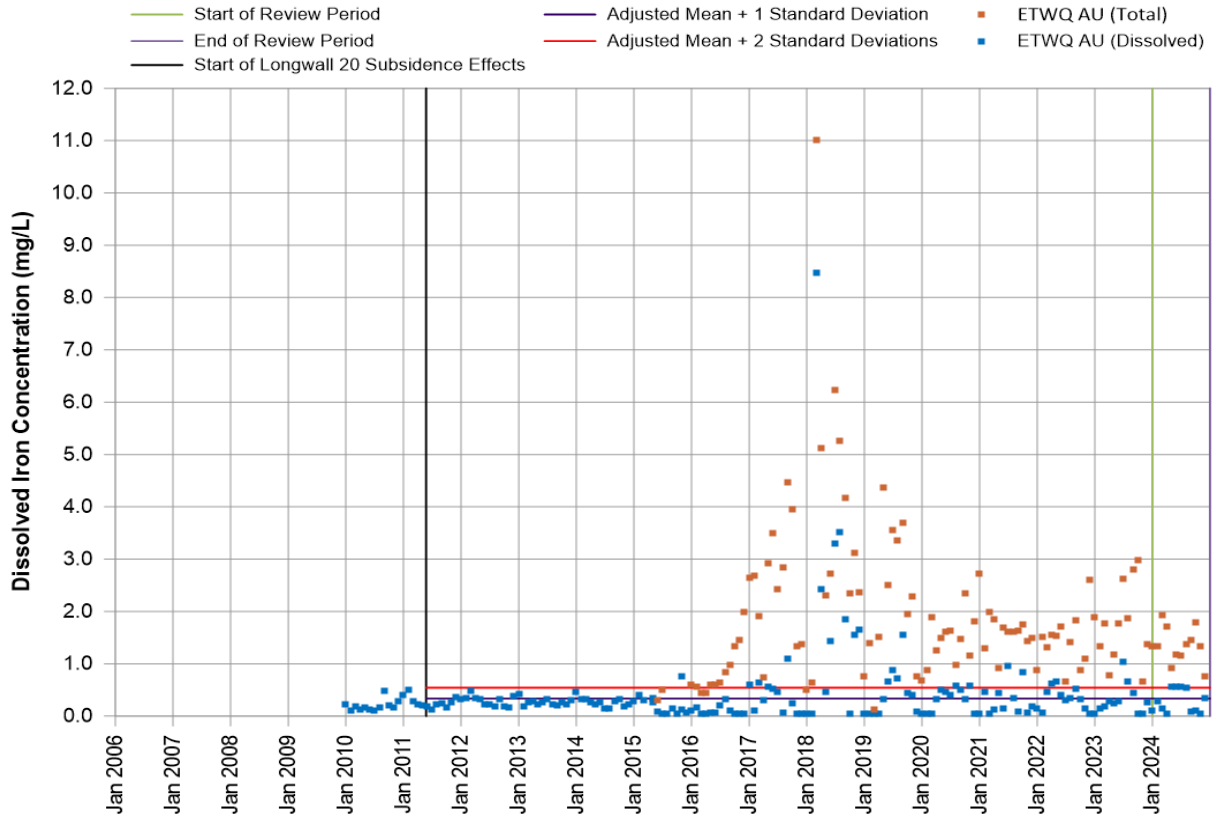


Chart 53b Iron Concentrations in Eastern Tributary at ETWQ AU

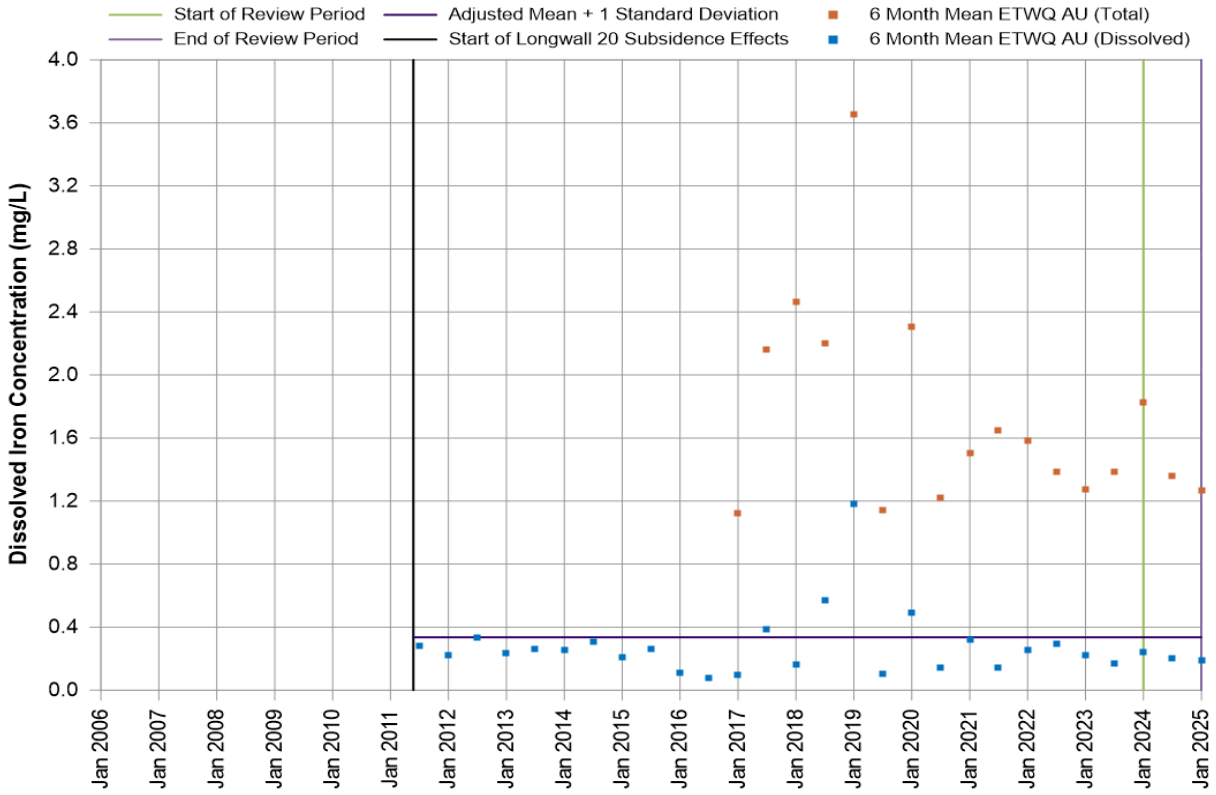


Chart 54 Six Month Means of Iron Concentrations in Eastern Tributary at ETWQ AU

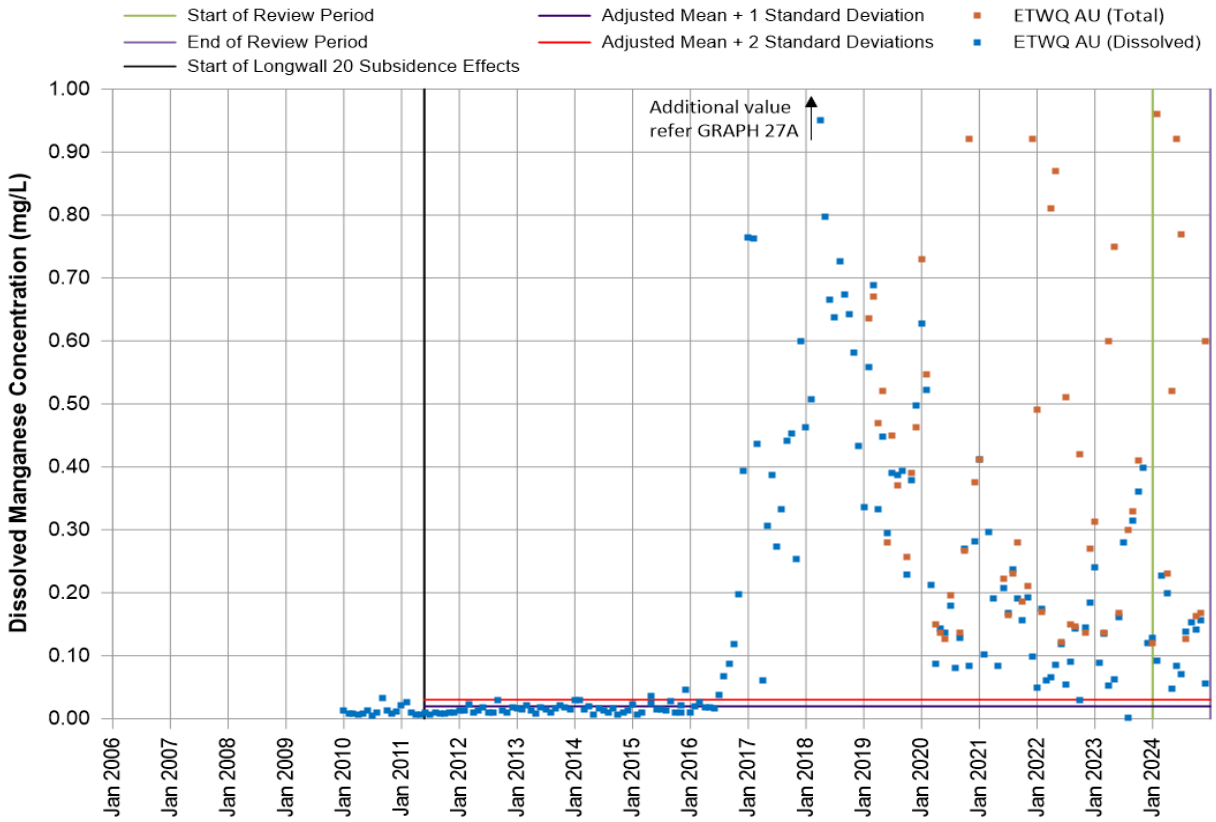


Chart 55a Manganese Concentrations in Eastern Tributary at ETWQ AU

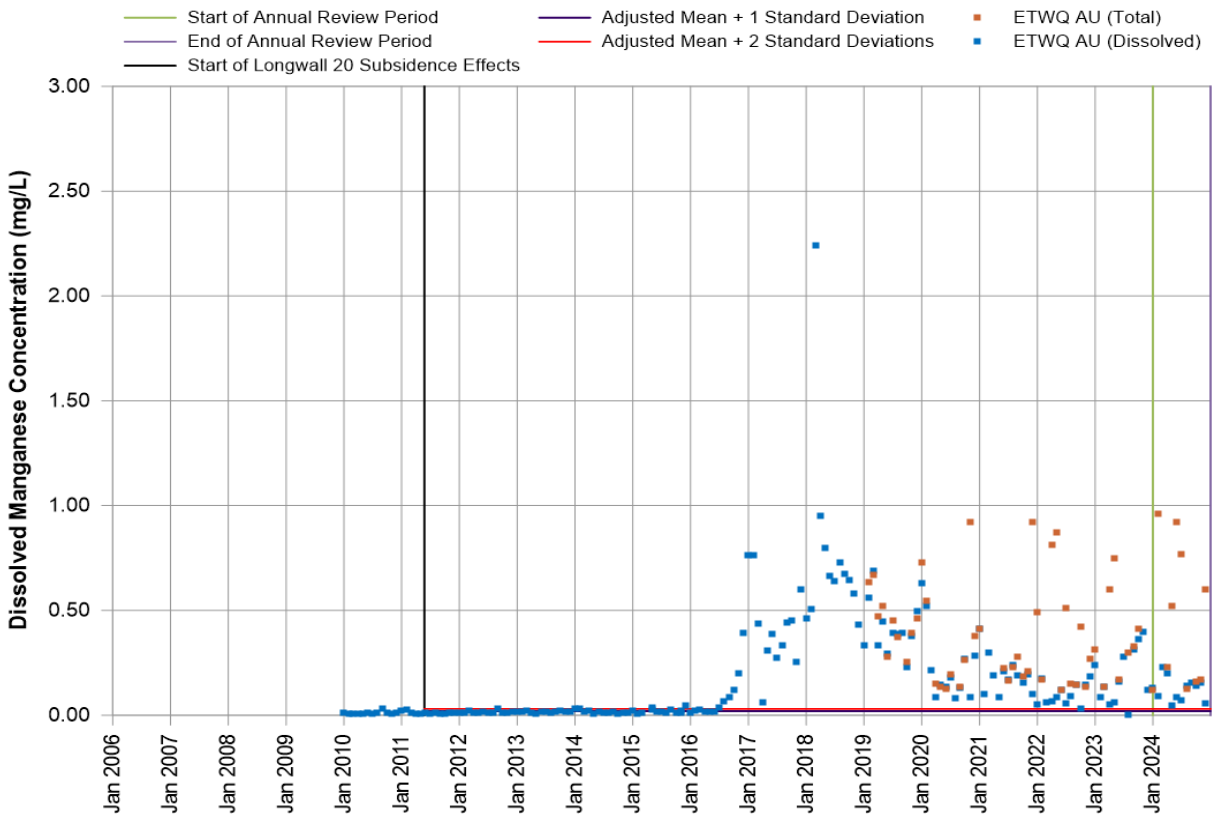


Chart 55b Manganese Concentrations in Eastern Tributary at ETWQ AU

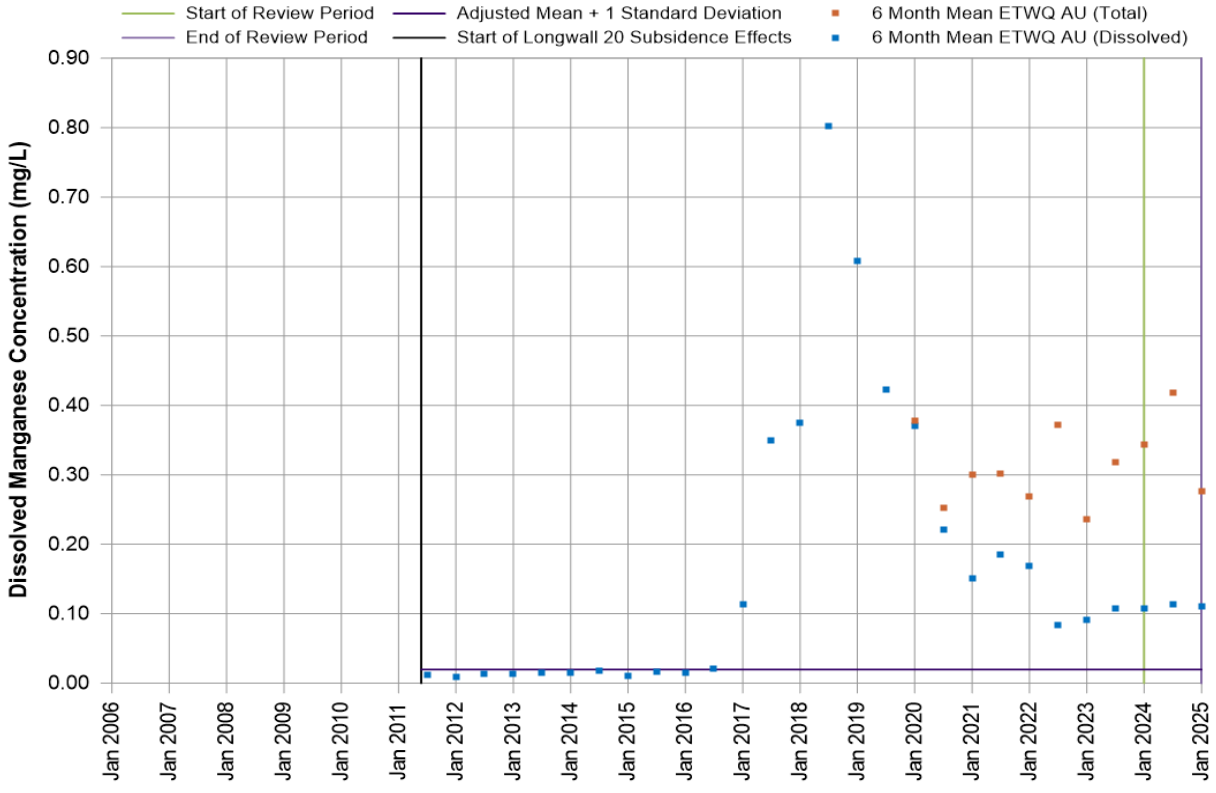


Chart 56 Six Month Means of Manganese Concentrations in Eastern Tributary at ETWQ AU

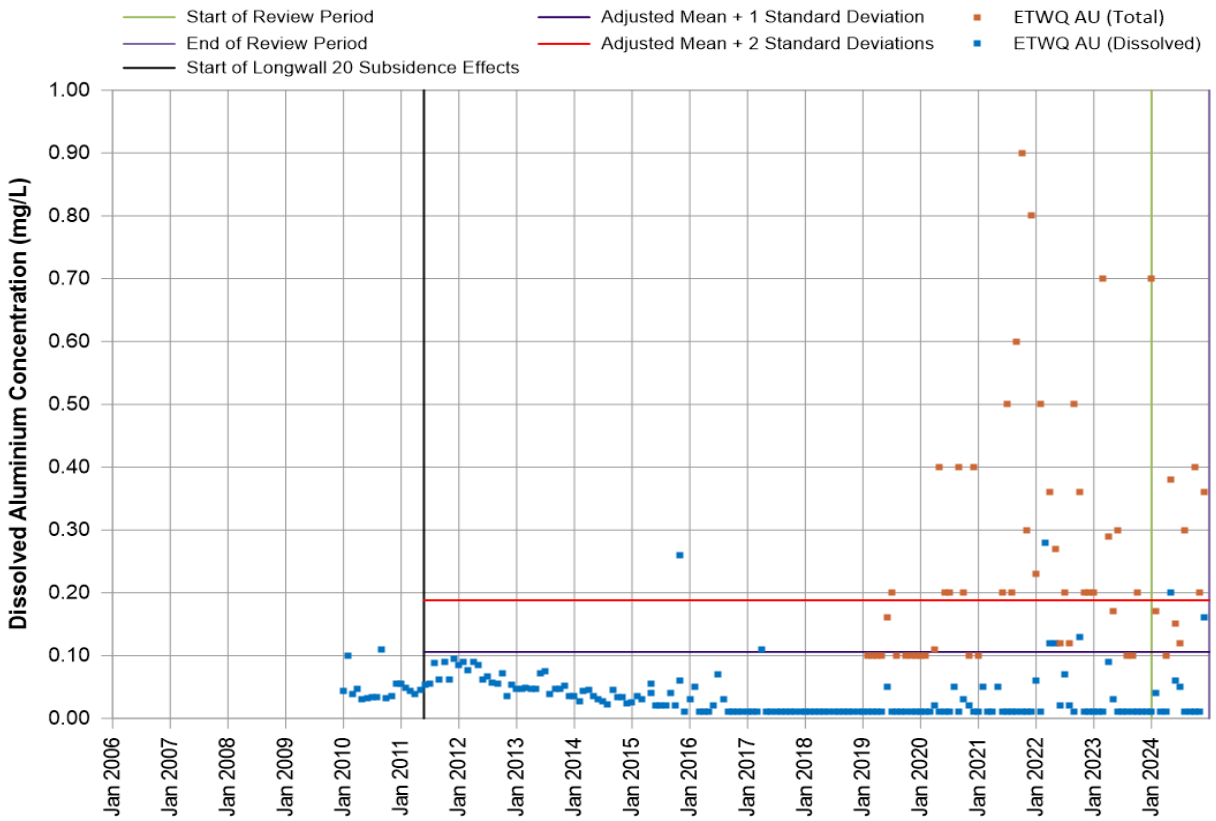


Chart 57 Aluminium Concentrations in Eastern Tributary at ETWQ AU

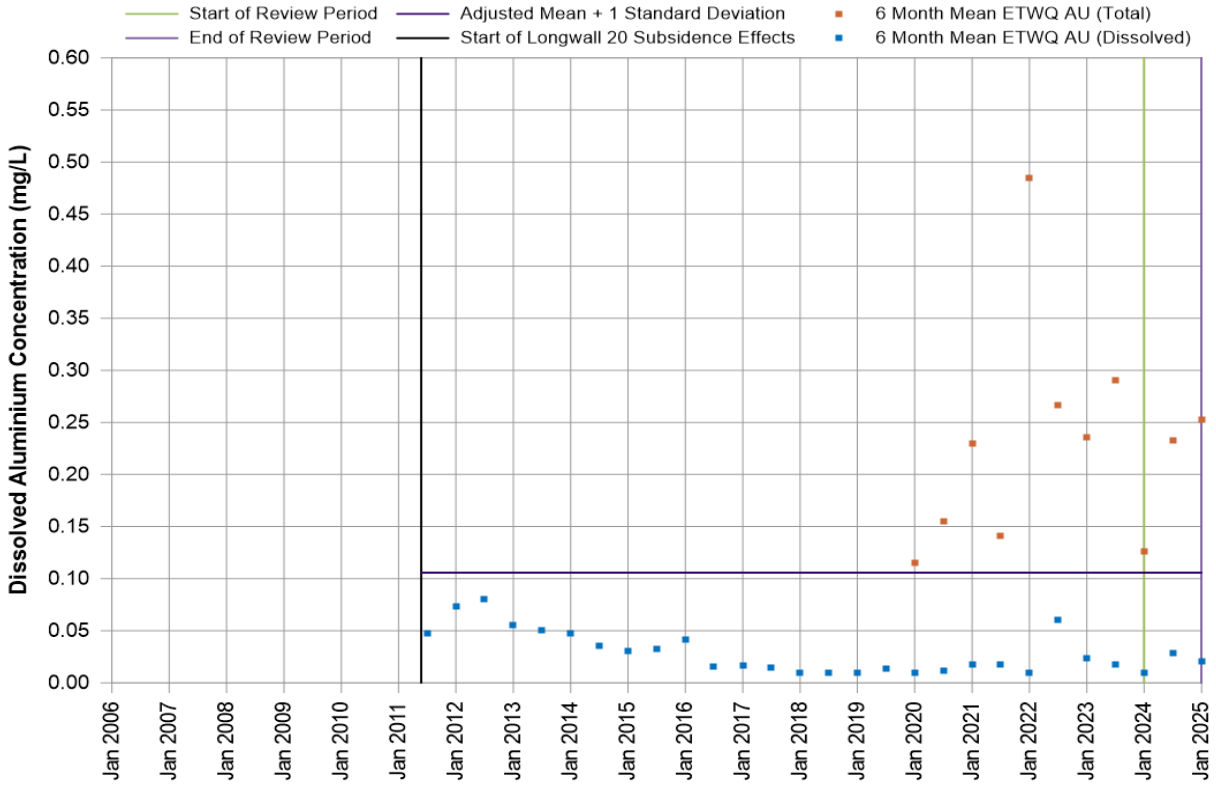


Chart 58 Six Month Means of Aluminium Concentrations in Eastern Tributary at ETWQ AU

The cracking and dilation of bedrock and associated diversion of surface flow and leakage of water through rock bars at pools which has occurred on the Eastern Tributary, including at the location of the stream which was the subject of the exceedance of the Eastern Tributary watercourse performance measure (the Eastern Tributary Incident), has resulted in increases in dissolved manganese and iron.

As a result of the performance indicator exceedances for dissolved manganese at site ETWQ AU on the Eastern Tributary in January to December 2024, assessments were made against the subsidence impact performance measure, *Negligible reduction to the quality of water resources reaching the Woronora Reservoir.* The assessments were undertaken by Associate Professor Barry Noller and are provided in Appendix F, and consider the manganese concentrations reaching the Woronora Reservoir. These assessments found there has been a negligible reduction in the quality of water resources reaching the Woronora Reservoir. The watercourse performance measure, *Negligible reduction to the quality of water resources reaching the Woronora Reservoir,* is not considered to have been exceeded (Appendix F).

The environmental consequences of subsidence impacts on water quality were predicted by the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans to be similar to that previously observed at Metropolitan Coal, specifically, transient pulses of iron, manganese and aluminium, which would likely occur following fresh cracking of the stream bed.

Monitoring and analysis of water quality data will continue in accordance with the Longwalls 311-316 Water Management Plan. Metropolitan Coal is committed to the remediation of pools on the Eastern Tributary. It is anticipated that ongoing stream remediation activities (described in Section 10.3.2) will reduce the transfer of iron and manganese from the groundwater to the Eastern Tributary.

6.2.5 Woronora Reservoir Water Quality

Metropolitan Coal has sourced water quality data for the Woronora Reservoir (at sampling location DWO1) from WaterNSW in accordance with a data exchange agreement. Results in relation to total iron, aluminium and manganese at levels from 0 m to 9 m below the reservoir surface for Woronora Reservoir throughout the period of record are presented in Charts 59 to 61.

The data presented in Charts 59 to 61 indicate that a gradual increasing trend in total iron, total aluminium and total manganese has been recorded since early to mid-2020 following the onset of higher rainfall conditions. The trend in total iron concentrations during 2022-2024 resembles that recorded in 1990-1991. The peak concentration recorded for this period (0.75 mg/L recorded in June 2023) is less than the historical maximum (0.85 mg/L recorded in 1965). Total iron concentrations show a declining trend from July 2023, and concentrations reduced by approximately 0.2 mg/L by December 2024 (Chart 59). Following from elevated concentrations at the end of 2022, there was a decrease in total aluminium to June 2024 with concentrations recorded below 0.15 mg/L during February and March 2024 (Chart 60). Total manganese concentrations have been slightly elevated since early to mid-2020 compared with previous years. Concentrations show a decreasing trend from mid to late 2023, with concentrations remaining relatively consistent during 2024 (Chart 61).

Water quality data in the Woronora Reservoir is analysed annually and assessed against the following performance indicator:

> *Changes in the quality of water in the Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations.*

The performance indicator is considered to have been exceeded if data analysis indicates a significant change in the quality of water post-mining, specifically if the current year's duration exceedance curve for a water quality parameter in Woronora Reservoir (total iron, total aluminium and total manganese) is above the baseline 20 year average recurrence interval (ARI) exceedance curve for any range of the duration percentages from 0% to 75%. The results of this assessment are shown on Chart 62, Chart 63 and Chart 64, respectively.

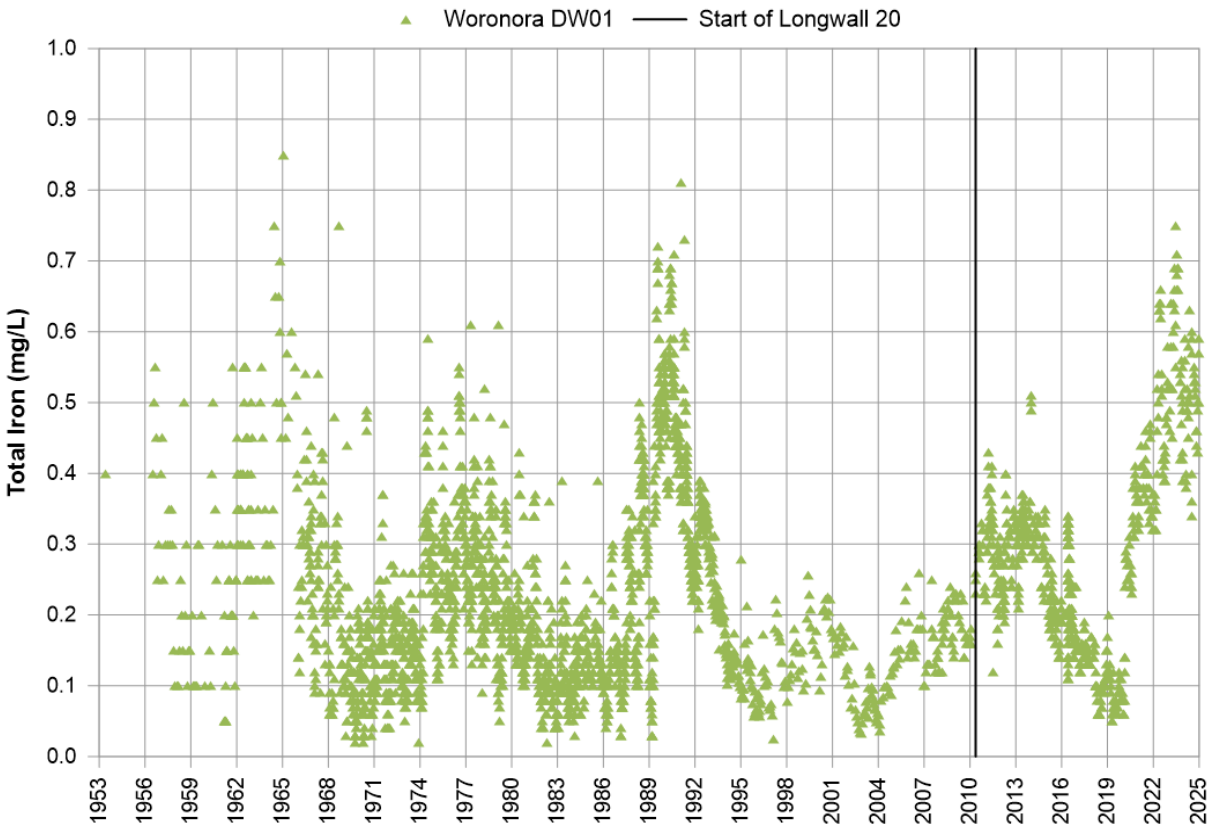


Chart 59 Total Iron Concentration Woronora Reservoir

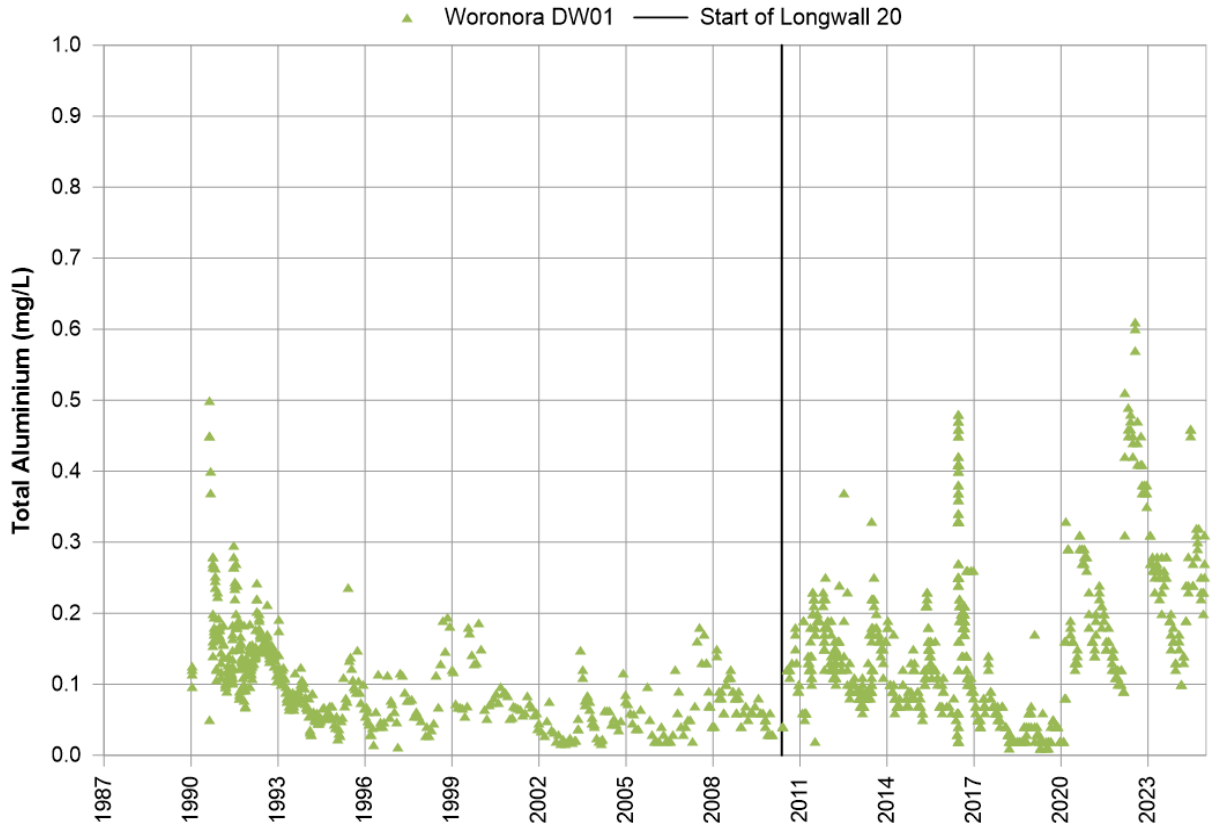


Chart 60 Total Aluminium Concentration Woronora Reservoir

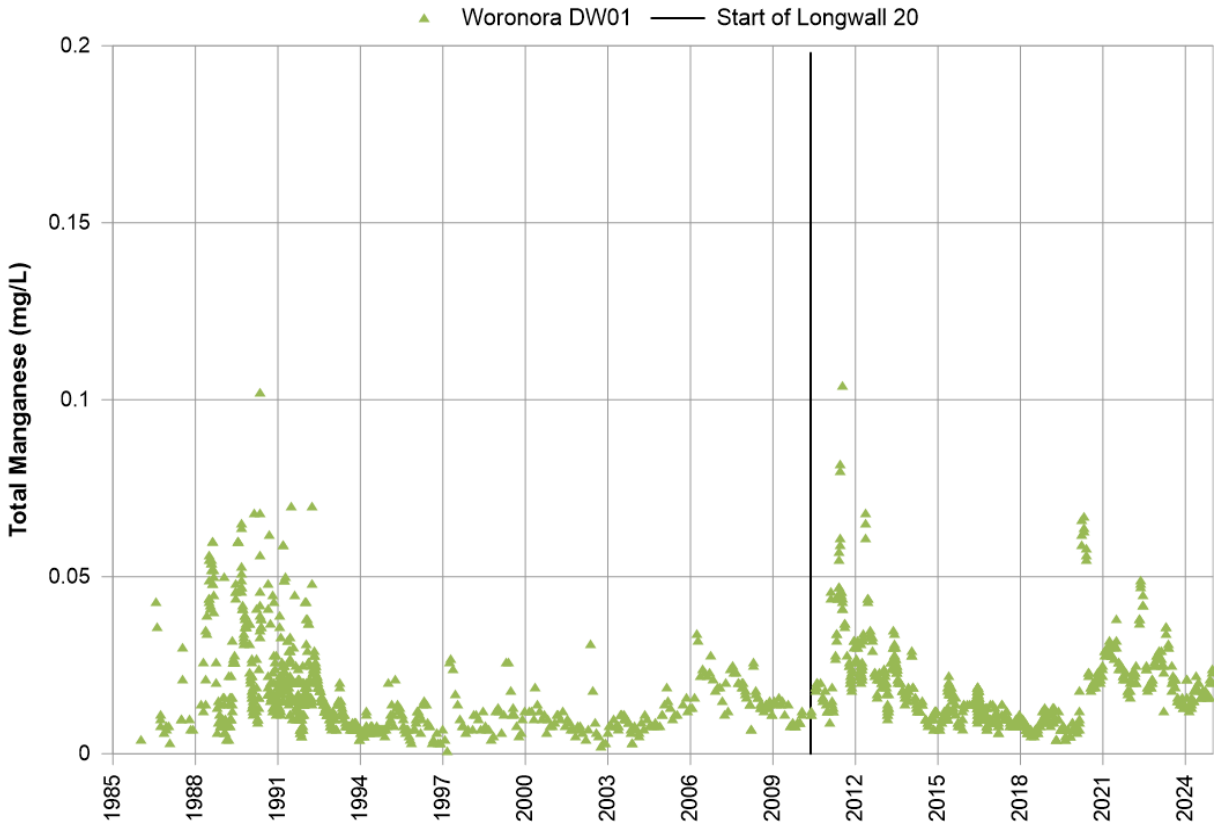


Chart 61 Total Manganese Concentration Woronora Reservoir

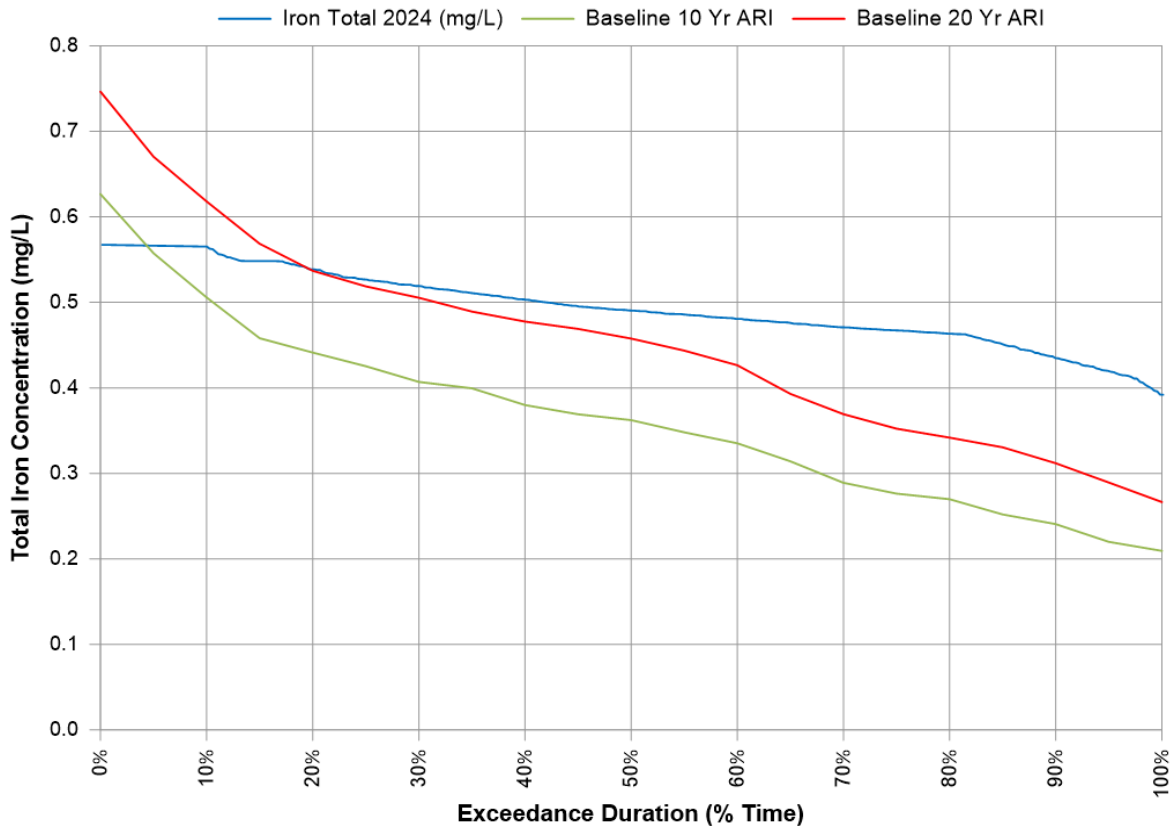


Chart 62 Total Iron Performance Indicator Woronora Reservoir 2024

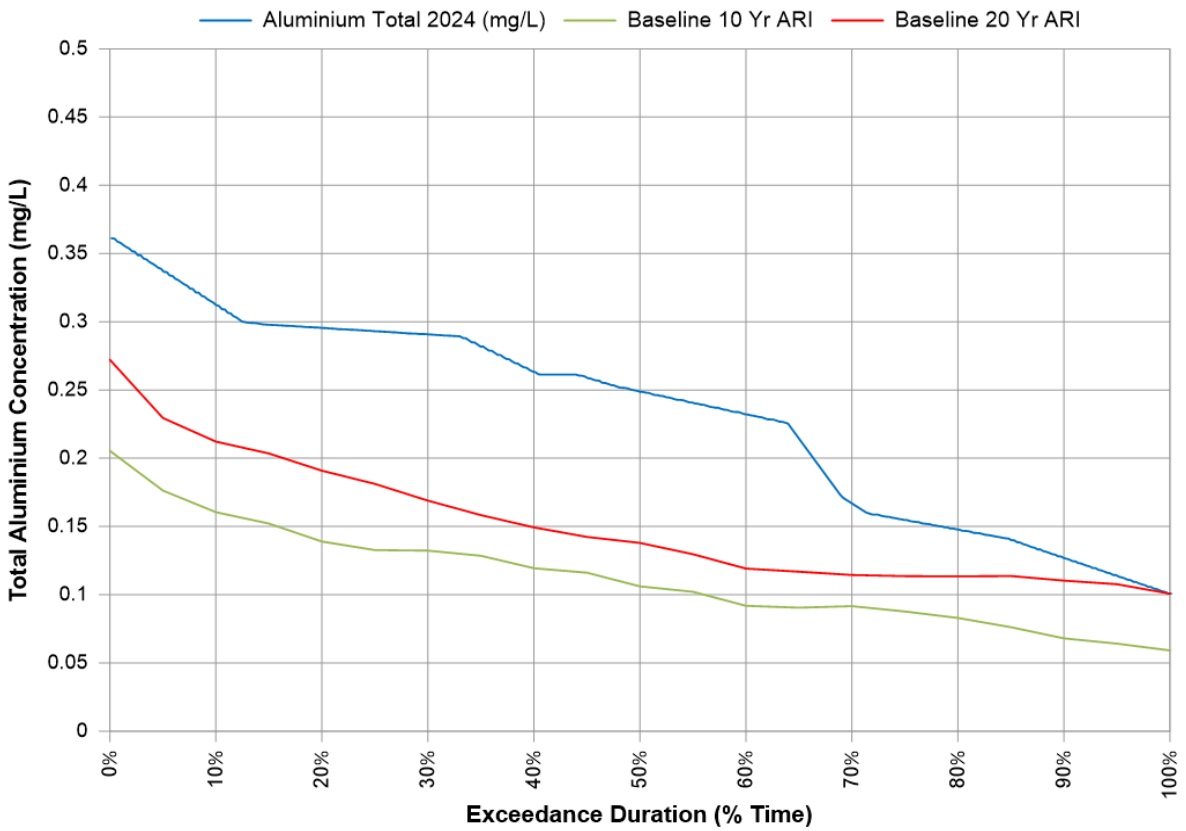


Chart 63 Total Aluminium Performance Indicator Woronora Reservoir 2024

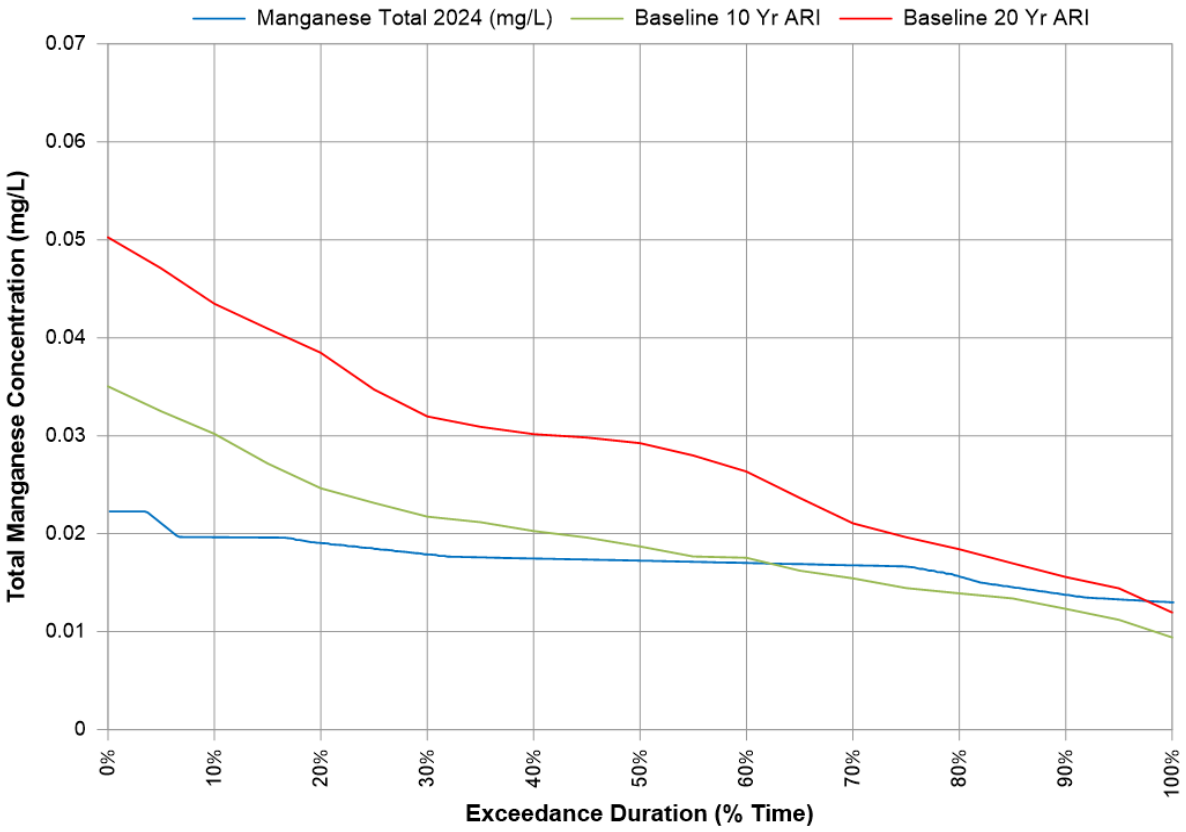


Chart 64 Total Manganese Performance Indicator Woronora Reservoir 2024

Total iron exceeded the baseline 10 Year ARI exceedance curve for 95% of the reporting period and exceeded the baseline 20 Year ARI exceedance curve for approximately 80% of the reporting period (Chart 62). Total aluminium exceeded the baseline 10 Year and 20 Year ARI exceedance curves for 100% of the reporting period (Chart 63). Total manganese exceeded the baseline 10 Year exceedance curve for 40% of the reporting period and marginally exceeded the baseline 20 Year ARI exceedance curve for approximately 5% of the reporting period (Chart 64). The results for total iron and total aluminium equate to a Level 3 significance and for total manganese equate to Level 2 significance.

In accordance with Longwalls 308-310 and Longwalls 311-316 Water Management Plans, an assessment against the Performance Measure was completed by ATC Williams and is provided in Appendix B2. The assessment concluded that the performance measure, *Negligible reduction in the water quality of Woronora Reservoir,* has not been exceeded.

The elevated concentration of total aluminium at site DW01 in the Woronora Reservoir is unlikely to be related to mining activities and more likely to be related to elevated concentrations in surface water system inflows from catchments that are outside of the potential influence of mining during and following a period of substantial rainfall. The elevated concentrations of total iron and manganese at site DW01 are likely to be partly related to the elevated concentrations of the respective metal inflows from the Eastern Tributary. Although inflows from the Eastern Tributary are subject to potential mining influences, it should be noted that dissolved iron and manganese concentrations in inflow from the Eastern Tributary were also elevated at similar levels in 2019, with no significant increase in total iron or manganese concentrations in the Woronora Reservoir at this time.

The Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans predicted the Project would not impact on the performance of the Woronora Reservoir and would have a neutral effect on water quality. The water quality monitoring results are consistent with the predictions.

6.2.6 Swamp Groundwater Levels

Groundwater monitoring of upland swamps has involved the use, where practicable, of paired piezometers, one in the swamp substrate (at approximately 1 m depth) and one in the underlying sandstone (at a depth of approximately 10 m) (Figure 9). Data shows that water levels within the swamps over longwalls are typically perched above those of the local Hawkesbury Sandstone groundwater levels and indicates a separate control on swamp water levels. That is, the swamps are primarily surface water fed systems and generally water infiltrates downwards from the swamps to the groundwater.

Swamp substrate water levels at Swamps 25, 30, 33, 35, 40, 41, 46, 50, 51, 52, 53, 62, 64, 82, 71a, 72, 92, 101, 137a and 137b are used to assess the impact on threatened species, populations, or ecological communities in accordance with the Longwalls 308-310 Biodiversity Management Plan. For the period January to June 2024, the swamp substrate water levels are assessed against the following upland swamp groundwater performance indicator:

> *Surface cracking within upland swamps resulting from mine subsidence is not expected to result in measurable changes to swamp groundwater levels when compared to control swamps or seasonal variations in water levels experienced by upland swamps prior to mining*.

The Longwalls 311-316 Biodiversity Management Plan includes additional monitoring of swamp substrate water levels at Swamps 76-1, 76-2, 76-3, 77-1, 77-2, 77-2, 81, 89, 92-1, 92-2 and 92-3. With the commencement of mining of Longwall 311 in October 2024, swamp substrate levels in the period July to December 2024, are assessed against the TARP for Longwalls 311-316 Biodiversity Management Plan. The swamp substrate water levels are assessed against the following upland swamp groundwater performance indicator:

> *Subsidence impacts are not expected to result in measurable changes to swamp groundwater levels when compared to control swamps or seasonal variations in water levels experienced by upland swamps prior to mining*

Swamp Monitoring for Longwalls 20-27

Paired piezometers have been monitored in Swamp 25 overlying Longwalls 20-22, Swamps 28, 30, 33 and 35 overlying Longwalls 23-27, and in control swamps 101, 137a, 137b and Bee Creek Swamp (Figure 9). At Swamp 20 (overlying Longwall 21) and at control swamp Woronora River Swamp 1, multiple piezometers have been monitored (i.e. one swamp substrate piezometer to a depth of approximately 0.9 m and two sandstone piezometers to depths of approximately 4 and 10 m) (Figure 9).

The Longwalls 305-307 Biodiversity Management Plan upland swamp groundwater performance indicator was exceeded at Swamp 20 since 2012 and at Swamp 28 since 2016 indicating a mining impact at these two swamps. As part of the Longwalls 308-310 and Longwalls 311-316 Biodiversity Management Plans, no trigger is assigned to either Swamp 20 or Swamp 28 due to these swamps previously having been impacted by mining. These swamps are no longer assessed against performance criterion, however, are assessed annually by relevant specialists.

The upland swamp groundwater performance indicator has been exceeded at Swamp 20 since 2012. Swamp 20 substrate water levels changed from being permanently saturated to being periodically saturated as a result of the passing of Longwall 21 (Chart 65, and Appendices C1 and C2). There is a very strong correlation with rainfall trend at Swamp 20 and control swamp Woronora River Swamp 1 over the period of record. As the rate of decline in the two piezometers is similar between 2013 and 2016, but different in 2012, it is likely that Longwall 21 caused a mining effect at Swamp 20, but the effects have not been exacerbated by Longwalls 22-27 or Longwalls 301-306 (Appendices C1 and C2). In 2018 and 2019, both swamps reported water levels at the base of the substrate dataloggers for the full period apart from the short period of saturation recorded in Swamp 20 in September 2019. Both swamps increased in water levels after the large rain event in February 2020. However, following rainfall events throughout 2020, 2021 and 2022, Swamp 20 exhibited a decrease in groundwater levels whereas the WRSWAMP1 water levels remained at near-saturated levels. In 2023, both swamps water levels were concordant with rainfall, both experiencing upward trends due to January to April rainfall, with downward trends during dryer months. However, Swamp 20 still displayed more rapid drawdowns than that exhibited in WRSWAMP1 and dropped to sensor level between July and November 2023. Even though control swamp WRSWAMP1 does not show low level of saturation, other control swamps (Swamps 101, 137a, 137b) showed low level of saturation in late 2023, hence the low water level in Swamp 20 is deemed natural. In 2024, the water levels in Swamp 20 and WRSWAMP1 showed similar trends, with Swamp 20 showing a more pronounced response to the weather conditions (Chart 65, and Appendices C1 and C2).

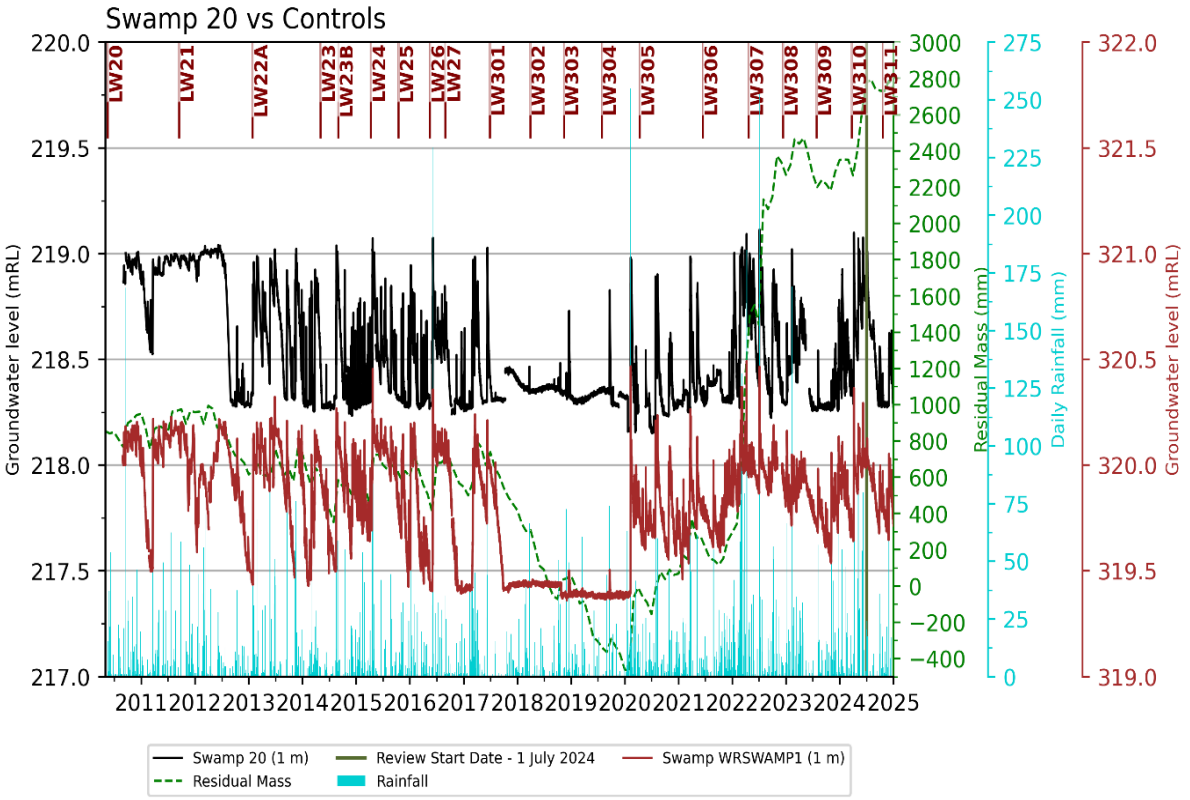


Chart 65 Comparison of Piezometer Responses at Swamp 20 and Woronora River 1 Control Swamp

A mining effect to the substrate water levels of Swamp 28 (overlying Longwall 24) was identified in 2016 based on the incomplete recovery of substrate water levels following rainfall events (Chart 66 and Appendices C1 and C2). At the time, Swamp 28 was considered to have an impact from mining of Longwall 25, although no effect on swamp substrate water levels occurred when Longwall 24 passed directly beneath the monitoring site (Appendices C1 and C2). The substrate piezometer at Swamp 28 returned to dry conditions from September 2017, remaining so until a rainfall event in February 2020, where the Swamp 28 substrate piezometer was re-saturated, returning to a saturation and recession pattern as observed prior to the drought. This behaviour was also observed at the two control swamp piezometers (Swamps 137a and 137b; Chart 66). The substrate piezometer at Swamp 28 indicated saturated conditions until December 2020. Groundwater levels were intermittently saturated throughout 2021. Groundwater levels responded to rainfall events towards the end of 2021 in both Swamp 28 and the controls swamps. Over 2022, the substrate was permanently saturated with groundwater levels constantly about 1 m above the sensor level in the first half of 2022, decreasing to 0.5 m by the end of the 2022. In 2023, water levels in all sensors increased and then declined following weather conditions and remained at the sensor level towards the end of the year. In the first half of 2024, water levels generally increased to near saturation, with a brief decrease observed in March 2024. Compared to the water levels in two control swamps, Swamp 28 displayed a similar trend but showed less responsiveness. During this reporting period, Swamp 28 showed a similar trend to the control swamps.

ATC Williams undertook an assessment of mining related impacts to historically undermined swamps (namely, Swamp 20, 25, 28, 22, 25, 30, 41, 46, 50, 51, 52 and 53) to support the Large Swamp Assessment prepared as part of the Longwalls 311-316 Extraction Plan application by:

- comparing water levels of undermined swamps with control swamps that are subject to similar climatic conditions; and

- assessing the rate of water level recessions pre-mining and post-mining, and against recession rates of control swamps.

A summary of the key findings of ATC Williams' assessment includes (ATC Williams, 2024):

- impacts on the underlying Upper Hawkesbury Sandstone, as measured by faster recession rates at the approximately 4 and/or 10 m piezometers, occurred without any discernible change in recession rate of the swamp substrate. An exception is Swamp 20, which showed a slight increase in the shallow substrate water level recession rate.
- Despite impacts to the Upper Hawkesbury Sandstone at several swamps, impact to the substrate water level at these swamps is considered indiscernible with the exception of Swamp 20 where a persistent impact to the substrate water level has occurred.
- Persistent mining-related effects are also considered to have occurred to the Upper Hawkesbury Sandstone water level at headwater Swamp 28, with moderate effects considered to have occurred to the Upper Hawkesbury Sandstone water level at headwater Swamp 46 and valley-side Swamp 50.

Based on the findings of ATC Williams' assessment, the Swamp 28 substrate piezometer was concluded to not have been impacted by mining despite an impact being observed to the deep sandstone piezometer. Following further analysis of monitoring data to date, it has been determined that the mining effect to the substrate water levels of Swamp 28 was concluded during a period of substantial drought. The substrate piezometer at Swamp 28 returned to pre-drought saturation and recession patterns following rainfall in February 2020, which was also observed at control Swamps 137a and 137b. As such, the conclusion that a mining impact was observed at the Swamp 28 substrate piezometer is no longer supported (Appendix C2).

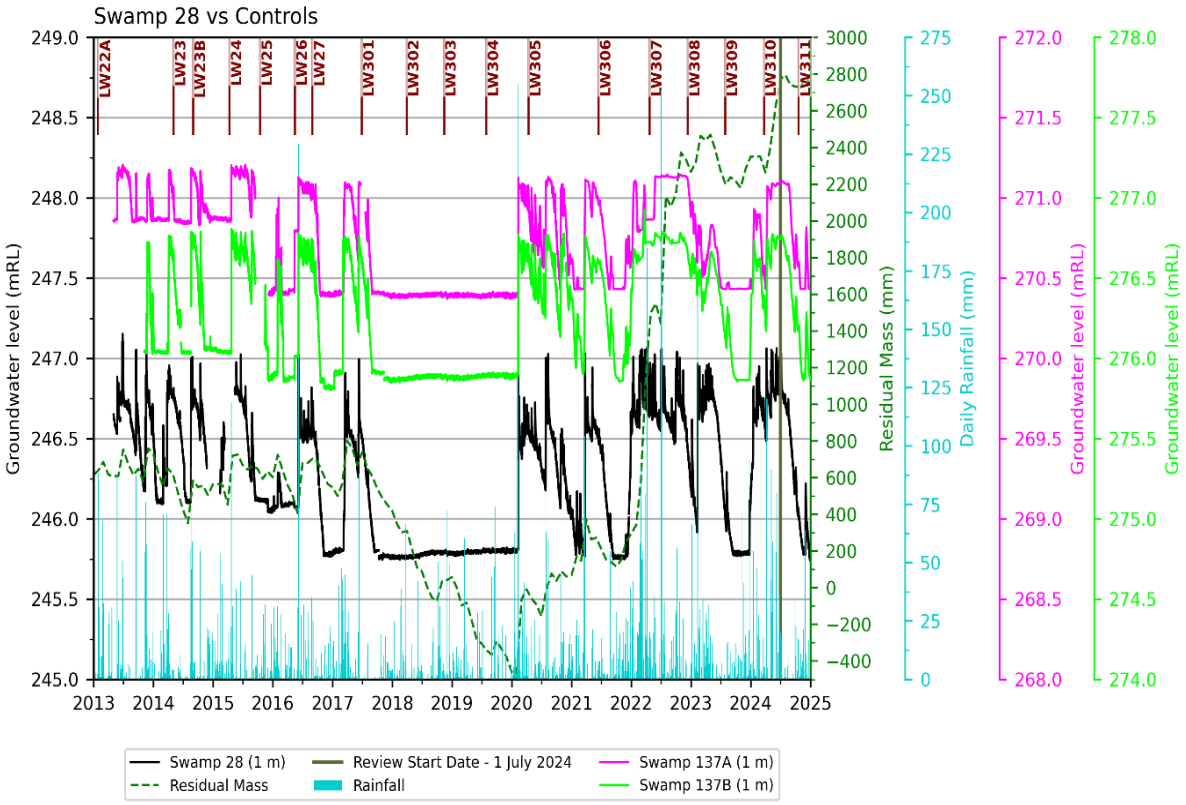


Chart 66 Groundwater Hydrographs at Swamp 28 and Two Control Swamps (137a and 137b)

Swamps Monitoring for Longwalls 301-304

Paired piezometers (i.e. one swamp substrate piezometer and one sandstone piezometer) have been monitored in Swamps 40, 41, 46, 50, 51, 52 and 53 overlying Longwalls 301-304 (Figure 9). As indicated in Section 4.1, Longwall 303 was completed on 2 June 2019 and the extraction of Longwall 304 commenced on 27 July 2019 and was completed on 28 January 2020.

The swamp substrate hydrographs for Swamps 40, 41, 46, 50, 51, 52 and 53 indicate that the correlation of swamp substrate with the rainfall trend is strong (Appendices C1 and C2). Data analysis for the reporting period indicates the seven-day moving average for all swamps, was at or above the minimum established for the swamp's length of record (Appendices C1 and C2).

Between October 2019 and January 2020 the Swamp 50 shallow sandstone (10 m) piezometer displayed a pronounced decline in water level coinciding with the passage of Longwall 304. After February 2020, groundwater levels have increased in response to increased regional rainfall; however, the maximum recorded groundwater levels during this period are approximately 3 m below those recorded prior to the passage of Longwall 304. This is an apparent mining affect considered to be related to mine subsidence to the Swamp 50 shallow sandstone (10 m) piezometer. The Swamp 50 performance indicator relates to the substrate piezometer and not the shallow sandstone (10 m) piezometer. Since February 2020, the substrate piezometer has generally remained saturated, excluding short-term groundwater declines during low rainfall periods. The substrate piezometer displayed correlation with rainfall throughout the reporting period, with water levels initially decreasing to above or at the sensor level, followed by some recovery in response to weather conditions. The seven-day moving average for Swamp 50 was at or above the minimum the minimum established for the swamp's full length of record, during the reporting period.

Swamps Monitoring for Longwalls 305-307

Paired piezometers (i.e. one swamp substrate piezometer and one sandstone piezometer) have been monitored in Swamps 71a and 72, relating to Longwalls 305-307 (Figure 9). Mining of Longwall 305 commenced on 12 April 2020 and ceased on 21 November 2020. Mining of Longwalls 306 commenced extraction on 15 June 2022 and was completed in March 2022. Mining of Longwall 307 commenced on 22 April 2022 and was completed on 21 November 2022.

Semi-quantitative comparisons of the swamp substrate water levels of Swamps 71a and 72 with control swamps and rainfall records during the reporting period do not show a definitive mining effect and the dry conditions are regarded as a natural response to reduced rainfall (Appendices C1 and C2).

Swamps Monitoring for Longwalls 308-310

Paired piezometers (i.e. one swamp substrate piezometer and one sandstone piezometer) have been monitored in Swamps 62, 64 and 92-2 and individual swamp substrate piezometers (i.e. one piezometer to a depth of approximately 1 m) have been monitored in Swamps 82, 92-1 and 92-3, relating to Longwalls 308-310 (Figure 9). Mining of Longwall 308 commenced on 12 December 2022 and ceased on 7 July 2023. Mining of Longwall 309 commenced on 28 July 2023 and ceased on 26 February 2024. Mining of Longwall 310 commenced on 22 March 2024 and ceased on 2 October 2024.

Data analysis for the reporting period indicates the seven-day moving average for all swamps was at or above the minimum established for the swamp's length of record (Appendices C1 and C2).

The key potential subsidence impacts and environmental consequences on perched groundwater systems described in the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans and Biodiversity Management Plans, included:

- Any cracking of the bedrock within upland swamps is expected to be isolated and of a minor nature, due to the relatively low magnitudes of the predicted strains and the relatively high depths of cover.
- Surface cracking resulting from mine subsidence within the upland swamps is not expected to result in an increase in the vertical movement of water from the perched water table into the regional aquifer as the sandstone bedrock is massive in structure and permeability decreases with depth.
- It is expected that any surface cracking that may occur would be superficial in nature (i.e. would be relatively shallow) and would terminate within the unsaturated part of the low permeability sandstone. Any changes in swamp water levels as a result of cracking are expected to be immeasurable when compared to the scale of seasonal and even individual rainfall event based changes in swamp groundwater levels.
- Whilst swamp grades vary naturally, the predicted maximum mining-induced tilts are generally orders of magnitude lower than the existing natural grades within the swamps. The predicted tilts would not have any significant effect on the localised or overall gradient of the swamps or the flow of water. Any minor mining-induced tilting of the scale and nature predicted is not expected to significantly increase lateral surface water movements which are small in relation to the other components in the swamp water balance.

No change to the fundamental surface hydrological processes and upland swamp vegetation were expected within upland swamps associated with Longwalls 301-310.

In relation to impacts of the Project on upland swamps, the NSW Planning Assessment Commission (2009) concluded that the mining parameters were such that:

- for most swamps in the Project Area, there was low risk of negative environmental consequences; and
- that there was a very low risk that a significant number of swamps would suffer such consequences.

While the water lost from Swamp 20 and Swamp 28 was retained in the unsaturated sandstone above the regional water table, the changes in swamp water levels as a result of cracking are measurable when compared to seasonal individual rainfall event based changes in swamp groundwater levels. There is currently no sign that the vegetation in Swamp 20 is being impacted by the changed hydrological conditions, however, the vegetation monitoring results suggest that the changes in vegetation occurring in Swamp 28 were significantly different to changes in the control swamps from autumn 2017 to spring 2019 (Appendices I3 and I4).

Swamps Monitoring for Longwalls 311-316

Individual swamp substrate piezometers (i.e. one piezometer to a depth of approximately 1 m) have been monitored in Swamps 81 and 89 relating to Longwalls 311-316. Mining of Longwall 311 commenced on 21 October 2024 and is expected to be completed in May 2025.

The visual comparison against control swamps shows that Swamp 89 remains unaffected by mining. The substrate in Swamp 89 showed a similar water level trend to the control swamps in response to rainfall events. However, Swamp 89 has experienced a narrower range of groundwater level changes and is dry less frequently compared to the control swamps.

Large Swamps

Individual swamp substrate piezometers (i.e. one piezometer to a depth of approximately 1 m) have been monitored in the upstream and downstream section and a paired piezometer (i.e. one swamp substrate piezometer and one sandstone piezometer) in the mid-section of Swamps 76, 77 and 92 since November 2020. Sandstone piezometers were installed in the in the upstream and downstream sections of Swamps 76 and 77 (where the substrate piezometers are located) in August 2024.

Sandstone piezometers are planned to be installed in two locations where swamp substrate piezometers are located in Swamp 92 as soon as possible, subject to suitable weather and access.
The visual comparison for the Large Swamps with their respective control swamps shows that all the Large Swamps remain unaffected by mining. All Large Swamps displayed similar water level trend to the control swamps, in response to the rainfall events. However, Swamps 92-1, and 92-3 have seen a narrower range of groundwater level change and are dry less frequently compared to the control swamps. Swamps 76-2, 76-3, and 77-3 dried for longer period compared to the control swamps (Appendix C2).

All Large Swamps, excluding Swamp 77-3, equate to a Level 1 significance level, as their minimums were above over the reporting period are above the baseline minimum (Appendix C2).

Swamp 77-3 was classified as a Level 2 significance level, as the seven-day average minimum level over the reporting period was below the baseline minimum towards the end of the reporting period. The semi-quantitative analysis showed that Swamp 77-3 shows a higher degree of variability and saturation than the control swamps. The results showed that the baseline and impact recession-recovery curves show the same pattern, which indicates that there is no change in the swamp dynamics (Appendix C2).

6.2.7 Shallow Groundwater Levels

Shallow Groundwater Level Sites near Streams

Continuous water level monitoring of shallow groundwater levels has been conducted at sites WRGW1, WRGW2 and WRGW7 along Waratah Rivulet and sites ETGW1[6] and ETGW2 on the Eastern Tributary (Figure 10).

At the time of passage of the Longwall 21 mining face past the piezometer sites WRGW1 and WRGW2 on the Waratah Rivulet (March 2012), the measured groundwater levels dropped by approximately 1 m (Chart 67). As wet conditions prevailed at the time, this was not a climatic effect. Since March 2012, groundwater levels recorded at sites WRGW1 and WRGW2 have fluctuated in response to seasonal rainfall variations with a seasonal (dry) minimum that is approximately 0.75 m below previous levels (Chart 67 and Appendices C1 and C2). From January to June 2018 the rainfall residual mass continued to decline and water levels at WRGW1 and WRGW2 spiked following rainfall in March 2018. From July 2018, the water level trend followed the rainfall residual mass trend, declining from July to September 2018 and increasing from October to December 2018. During January to June 2019, the water level correlated with the daily rainfall including a large spike following the March rainfall event, and generally correlated with the residual mass curve except for January and February, when following rainfall in December 2018 the water level increased while the monthly rainfall was below average. The water levels have not returned to pre-March 2012 levels.

The groundwater level trends at both sites continued to be concordant with rainfall throughout the 2024 reporting period with rapid response to rainfall events and sharp spikes associated with runoff events, indicating interaction with the Waratah Rivulet. WRGW2 has been observed a more rapid drawdown than WRGW1 around May 2023. Since that time, the difference between the groundwater levels at these locations has remained larger than historically, however this is a small change.

[6] Site ETGW1 was unable to be sampled since August 2017.

Shallow groundwater levels at site WRGW7 remained correlated with rainfall trends and unaffected by mining during the reporting period (Chart 68, and Appendices C1 and C2).

At the Eastern Tributary sites ETGW1 and ETGW2, shallow groundwater levels have previously followed the rainfall trends closely (Chart 69) and have continued to show a close correlation during the reporting period. The variations at these sites are unrelated to mining (Appendices C1 and C2). Although Woronora Reservoir water levels also respond to rainfall with a similar pattern, a groundwater hydraulic gradient is maintained towards the reservoir because the groundwater levels were 2 to 3 m higher than the dynamic reservoir levels, which were observed to be approximately 169 metres with respect to the Australian Height Datum (mAHD) during the reporting period (Appendices C1 and C2).

Shallow Groundwater Transect

Continuous groundwater level monitoring has also been conducted at an approximately east-west transect of bores (sites T1, T2, T3, T4, T5 and T6) located above Longwalls 305-307 (T1-T5) and to the west on the other side of Woronora reservoir (T6) located above the chain pillar between Longwalls 309 and 310. The water levels of the six bores, the Woronora Reservoir Level (WRL) and the monthly rainfall are shown in Chart 70.

Bore T1, the closest of the five bores to Woronora Reservoir, has almost identical water levels to those measured in the reservoir, until an old weir across the rivulet is exposed at low water levels. In that case, T1 water levels are maintained a little below the water level in the weir pool, but above the WRL (Appendices C1 and C2).

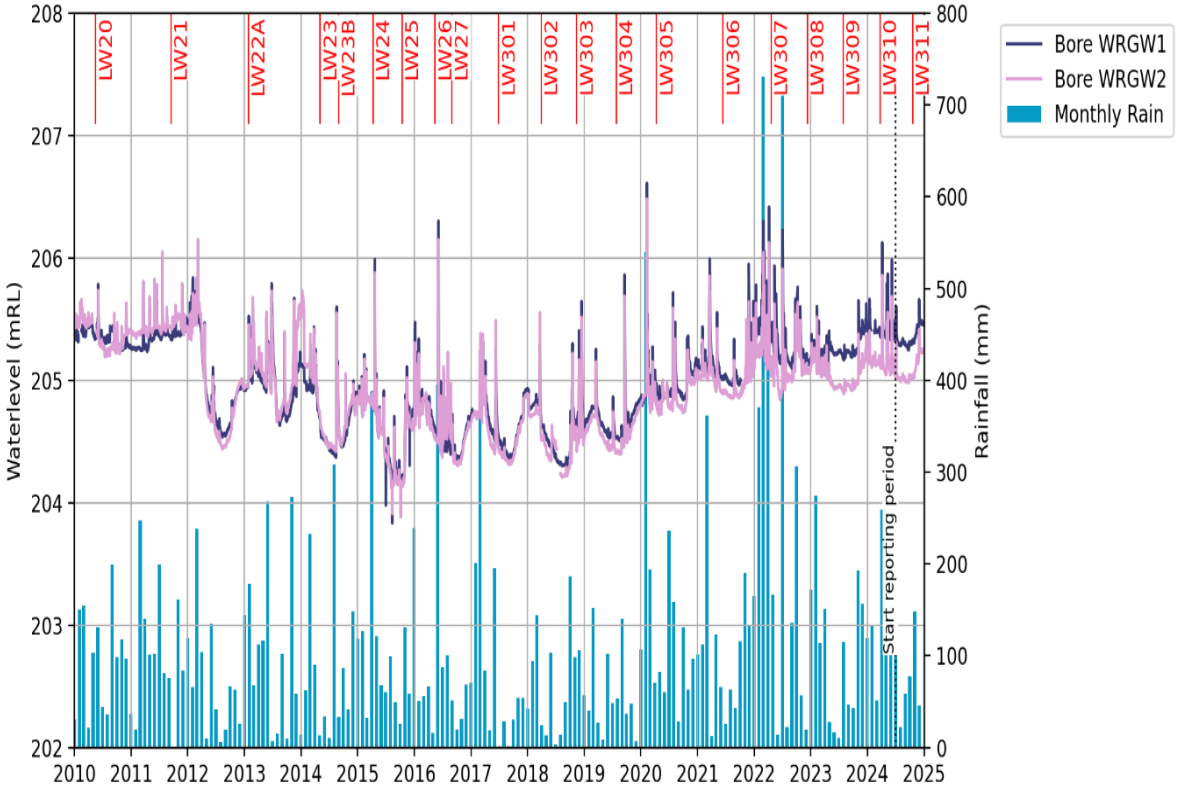


Chart 67 Shallow Groundwater Hydrographs on Waratah Rivulet at WRGW1 and WRGW2

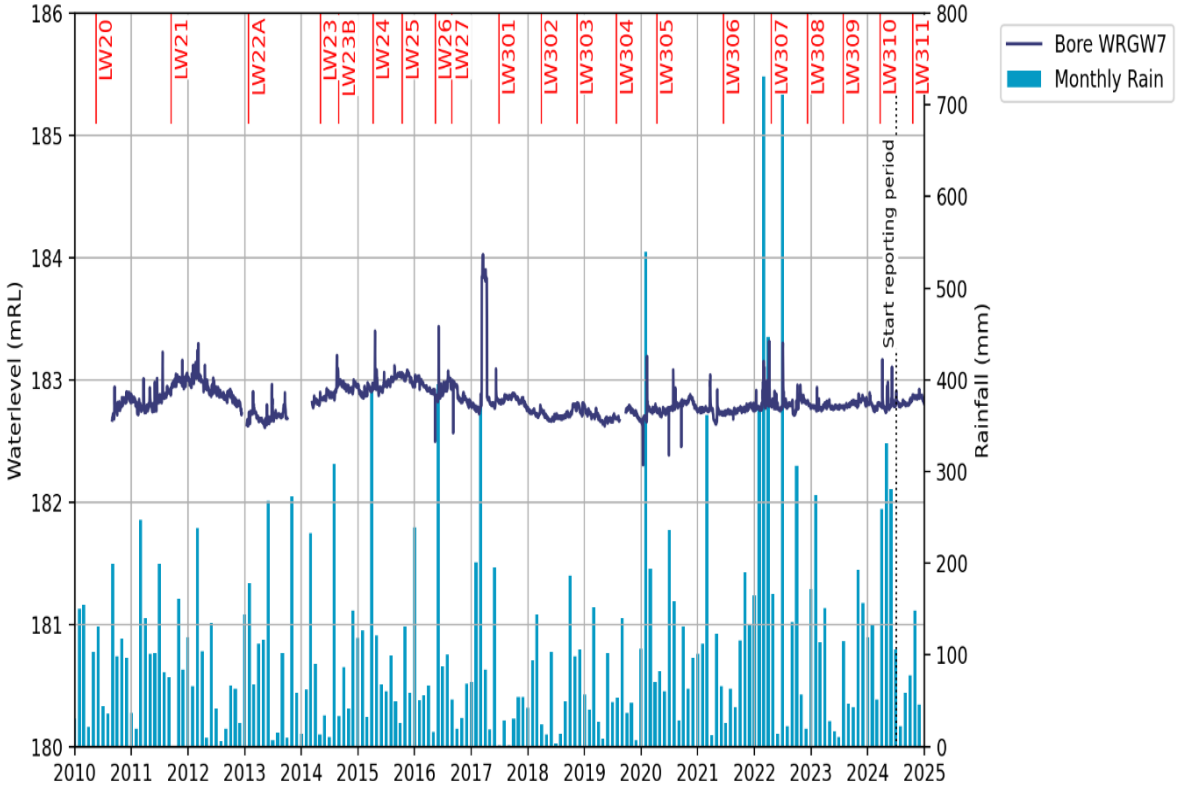


Chart 68 Shallow Groundwater Hydrograph on Waratah Rivulet at WRGW7

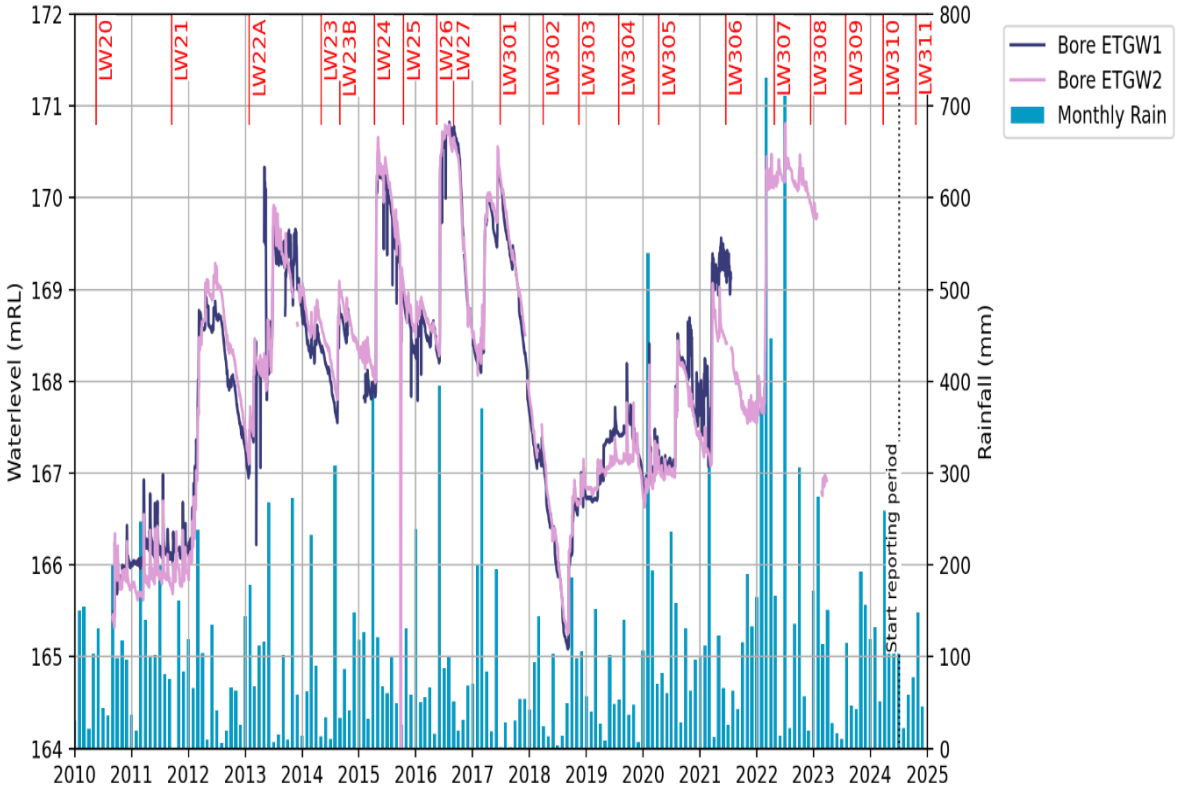


Chart 69 Shallow Groundwater Hydrographs on Eastern Tributary at ETGW1 and ETGW2

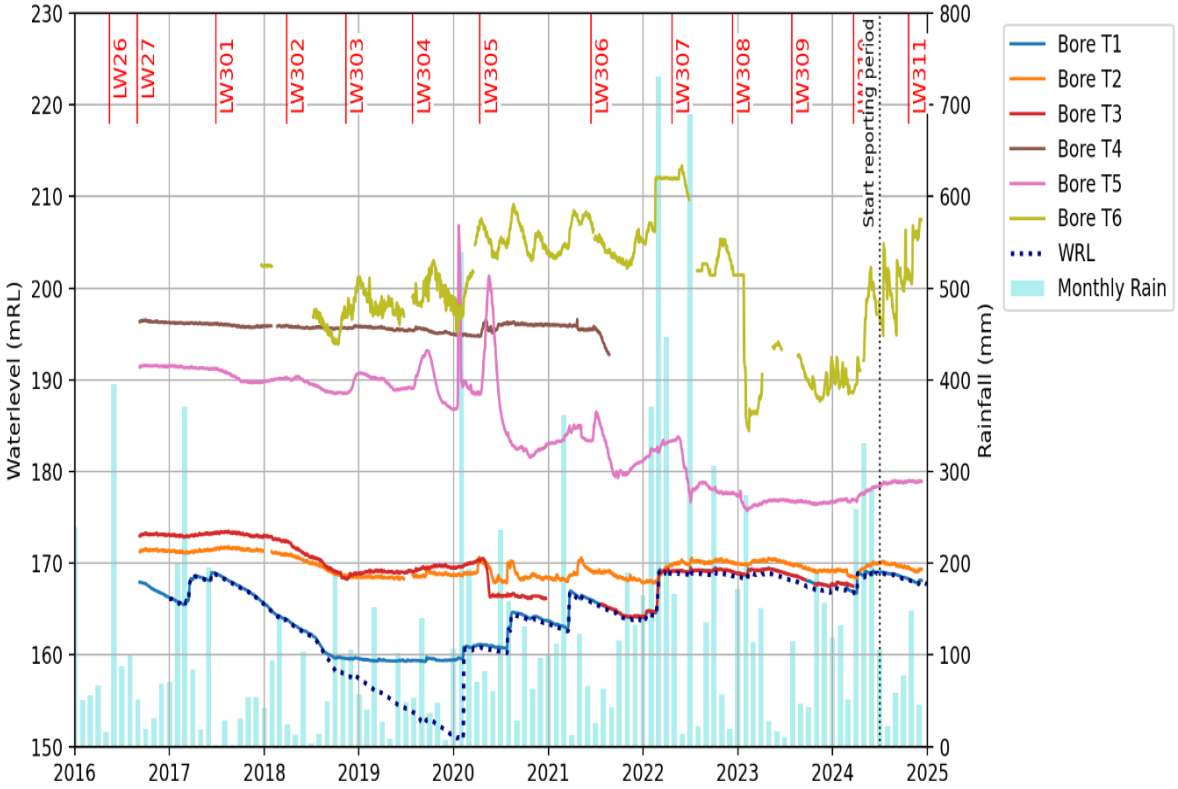


Chart 70 Groundwater Level in Bores T1 to T6

Bore T2 has shown fairly stable water levels, with limited response to the rainfall events over 2022. The water levels showed a slight continual increase in early 2022, before stabilising at approximately 170 mAHD over late 2022 and into this reporting period. The hydraulic gradient was maintained from T2 towards T1 and the reservoir for most of 2024, except in early April 2024, when the WRL rose quickly in response to a large rainfall event, but T2 groundwater displayed a lagged response to this rainfall event. (Appendices C1 and C2).

Bore T3 has been dry since May 2020 until it ceased recording in December 2020. The bore has been replaced by a redrilled bore T3-R in May 2021, approximately 10 m to the north of the original T3 location. The redrilled bore is around 20 m deeper than the original bore. The current observations show a reflection of the reservoir (and T1) water levels. From 24 March 2024 onwards, water level data was lost in T3R. Site personnel subsequently investigated this data loss, but no data could not be recovered (Appendices C1 and C2).

Bore T4 stopped working in August 2021 after a sharp decline in water levels after the passage of Longwall 306. Prior to this, bore T4 was anomalous, as its head was higher than the head at upgradient site T5. This is unlikely to be a groundwater divide as it is not related to the topographic ridge well upgradient. The sharp decline in groundwater levels in July 2021 occurred after the passage of Longwall 306. Given that the bore is located in the footprint of Longwall 306, this decline is interpreted as a mining effect. As T4 has never provided meaningful information, there is no need to reinstate this bore (Appendices C1 and C2).

In the first half of 2020, the water levels at T5 showed a high variability. The water level increased by 15 m in early January 2020 and decreased in late January 2020. This spike in water level was unrelated to the large rainfall event in February 2020. Since April 2020 (after Longwall 305 started), the water levels increased again, this time over a longer period and have again decreased. The second spike is reflected in the observations for T4, which shows a lower rise and fall at the same time. The broad rises in T5 water levels in 2019 and 2020 are compressive effects associated with the passage of Longwalls 304 and 305, respectively. After the passage of Longwall 306, the water levels at T5 showed another decrease to 180 mAHD, before stabilising at that level in the last quarter of 2021. In early 2022, water levels increased in the first half before decreasing from May 2022 onwards, after the passage of Longwall 307. This is indicative of a mining effect associated with shallow tensile cracking above the eastern edge of the longwall panel. Although there appears to be a permanent lowering of the water table at this site due to mining, a positive hydraulic gradient towards the reservoir is maintained and the water levels in T5 have been stable since 2023, continuing on into 2024 with a slight upward trend. During late 2024, water levels in T5 maintained around 178.8 mAHD (Appendices C1 and C2).

Bore T6 lies on the western side of Woronora Reservoir at a higher elevation than the eastern transect. Unlike the eastern bores T1 to T5, it responds readily to rainfall recharge and its dynamics closely correlate with the rainfall trends. Since January 2023, the water level rapidly decreased, independent of the high rainfall during this time period. The decrease correlates to the passing of Longwall 308, which lies 200 m east of Bore T6. In July 2023, data was not recorded in Bore T6, after which a decrease in groundwater level was observed. No decrease was seen upon passing of LW309 or LW310. Although there appears to be a lowering of the water table at this site due to mining at LW308, a positive hydraulic gradient towards the reservoir is maintained. During the second half of the reporting period the bore water levels have increased by 10 m and are recovered to similar levels compared to observations in 2018-2020. (Appendices C1 and C2).

The hydraulic gradient at transect bores T2, T3 and T5 has been assessed against the performance indicators below in accordance with the Longwalls 308-310 Water Management Plan:

> *The hydraulic gradient from transect bore T5 to bore T3 is reduced by no more than 10% from that measured on 30 June 2017.*

The performance indicator is designed to provide an early warning for the assessment of negligible leakage from the Woronora Reservoir. Leakage from the Woronora Reservoir to the surrounding groundwater environment would occur if there were a reversal of hydraulic gradient (i.e. when the water table in surrounding piezometers is below the water level in the Woronora Reservoir).

The hydraulic gradient from transect bore T5 to transect bore T3 over the reporting period is presented on Chart 71. The T3 logger stopped working during the previous reporting period and was replaced by a logger in bore T3-R in May 2021, with reliable data being made available from 28 June 2021. Since the installation of T3-R in May 2021, the performance indicator is at Level 3. T5 has shown large changes in water level, occasioned by proximity to Longwalls 304, 305, 306, and 307 as mining passed nearby. The gradient remains positive (i.e. higher water level in T5 than T3-R), which indicates flow towards the reservoir. Although an exceedance has occurred for the gradient between bore T3-R and the reservoir, there has not been a reversal of gradient to the Woronora Reservoir that would induce leakage from the reservoir (the performance measure) because the intervening bore T2 still shows a hydraulic gradient towards the reservoir. This suggests the depressurisation at bore T3 is localised. From 24 March 2024 onwards, water level data was lost in T3R. Investigation into this data loss was subsequently carried out but no data could not be recovered. Note, at the time of data loss, the hydraulic gradient between T5 and T3R was increasing, with a steady increase seen since early 2023.

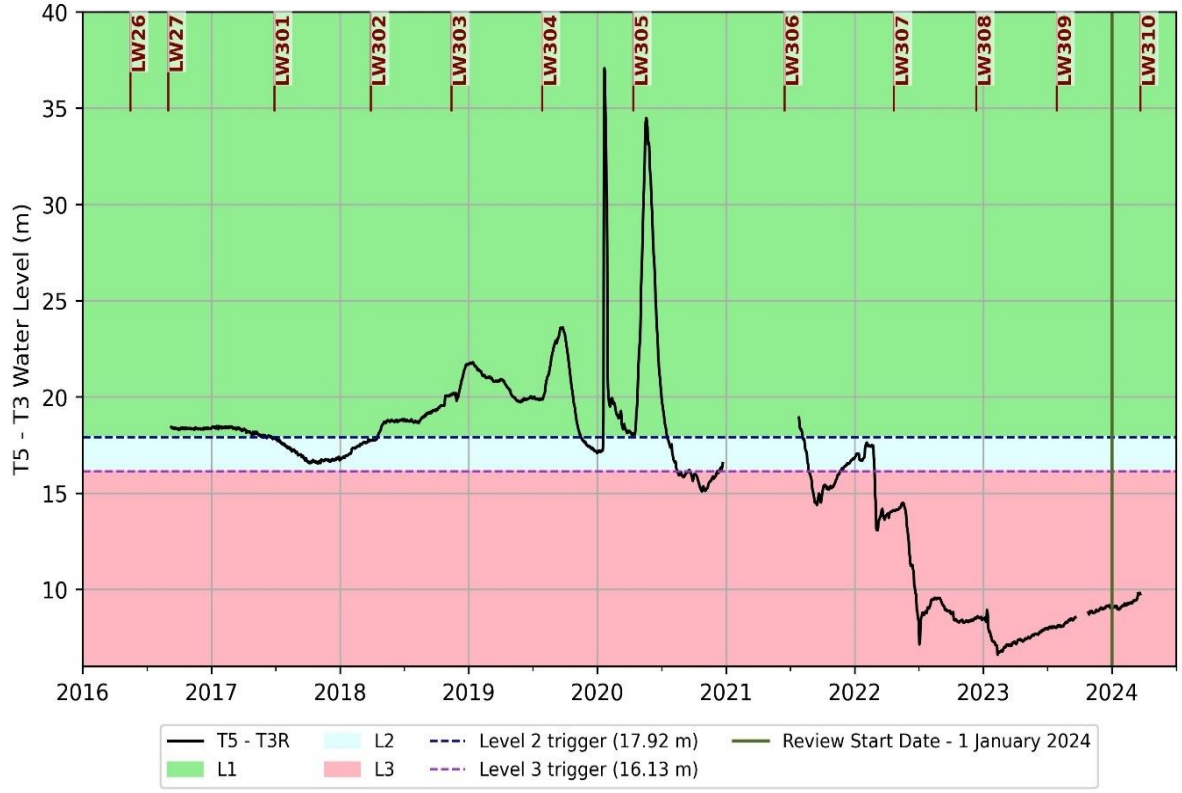


Chart 71 Hydraulic Gradient Measured from Bore T5 to T3

The exceedance of the Level 3 Trigger Level in the performance indicators for bore T5-T3-R has been assessed by SLR (2024), and is provided as Appendix G.

The findings of SLR (2024) are summarised below:

- Leakage from the Woronora Reservoir to the surrounding groundwater environment would occur if there was a reversal of hydraulic gradient (i.e. if the water table in surrounding piezometers falls below the water level in the Woronora Reservoir).
- Bores T2 and T5 maintain a hydraulic gradient to the reservoir, whereas bore T3-R has a water level almost coinciding with reservoir level. However, this does not imply an overall absence of hydraulic gradient, as the intervening bore T2 defines the effective hydraulic gradient close to the reservoir. Both bores T3-R and T5 show localised depressurisation of the groundwater, in the case of T5 definitely due to mining beneath the bore, and in the case of bore T3-R probably due to mining directly beneath the bore.
- The performance measure relating to bores T2, T3 and T5, *Negligible leakage from the Woronora Reservoir*, has not been exceeded.

The Longwalls 311-316 Water Management Plan does not include a trigger criteria for bore T3 and instead focuses on bore T2 due to the greater reliability of data from this bore. As T3-R has stopped working in this reporting period, T2 is also compared to understand if the Longwalls 311-316 Water Management Plan trigger criteria has been exceeded. The performance indicators are as follows:

The hydraulic gradient from transect bore T5 to bore T2 does not reduce outside the range seen during the baseline period (baseline period between 21 December 2022 to 29 February 2024).

The hydraulic gradient from transect bore T2 to the Woronora Reservoir remains positive (towards the Reservoir).

The key potential subsidence impacts and environmental consequences on shallow groundwater systems and inflows to the Woronora Reservoir described in the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans included:

- Permanent mining-induced changes in the groundwater levels of shallow aquifers in connection with streams and ecosystems at Metropolitan Coal would not occur to any significant degree (i.e. the direction of shallow groundwater system flow [i.e. in the Hawkesbury Sandstone] has not been altered by mining).
- As there is an alternation of thick sandstone/claystone lithologies, there is a constrained zone in the overburden that remains rigid and acts as a bridge which isolates shallow and deep aquifers. At the substantial depths of cover of the Project, there would not be connective cracking from the mined seam to the surface.
- The depressurisation effects described below for the deep groundwater system would not propagate to the Hawkesbury Sandstone where the shallow groundwater system is located. As a result, no measurable impacts on registered bores in the wider Project Area and surrounds would be expected.

Based on the analysis of the conceptual groundwater system, there would be negligible loss of groundwater yield to the Woronora Reservoir. This is reinforced by the groundwater modelling which indicates negligible reduction in cumulative average inflows to the Woronora Reservoir. In relation to the potential loss of catchment yield, the NSW Planning Assessment Commission (2009) was of the view that the risk of any significant loss is very low unless a major geological discontinuity is encountered during mining that provides a direct hydraulic connection between the surface and the mine workings.

The groundwater monitoring results are consistent with the potential subsidence impacts and environmental consequences described in the Project EA, Preferred Project Report, and the Metropolitan Coal Water Management Plans.

6.2.8 Deep Groundwater Levels

Immediately above a mined coal seam, rocks collapse into the void created by the removal of coal to form a caved zone and a fractured zone develops above the caved zone. This causes aquifer properties to change (e.g. permeability and porosity) and results in a higher vertical permeability as a result of mining.

A three-dimensional numerical model of groundwater flow was developed in 2008 for the Project EA. The groundwater model was recalibrated in December 2012 for the Preferred Project Layout by revising the hydraulic conductivities in the Hawkesbury Sandstone and the Bald Hill Claystone. At this time, two extra layers were added to the Hawkesbury Sandstone section to improve resolution of the vertical hydraulic gradient in the shallow groundwater system. The model simulations are based on initial conditions at the end of Longwall 14, consistent with the Project EA assessment (Heritage Computing, 2008).

Transient calibration was undertaken to incorporate Metropolitan Coal updates to the geological model. The revised model includes an update of the topographical surface and geological interfaces, the addition of two model layers below the Bulli Seam and updated estimates of the fractured zone height. A report for the updated model has been prepared (HydroSimulations, 2018a) and this model has been used for the assessment of Longwall 304 and Longwalls 305-307.

In 2020, and consistent with the recommendations of the Woronora Reservoir Impact Strategy (WRIS) Panel Stage 2 Report (Hebblewhite *et al*., 2019), the groundwater model was updated to include the incorporation of ‘stacked drains’ to represent the fractured zone instead of using enhanced hydraulic conductivity and storage properties. A calibration report for the updated model was prepared by SLR (2020), which was used for the assessment of Longwalls 308-310.

In December 2020, Metropolitan Coal commissioned Dr Justin Bell (JBS&G) to undertake a peer review of the calibration report for the updated model (SLR Consulting, 2020). Although the peer review was focussed around the incorporation of stacked drains, Dr Bell reviewed the complete groundwater model as described in the calibration report. Dr Bell concluded that "*the current approach to the groundwater model is 'fit-for-purpose', as per the definition of the NSW Aquifer Interference Policy"*.

6.2.8.1 Time Series Head Variations and Vertical Head Differences

Continuous deep groundwater level monitoring is conducted at bores 9HGW0 (Longwall 10 Goaf Hole), 9EGW1B, 9FGW1A, 9GGW1-3, 9GGW1-80, 9GGW2B, 9HGW1B, PM02, PM01, 9EGW2A, 9EGW2-4, S1997, PM03, PHGW1B, PHGW2A, LW305-Goaf, F6GW3A, F6GW4A, F6GW4D, TBS02 and TBS03 (Figure 10) in accordance with the Longwalls 308-310 and Longwalls 311-316 Water Management Plans. The time-series head variations and vertical head differences for these bores have been examined (Appendices C1 and C2).

The time-series head variations and vertical head differences for these bores have been examined, with the following outcomes:

- sites close to current mining show significant depressurisation with depth, consistent with the Project EA (HCPL, 2008); and
- sites close to old workings at Helensburgh show substantial depressurisation with depth, consistent with the Project EA.

Of those monitoring sites mentioned above, the following bores are located within 600 m from Longwalls 311-316 secondary extraction: bores 9EGW2A and 9EGW2-4. Located outside of that area, but still in proximity are bores PHGW1B (east), LW305-Goaf (east), PHGW2A (east), and F6GW4A (east) (Figure 10 and Appendices C1 and C2).

Bore F6GW4A

Bore F6GW4A overlies the chain pillars between Longwalls 303 and 304. The time-series record for bore F6GW4A is shown on Chart 72. This bore is two panel widths from Longwall 301 and one panel width from Longwall 302. The respective mining faces came closest to the bore in late-September 2017 and late-May 2018, at which times distinct features are evident on all hydrographs. The passage of Longwall 301 caused mild responses, generally short-term increases in head, while the passage of Longwall 302 caused sharp cusp-like features on the Hawkesbury Sandstone hydrographs, sustained rises in the upper and mid Bulgo Sandstone, and strong declines in the three deepest piezometers. In January 2019, F6GW4A was undermined by Longwall 303 causing the depressurisation and disabling of the six lower sensors (i.e. 139 metres below ground level [mbgl], 201 mbgl, 278 mbgl, 362 mbgl, 440 mbgl and 512 mbgl). The upper and mid Hawkesbury Sandstone piezometers (50 mbgl and 90 mbgl) also displayed a lowering of groundwater head following the passage of Longwall 303, however, they showed no significant decline after the passage of Longwall 304, 305, 306, 307, 308 or 309. Both piezometers show stable, slightly increasing, water levels over this reporting period after being reactivated.

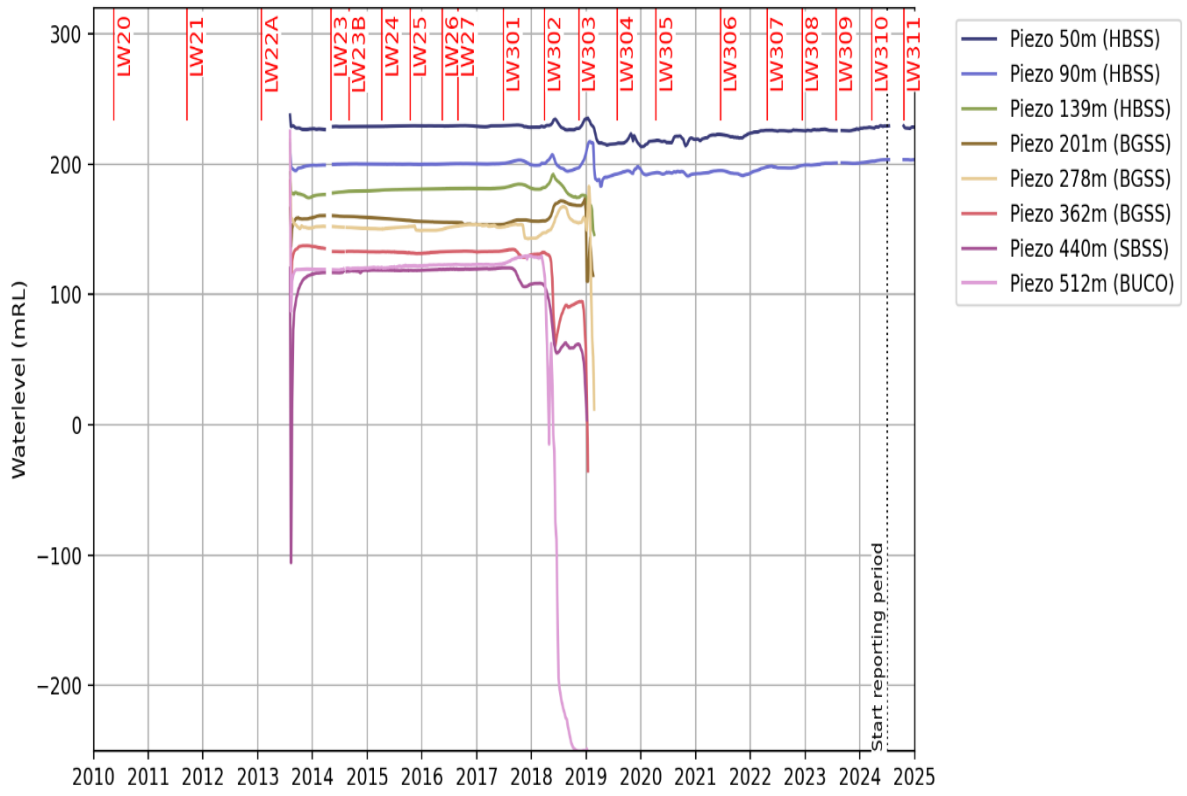


Chart 72 Time Variations in Potentiometric Heads at F6GW4A

Bore PHGW2A

Chart 73 shows the groundwater levels at site PHGW2A, located about 400 m north-east of the commencement of Longwall 309. A connection failure prevented upload of data for sensors in PHGW2A in 2016. Sensors have now been reinstated. All vibrating wire piezometers (VWPs), except for the shallowest 60 mbgl piezometer, had a compressive response to the commencement of Longwall 305, about 400 m away. In June 2021, the three deepest piezometers (piezometers at 411 mbgl, 437 mbgl and 470 mbgl) showed a depressurisation, likely linked to the start of mining of Longwall 306. After this rapid depressurisation, the water levels showed a recovery. Most piezometers showed an increase in levels from June 2021, with the top two piezometers showing rises and declines in response to individual rainfall events. The deepest piezometer (470 mbgl) experienced a rapid depressurisation in early May 2022 of approximately 40 m; this occurred after the start of Longwall 307, which was 288 m from PHGW2A at this time.

By early September 2022, three piezometers (piezometers at 389 mbgl, 411 mbgl, and 437 mbgl) experienced depressurisation after a period of non-recording, coinciding with the start of Longwall 307. In the last reporting period, only four of the 10 piezometers (piezometers at 60 mbgl, 97.5 mbgl, 135 mbgl, 181.5 mbgl) were recording during this reporting period, all four show a decrease in groundwater pressure, before increasing in mid-2023. Additionally, lost monitoring data from early 2023 for piezometers 389 mbgl, 411 mbgl, and 437 mbgl were recovered and updated. In this reporting period, most piezometers (piezometers at 60 mbgl, 98 mbgl, 135 mbgl, 201 mbgl, 182 mbgl, 389 mbgl, and 437 mbgl) showed stable readings, with a brief interruption in data recording in August 2023. This is seemingly independent of the climate. During this reporting period, the water level in all piezometers were generally stable, except water level in piezometer 411 mbgl showed a decrease followed by a gradual recovery. Piezometer 389 mbgl were disconnected since June 2024.

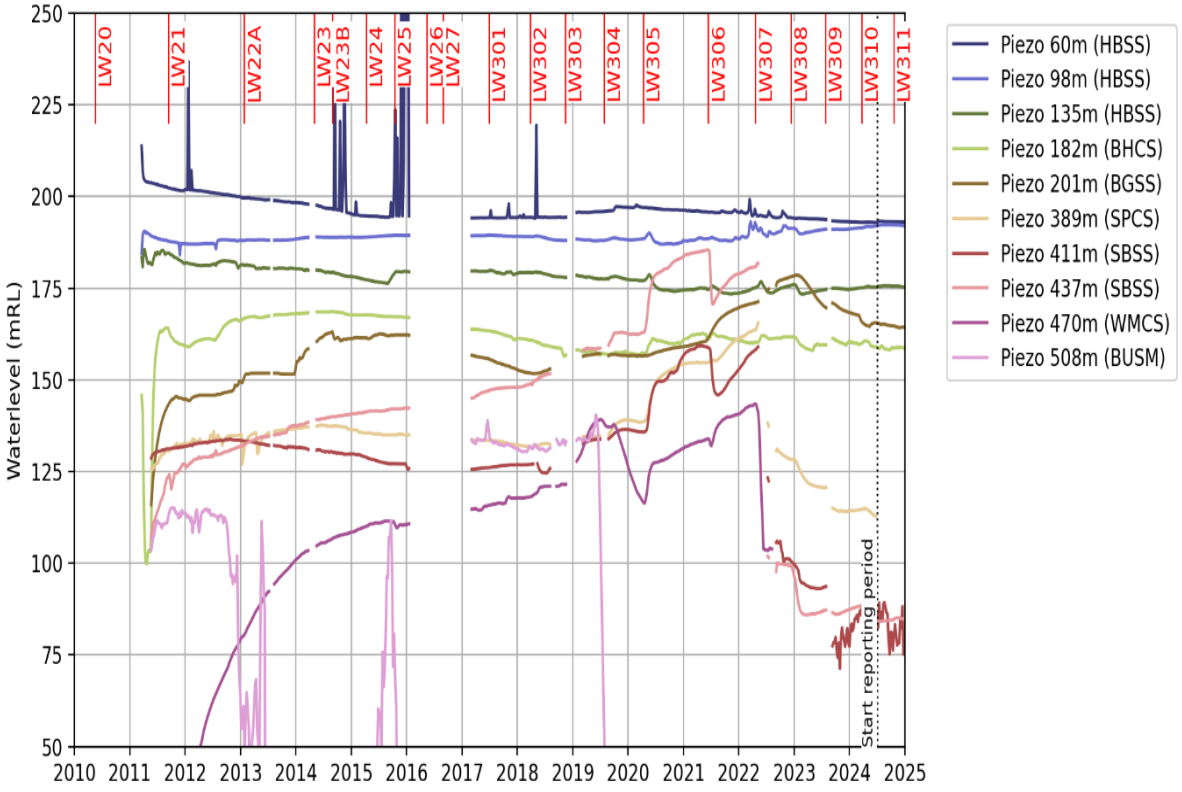


Chart 73 Time Variations in Potentiometric Heads at PHGW2A

Bores 9EGW2A and 9EG2A-4

Chart 74 shows the potentiometric heads for bores 9EGW2A and 9EG2A-4 which are about 100 m west of Longwall 308. Piezometers 484 mbgl, 517 mbgl, and 557 mbgl showed a significant decline in late 2021 and a rapid increase at the end of 2022. This decrease can be attributed to in-seam gas drainage holes, which arrived at this location. Geophysics showed an unusually high pore space in the respective claystone formations above the Bulli Seam, which is thought to be the reason for those declines. Piezometers at 484 mbgl and 517 mbgl have shown an oscillation response with rapid recovery towards the end of 2022. Spikes in water level were observed in piezometers 60 mbgl and 235 mbgl before becoming stable in late 2022, this is likely due to the loggers malfunctioning. In October 2023, piezometers 60 mbgl, 155 mbgl, and 235 mbgl have shown a sustained rise, before stabilising through the first half of 2024, whilst strong declines in the deeper piezometers 407 mbgl, 433 mbgl, 454 mbgl, and 517 mbgl. In early 2024, water levels in most piezometers remained stable, with no response to the passage of Longwall 310. Meanwhile, water levels in piezometer 433 mgbl slightly increased.

During this reporting period, both 9EGW2A and 9EGW2-4 were turned off to allow the passage of longwall through area. The upper piezometers were reconnected after Longwall 310 was 200 m south of the monitoring site, while the lower three piezometers are permanently disconnected and wires removed. After connection, the water level in piezometer 60 mbgl were stable and piezometers 155 mbgl and 235 mbgl showed a rapid decrease in water level, while piezometers 108 mbgl and 212 mbgl showed a slow increase.

After the reconnection of the upper piezometers, bore 9EGW2A was at a Level 3 significance level. However, water level increased during the end of reporting period and the performance indicator recovered to Level 2 significance level (Chart 75).

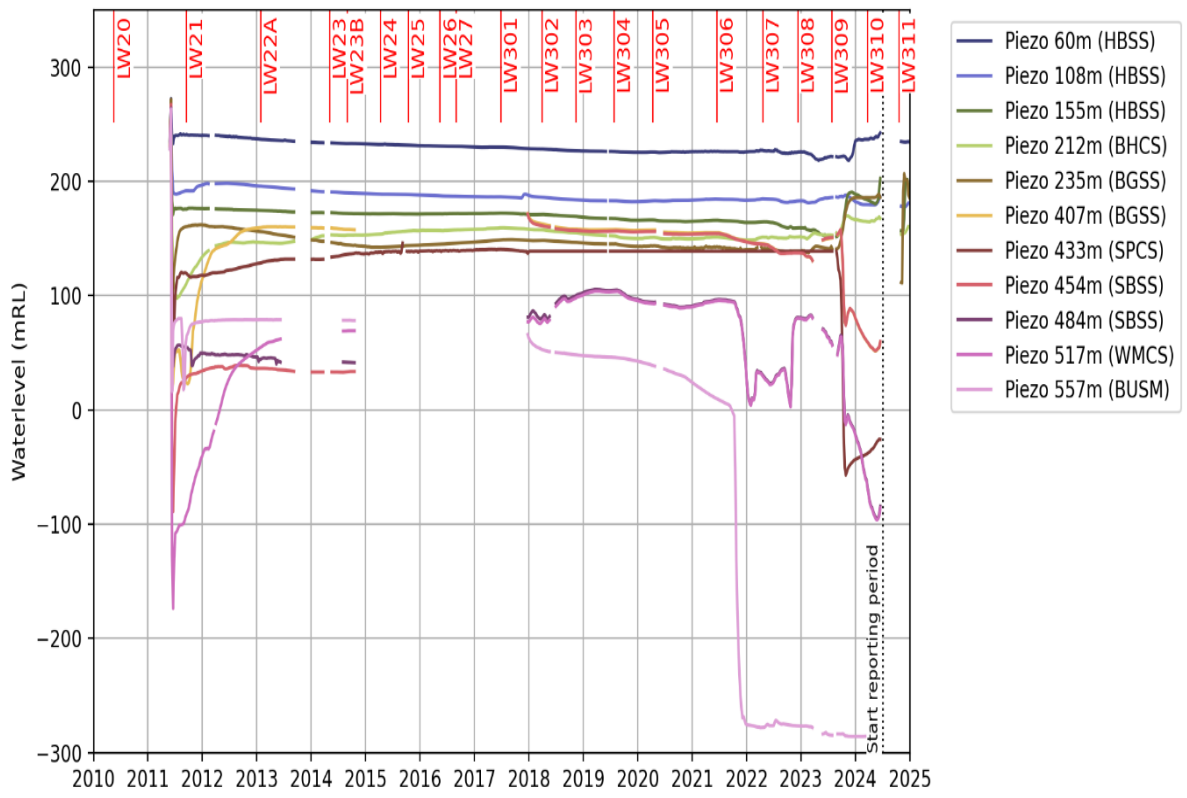


Chart 74 Time Variations in Potentiometric Heads at 9EGW2A and 9EGW2-4

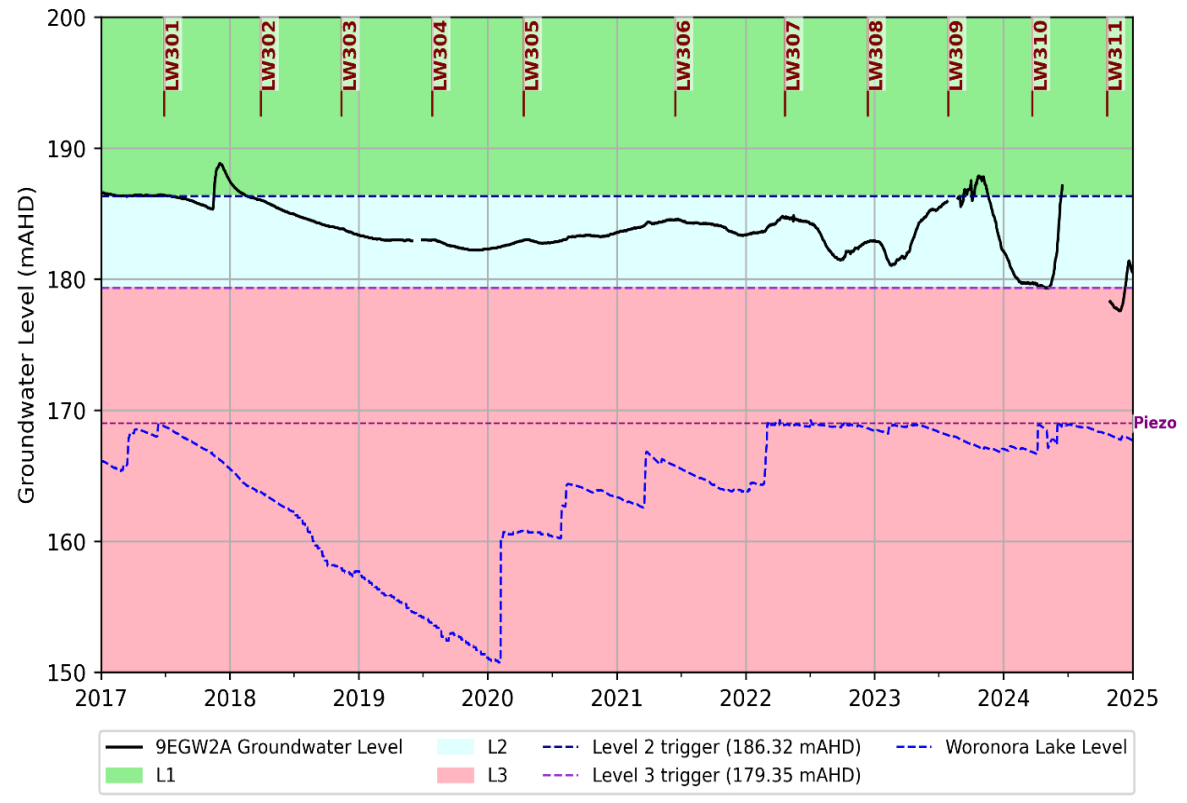


Chart 75 Groundwater Levels at 9EGW2A

Bore PHGW1B

Chart 76 shows the water levels at bore PHGW1B. The piezometers are located approximately 700 m north of Longwall 308. A connection failure prevented the upload of data for sensors in PHGW1B in 2016. During the reporting period, all piezometers showed steady water pressures and no response to mining at Longwall 310 to 311.

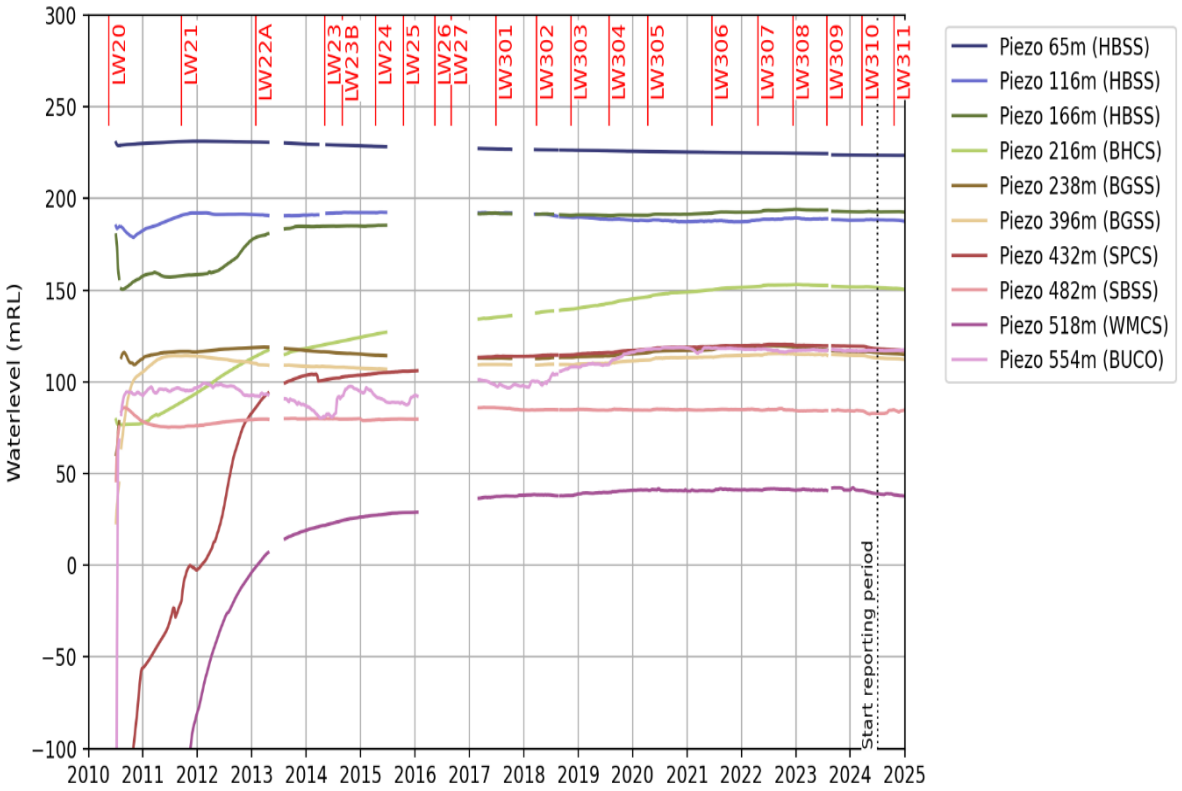


Chart 76 Time Variations in Potentiometric Heads at PHGW1B

Bore LW305-Goaf Hole

Chart 77 shows the water levels at bore LW305-Goaf Hole. Bore LW305-Goaf Hole was installed in 2022 for post-extraction monitoring of narrow longwall extraction geometry being used undeath the reservoir as required in the Longwalls 305-307 Extraction Plan. The three shallowest piezometers in the Hawkesbury Sandstone have showed stable water levels since monitoring began. The upper Bulgo Sandstone sensor showed a decrease in 2022, followed by a consistent increase into 2024. In early 2024, the groundwater levels in all sensors remained relatively stable excluding piezometer 250 mbgl that showed a gradual increase in water level. Sensor data in the four shallowest piezometers at has been unavailable since late May 2024. During this reporting period, piezometer 250 mbgl showed a gradual decrease, while piezometer 331 mbgl remained stable.

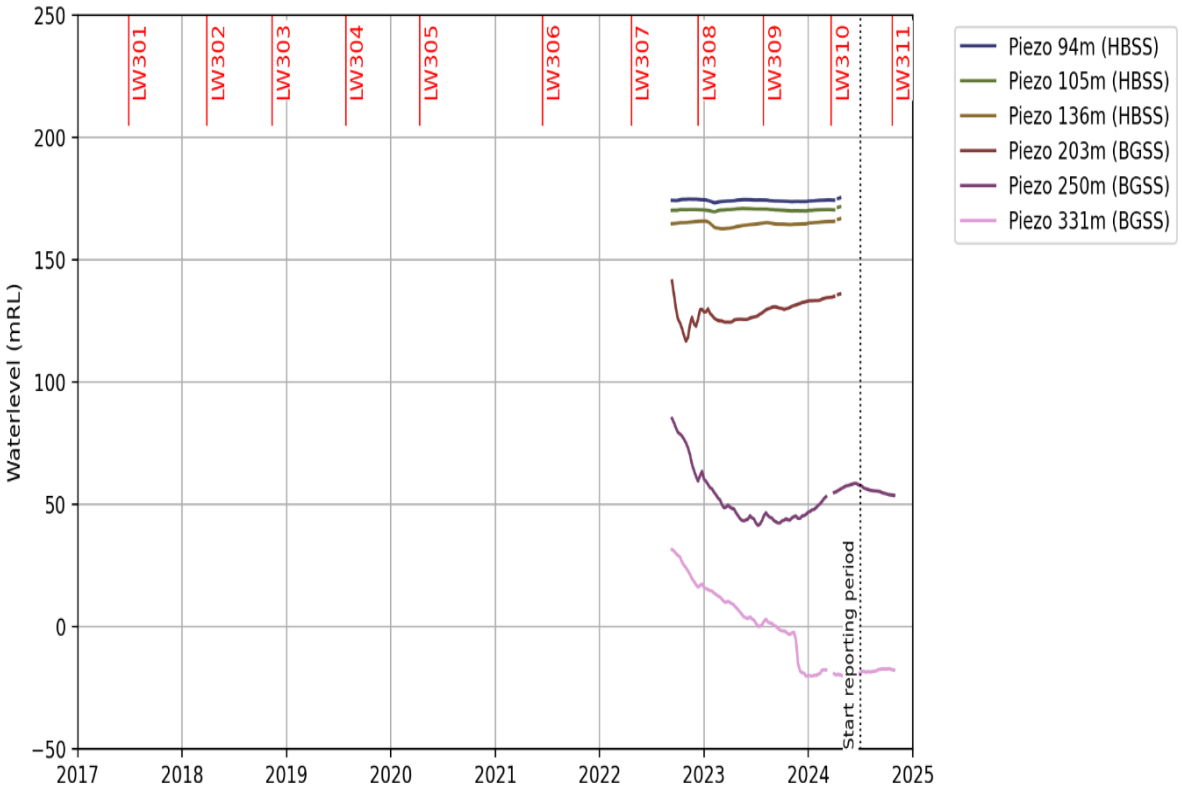


Chart 77 Time Variations in Potentiometric Heads at LW305-Goaf

PM02

Chart 78 shows the groundwater levels at PM02, located along Fire Trail 9D. The passage of longwalls to date has had seemingly no effect on the piezometers at PM02. Minor rises and declines observed within the piezometers, particularly piezometers 220 mbgl and 250 mbgl are likely to reflect variations in the climate (rainfall events). In mid-2023, data gaps were observed, likely from a logger malfunction. After recovery of the data, the water level readings in piezometers exhibited a ‘jump’ up from levels previous to the logger malfunctions. The reason for this jump is unknown. In 2024, all piezometers showed stable water levels with no response to mining at Longwalls 309 to 311. Until the end of 2024, water level in piezometers 475 mbgl and 495 mbgl showed a brief increase. During the reporting period, all piezometers showed water pressures aligned with historical levels and no response to mining at Longwalls 309 to 311.

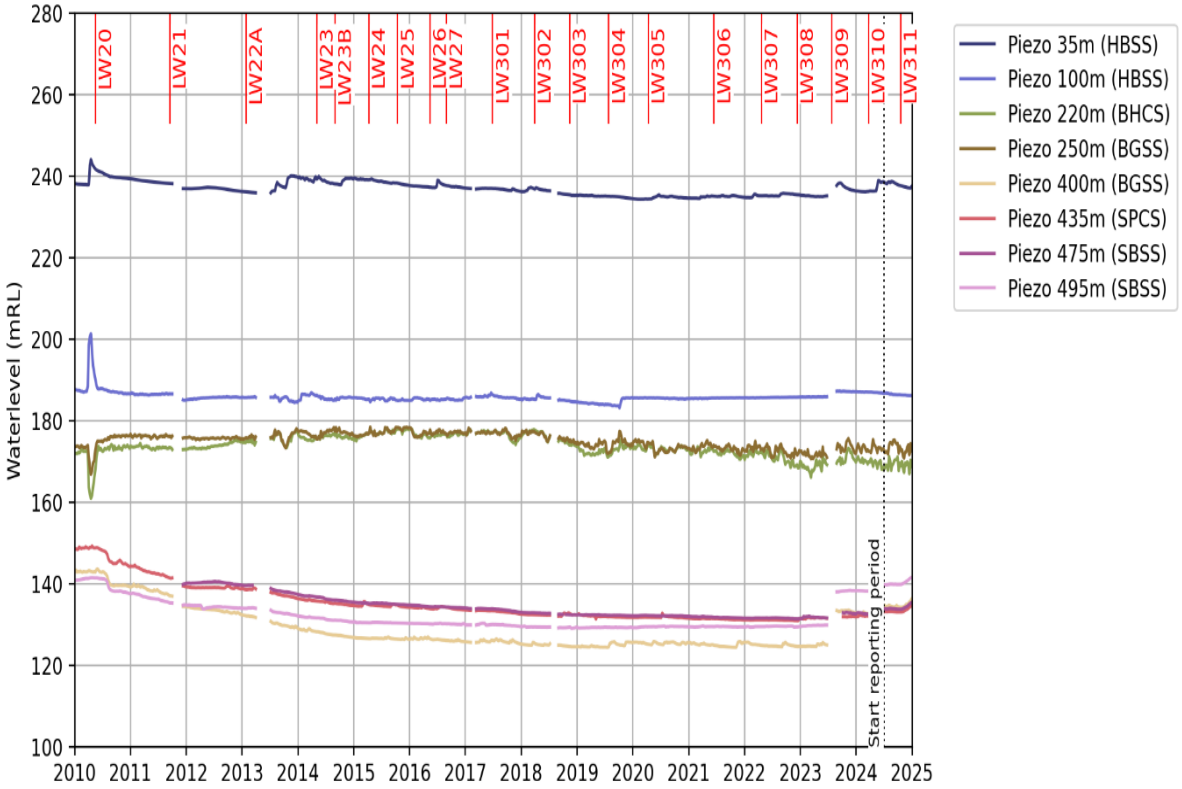


Chart 78 Time Variations in Potentiometric Heads at PM02

6.2.8.2 Assessment of Vertical Potentiometric Head Profiles

Vertical potentiometric head profiles at bores PHGW2A and PM02 are used to assess connective cracking between the surface and the mine in accordance with the Longwalls 308-310 and Longwalls 311-316 Water Management Plans.

The vertical potentiometric head profiles have been assessed against the following performance indicators:

> *Significant departure from the predicted envelope of the vertical potentiometric head profile at Bore PHGW2A does not occur.*
>
> *Significant departure from the predicted envelope of the vertical potentiometric head profile at Bore PM02 does not occur.*

The performance indicators were not exceeded during the reporting period because the measured potentiometric head profiles are consistent in shape and do not lie significantly to the left of the predicted model curves (Appendices C1 and C2).

6.2.8.3 Assessment of Hydraulic Gradient to the Woronora Reservoir

The groundwater head of Bores PHGW2A, 9EGW2A and PM02 are compared to the full supply level of the Woronora Reservoir to assess reductions in hydraulic gradient from the bores to the Woronora Reservoir in accordance with the Longwalls 308-310 and Longwalls 311-316 Water Management Plans.

The results have been assessed against the following performance indicators:

> *The hydraulic gradient to the Woronora Reservoir at full supply level from Bore PHGW2A is reduced by no more than 40% from that measured to 30 June 2017.*
>
> *The hydraulic gradient to the Woronora Reservoir at full supply level from Bore 9EGW2A is reduced by no more than 40% from that measured to 30 June 2017.*
>
> *The hydraulic gradient to the Woronora Reservoir at full supply level from Bore PM02 is reduced by no more than 40% from that measured to 30 June 2017.*

The performance indicators for bores PHGW2A and PM02 were not exceeded during the reporting period (Appendices C1 and C2).

During the end of the reporting period, an exceedance of the performance indicator, *The hydraulic gradient to the Woronora Reservoir at full supply level from Bore 9EGW2A is reduced by no more than 40% from that measured to 30 June 2017,* was identified at bore 9EGW2A.

The exceedance of the Level 3 performance indicator for bore 9EGW2A has been assessed by SLR (2025), and is provided in Appendix H.

The findings of SLR (2025) are summarised below:

- Although groundwater levels in 9EGW2A have decreased over time, exceeding the performance indicator stated in Longwalls 311-316 Water Management Plan, the latest monitoring rounds during December 2024 show that the groundwater level increased to 180.56 mAHD, returning to a Level 2 significance level).
- The hydraulic gradient has been maintained consistently from bore 9EGW2A towards the Woronora reservoir, reaching a maximum reduction of around 50% on activation of Level 3 significance level, before reducing to 35% during the latest monitoring rounds.
- As the groundwater level in bore 9EGW2A and surrounding piezometers have not fallen below the water level in the Woronora Reservoir, the hydraulic gradient has not been reversed, meaning that the performance measure relating to bore 9EGW2A listed in the Longwalls 311-316 Water Management Plan, "*Negligible leakage from the Woronora Reservoir*", has not been exceeded.

The key potential subsidence impacts and environmental consequences on the deep groundwater system described in the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans, included:

- Based on experience at Metropolitan Coal, substantial depressurisation of the deep aquifers in the fractured zone above the goaf is restricted to a height of less than 130 m from the top of the goaf, while transient pressure effects have been observed to propagate to a height of about 300 m above the goaf. That is, there is a pronounced increase in vertical hydraulic gradient in the deep groundwater system over the Metropolitan Coal longwalls.
- Above goaf zones there would be substantial changes in fracture porosity and permeability, due to opening up of existing joints, new fractures and bed separation. Permeability increases would have accompanying reductions in lateral hydraulic gradients, with associated changes in groundwater levels and pressures. Pronounced changes in groundwater levels can occur without any significant drainage into a mine, particularly from the Narrabeen Group sandstones.

- Groundwater discharge to the mined seam would occur from above and below the seam in proportion to local permeabilities. Based on earlier modelling, the water make (i.e. groundwater inflow) was expected to be in the order of 0.1 megalitres per day (ML/day) for Longwalls 20-27 and from 0.045 to 0.6 ML/day for Longwalls 301-303. Modelling indicated that the inflow could be up to 0.5 ML/day from the deep groundwater system during mining of Longwall 24 and up to 0.6 ML/day during the mining of Longwall 302. The 2018 groundwater model predicted that inflow for Longwalls 305-307 would be approximately 0.02 ML/day to approximately 0.24 ML/day at the end of Longwall 307. A recalibration of the groundwater model was completed by SLR in 2020 and predicted groundwater inflow of approximately 0.1 ML/day. Improving the previous overly conservative prediction of inflows that predicted of up to 0.24 ML/day.
- Due to the substantial depths of cover at the Project, there would not be connective cracking from the mined seam to the surface. Groundwater modelling for the Project indicates that there is expected to be eventual recovery of deep groundwater system pressures over many decades following the cessation of mining.

The NSW Planning Assessment Commission (2009) concluded that given the considerable depth of mining and the restricted panel width in the Project Area, that, in the absence of geological structures such as faults and igneous intrusions (sills, dykes and diatremes), there is a very high probability that a constrained zone will be associated with the mine layout proposed over the Project Area, thereby preventing direct hydraulic connections between mine workings and surface water bodies.

The groundwater monitoring results are consistent with the potential subsidence impacts and environmental consequences described in the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans.

6.2.9 Groundwater Quality

Waratah Rivulet

Groundwater quality at sites WRGW1 to WRGW7[7] on Waratah Rivulet (Figure 11) is shown on Charts 79 to 81 for iron, manganese and pH, respectively.

Groundwater quality monitoring at sites WRGW1 to WRGW7 indicates dissolved iron concentrations are usually in the 1 to 10 mg/L range, with the exception of sites WRGW1 and WRGW2 which peaked at 14 mg/L in earlier years (2010-2011) (Chart 79). Iron concentrations in groundwater at WRGW1 and WRGW2 have decreased since 2011. During the reporting period, concentrations remained below 10 mg/L at both bores excluding WRGW2 in March and from September to November 2024. Dissolved iron concentrations in groundwater at site WRGW5, WRGW6 and WRGW7 remained below 4 mg/L while WRGW3 varied between 2.7 and 6.7 mg/L during the reporting period (Chart 79, and Appendices C1 and C2).

Dissolved manganese concentrations at sites WRGW1 to WRGW7 are typically less than 1 mg/L. Higher concentrations of manganese were reported for WRGW3 in June 2015 (3.36 mg/L), September 2015 (1.47 mg/L), March 2017 (1.31 mg/L) and April 2017 (1.65 mg/L) and for WRGW6 in April 2017 (1.77 mg/L) (Chart 79). Dissolved manganese concentrations at WRGW3 have followed a slight increasing trend since 2007. The trend has reversed in 2018 and the concentrations are decreasing slightly and are now in the range of 0.5 to 0.75 mg/L. In the current reporting period, all sites remained below 1 mg/L (Chart 80, Appendices C1 and C2).

The pH level at the Waratah Rivulet sites has been generally acidic and usually between pH 5.5 and 7. Occasional occurrences in excess of pH 9 and less than pH 5 in prior reporting periods are unsustained outliers. The pH at all sites increased towards more neutral/ alkaline conditions compared to the historical range since 2019, with pH observed between 6.2 and 8. During this reporting period, the pH levels at all sites were similar to those recorded in 2023 (Chart 81, and Appendices C1 and C2).

[7] Site WRGW4 was sheared in 2011 and has subsequently not been sampled.

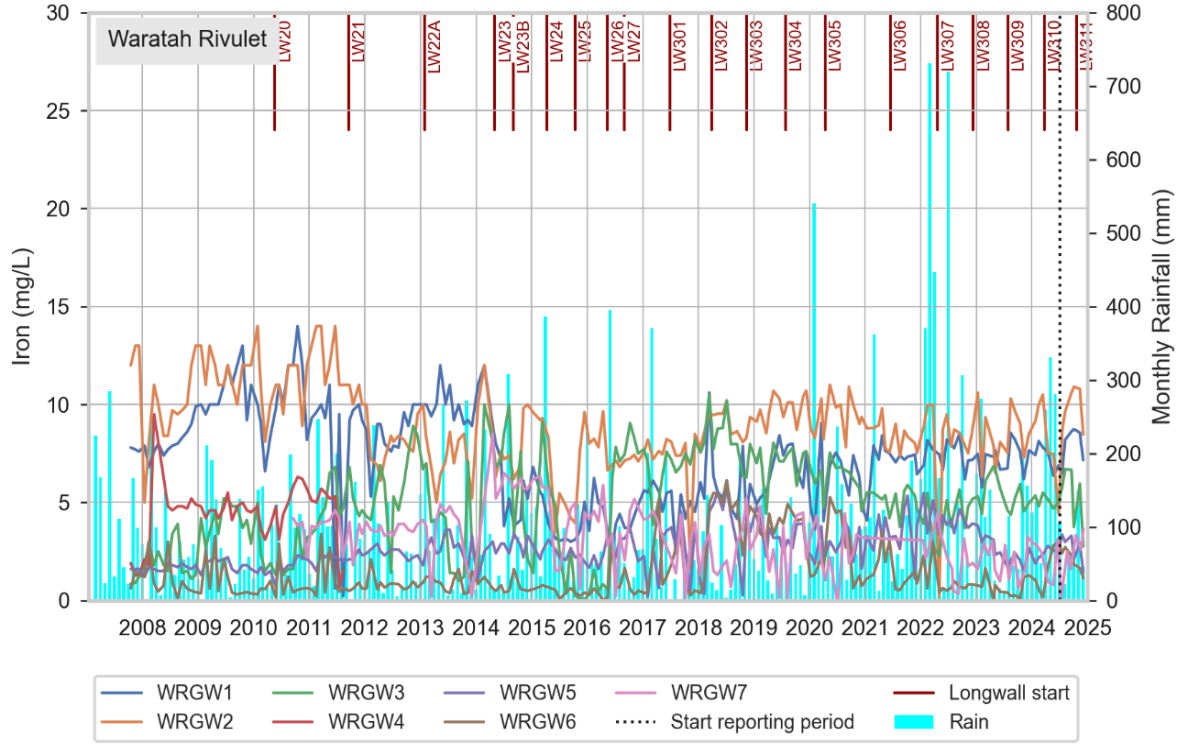


Chart 79 Iron Concentrations at WRGW1 to WRGW7

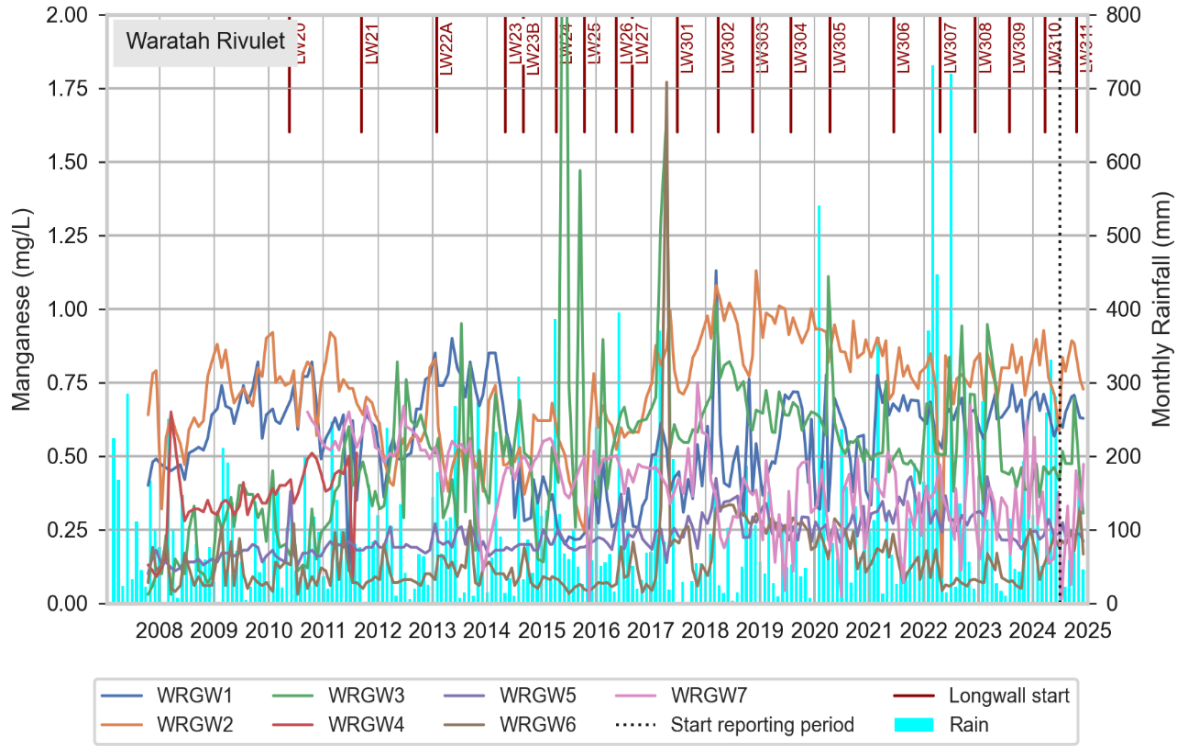


Chart 80 Manganese Concentrations at WRGW1 to WRGW7

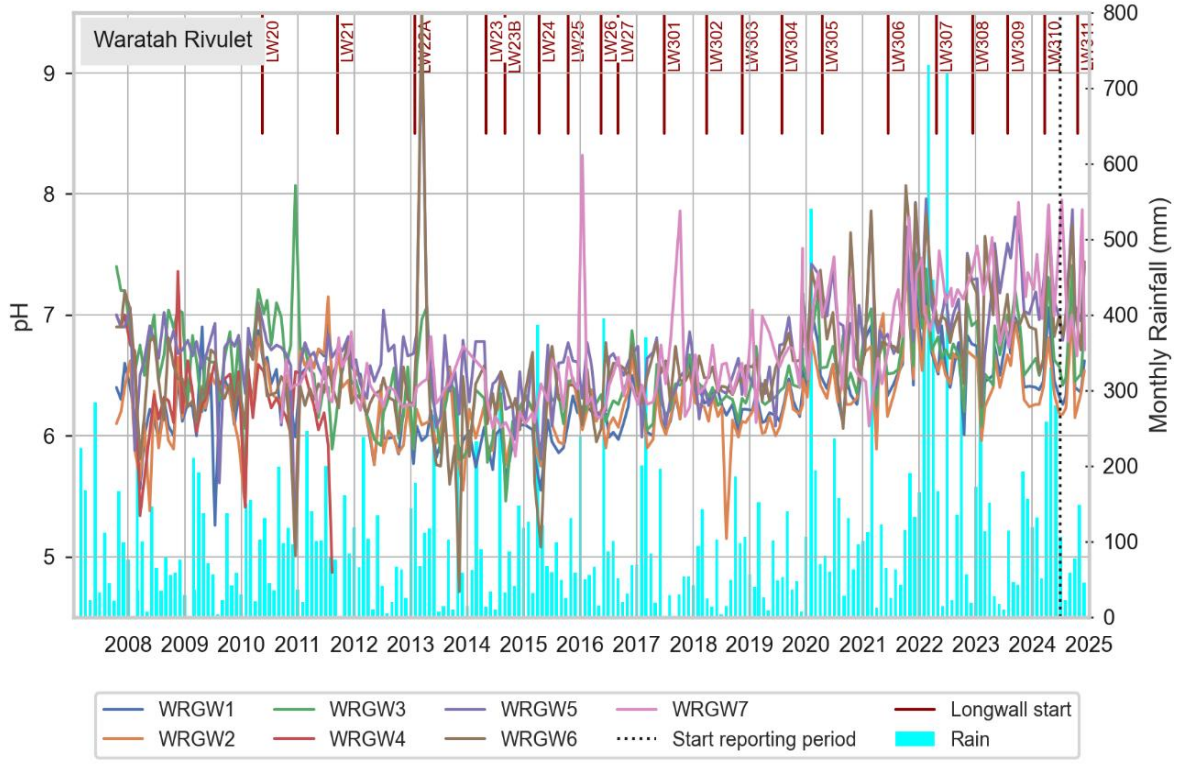


Chart 81 pH Levels at WRGW1 to WRGW7

Eastern Tributary

Groundwater quality at the two Eastern Tributary sites ETGW1 and ETGW2 (Figures 10 and 11) is shown on Charts 82 to 84 for iron concentration, manganese concentration and pH, respectively. Bore ETGW1 was unable to be sampled for groundwater quality from January to March 2017. Further, ETGW1 was sheared in July 2017 and has subsequently not been sampled. Bore ETGW2 sheared in August 2021 and sampling at this location was not possible during the first half of 2022 and from February onwards. Therefore, no quality measurements exist for this bore in this reporting period.

Groundwater quality monitoring on the Eastern Tributary (Figure 11) indicates high iron concentrations with an increasing trend, and larger variability than recorded in the period 2010 to 2015, persisted until July 2017 when the concentration decreased. During 2019, ETGW2 displayed a variable trend and recorded the maximum recorded concentration of 21.8 mg/L in October 2019 and the historical minimum of 0.4 mg/L in March 2019. Sampling in 2022 displayed a high variability with a lowest value of 3 mg/L (October 2022) and highest value of 16 mg/L (July 2022). Conversely, January 2023 recorded a very low iron concentration of 0.65 mg/L (Chart 82).

During the reporting period, manganese concentrations in samples collected continue to be consistently higher than the historically recorded manganese concentrations at ETGW2. Up to 2017, ETGW2 recorded manganese concentrations below 0.6 mg/L, but these have since increased to a range of 0.6 to 1 mg/L. The manganese concentrations seem to have stabilised at this range of concentrations, which has been observed since 2017 (Chart 83).

The groundwater at the Eastern Tributary sites is generally acidic, ranging between pH 5.5 and pH 6.5 for most of the monitoring record (since 2010). At ETGW2, recent data has shown an increasing pH trend to a more neutral range of 6.5 to 7, potentially associated with increased recharge from surface water. The January 2023 measurement showed a reduction of pH to 6.2. (Chart 84, Appendices C1 and C2).

The Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans predicted local surface water quality impacts as a result of enhanced groundwater-surface water interactions (as described for surface water quality above). The groundwater quality monitoring results are considered to be consistent with the predictions.

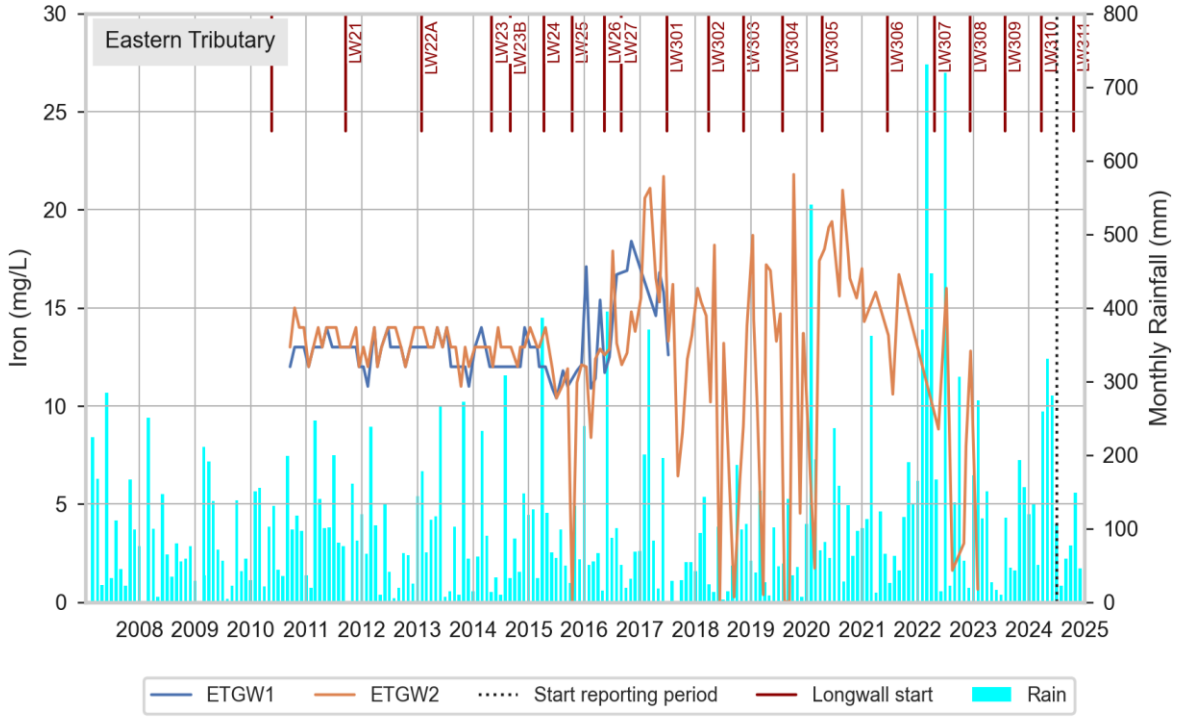


Chart 82 Iron Concentrations at ETGW1[8] and ETGW2

[8] Site ETGW1 was unable to be sampled from January to March 2017, and since August 2017.

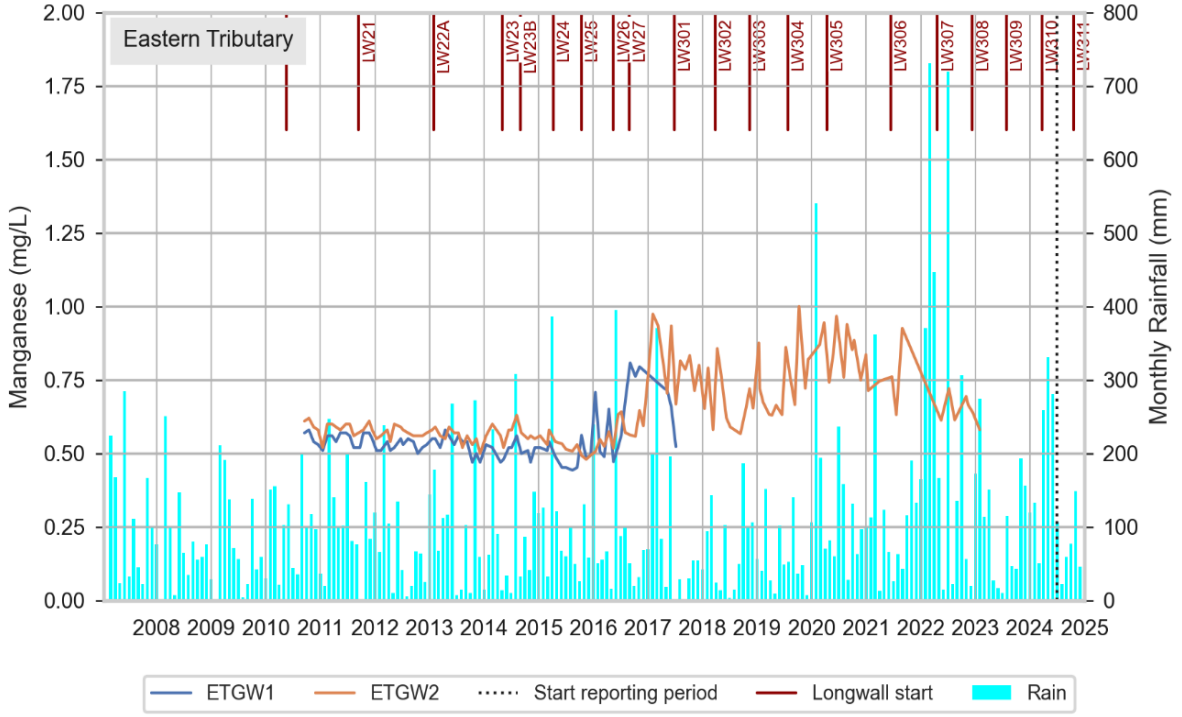


Chart 83 Manganese Concentrations at ETGW1 and ETGW2

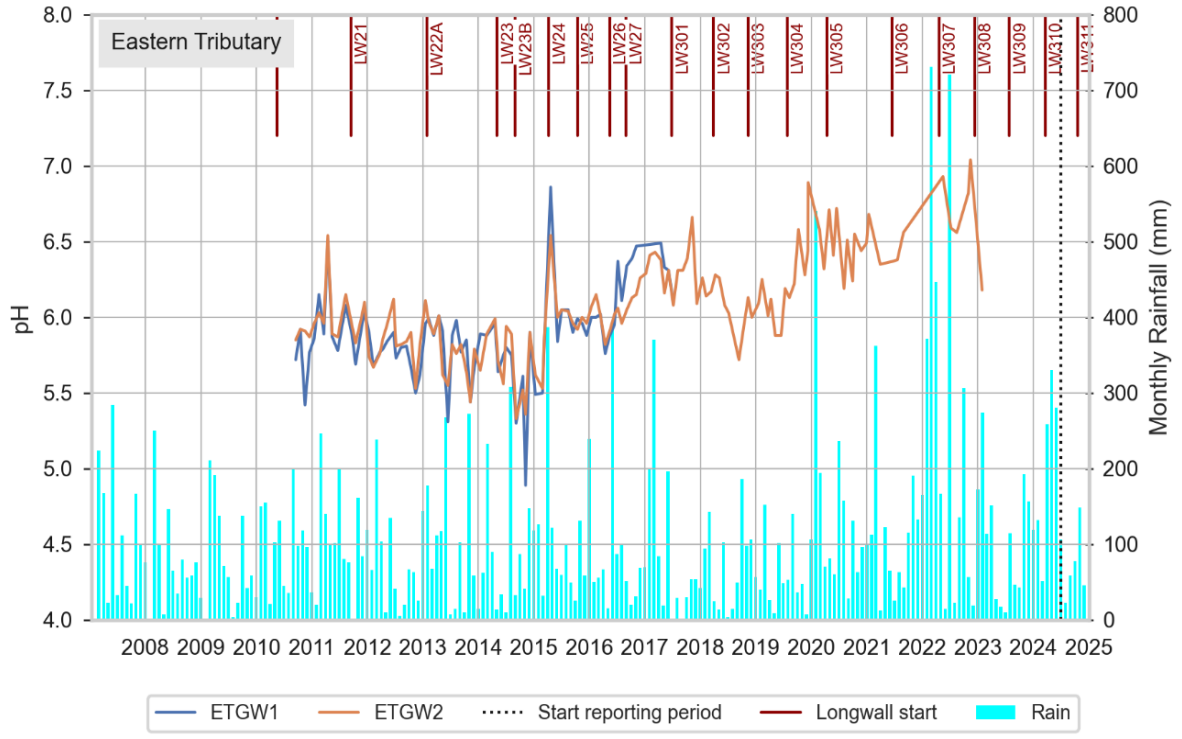


Chart 84 pH Levels at ETGW1 and ETGW2

6.2.10 Inspections of Mine Workings

Mine inspections did not identify any abnormal water flows from the goaf, geological structure, or strata generally during the reporting period.

6.2.11 Mine Water Intake

Monitoring of the mine water balance comprises:

- Metered water reticulated into the mine (recorded continuously and downloaded monthly).
- Backfill water used to assist pumping into the mine (recorded continuously and downloaded monthly).
- Metered water reticulated out of the mine (recorded continuously and downloaded monthly).
- Manual measurement of moisture content into and out of the mine through the mine ventilation system using a digital psychrometer. The frequency of readings is as follows:
    - every hour over a nine hour period on two occasions during a 12 month period;
    - daily (week day) except public holidays or other circumstances (access, fan maintenance, etc.) that prevent readings to be taken; and
    - once per week as a minimum.
- Measurement of the *in-situ* moisture content of the coal during channel sampling for coal quality.
- Measurement of the moisture content of ROM coal conveyed out of the mine at the drift portal using an automated moisture scanner. A fully automated data acquisition system records and stores the data.

The inferred water make (i.e. groundwater that has seeped into the mine from the strata) is calculated from the difference between total mine inflows (reticulated water into the mine, moisture in the downcast ventilation, and the *in-situ* coal moisture content) and total mine outflows (reticulated water out of the mine, moisture in the exhaust ventilation, and moisture in the ROM coal). Given the large fluctuations in daily water usage and the cycle period for water entering the mine, a 20 day average is used to provide a more reliable estimate of water make.

The average daily mine water make was approximately 0.12 ML/day during the reporting period (i.e. well below the 0.5 ML/day Level 2 TARP trigger) (Chart 85).

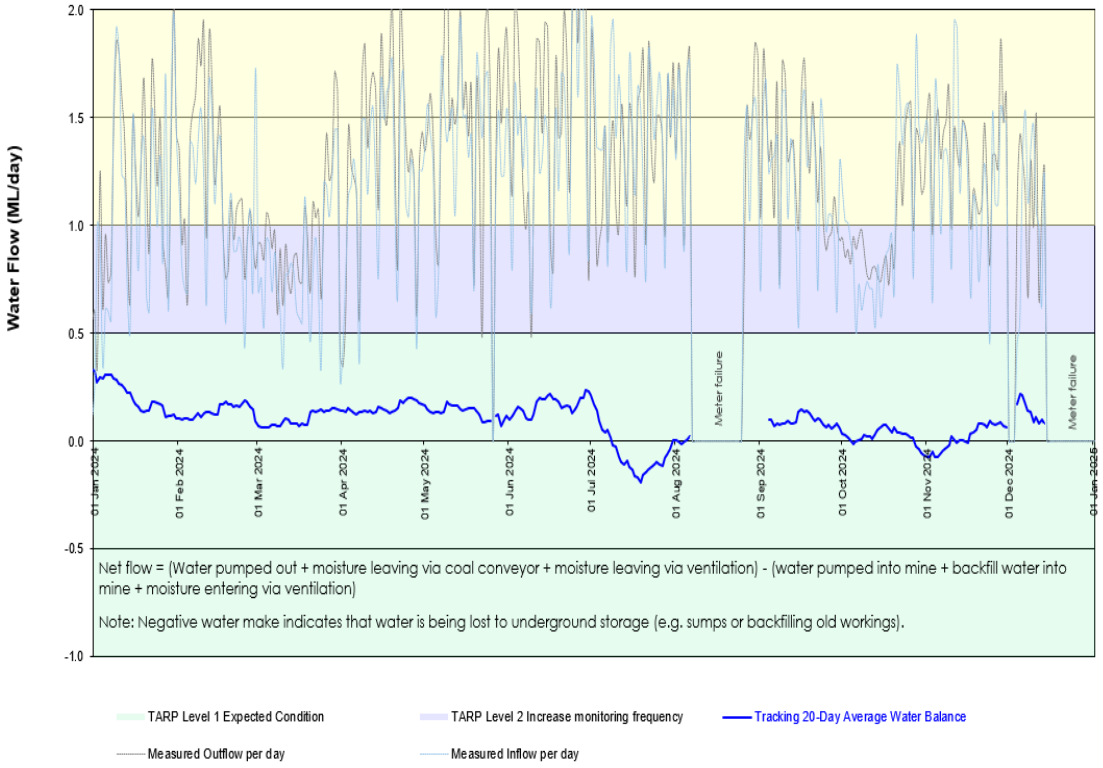


Chart 85 Estimated Daily Mine Water Make

6.2.12 Large Swamp Hydrological and Hydrogeological Models

Conceptual one-dimensional and two-dimensional hydrological and hydrogeological model were developed for the Large Swamps (namely, Swamps 76, 77 and 92) as part of the Large Swamp Assessment prepared for the Longwalls 311-316 Extraction Plan. Appendix P provides the conceptual hydrological and hydrogeological models for the Large Swamps.

Based on the hydrological and hydrogeological processes described in the Large Swamp Assessment prepared by ATC Williams (ATC Williams, 2024**)**, it is considered that the swamp water balance is dominated by direct rainfall, actual evapotranspiration, runoff (in excess of the swamp substrate capacity) and basal seepage.

Based on the monitoring data to date, no subsidence consequence has been observed at the Large Swamps and the groundwater monitoring indicated all Large Swamp monitoring sites, except Swamp 77-3 were above the baseline minimums during the reporting period. Swamp 77-3 average minimum level was below the baseline minimum towards the end of the reporting period. However, semi-quantitative analysis indicated that Swamp 77-3 shows a higher degree of variability and saturation compared to the control swamps and that there was no change in swamp dynamics (Appendix C2).

In consideration of the above, no change to the hydrological and hydrogeological processes and upland swamp vegetation were identified for the Large Swamps during the reporting period.

6.3 BIODIVERSITY MANAGEMENT

The Metropolitan Coal Longwalls 308-310 Biodiversity Management Plan was prepared to manage the potential environmental consequences of the Longwalls 308-310 Extraction Plan on aquatic and terrestrial flora and fauna, with a specific focus on swamps, in accordance with Condition 6, Schedule 3 of the Project Approval.

The Metropolitan Coal Longwalls 311-316 Biodiversity Management Plan was prepared to manage the potential environmental consequences of the Longwalls 311-316 Extraction Plan on aquatic and terrestrial flora and fauna, with a specific focus on swamps, in accordance with Condition 6, Schedule 3 of the Project Approval.

The Longwalls 311-316 Biodiversity Management Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences associated with Longwalls 20-22, Longwalls 23-27, Longwalls 301-303, Longwall 304, Longwalls 305-307 and Longwalls 308-310.

Sections 6.3.1 to 6.3.5 provide a summary of the biodiversity assessments for the reporting period. Section 6.8 provides a summary of the assessments against the biodiversity subsidence impact performance indicators and measures for the reporting period.

6.3.1 Upland Swamp Vegetation Monitoring

6.3.1.1 Longwalls 20-22 and Longwalls 23-27

Upland swamp vegetation monitoring is conducted biannually (in autumn and spring) at a number of swamps overlying or adjacent to Longwalls 20-22 and Longwalls 23-27, and at a number of control swamps (Figure 9).

In autumn 2024, visual inspections were conducted in Swamps 16, 17, 18, 19, 20, 24, 25, 28, 30, 31, 32, 33, 34, 35, 36 and 94 overlying or adjacent to Longwalls 20-27 and in control Swamps 101, 111a, 125, 135, 136, 137a, 137b, 138, Bee Creek Swamp, Dahlia Swamp, Woronora River 1, and Woronora River south arm.

Transect/quadrat monitoring of Longwalls 20-22 sites was discontinued from autumn 2023 onwards, as outlined in the Longwalls 308-310 Biodiversity Management Plan. This was due to the relative stability of the vegetation condition, as reflected by species richness, in the Longwalls 20-22 sites over the eight years since the completion of mining of Longwalls 20-22. This was applicable to all sites overlying or immediately adjacent to Longwalls 20-22, namely Swamps 16, 17, 18, 20, 24, and 25. Transect/quadrat monitoring was conducted in Swamps 28, 30, 33, 35 and 94 overlying or adjacent to Longwalls 23-27 and in control Swamps 101, 111a, 125, 135, 136, 137a, 137b, 138, Bee Creek Swamp, Woronora River 1, and Woronora River south arm.

Indicator species monitoring for Longwalls 20-22 includes 20 tagged individuals of *Epacris obtusifolia* (in Swamps 18, 24, 25, 101, 111a and 125), *Pultenaea aristata* (in Swamps 18, 24, 25, 101 and 111a) and *Sprengelia incarnata* (in Swamps 24, 101 and 125). Three indicator species characteristic of the Tea Tree Thicket vegetation community, namely *Banksia robur, Callistemon citrinus* and *Leptospermum juniperinum* are monitored in Swamp 20 and at control Swamps Woronora River 1, Woronora River south arm and Dahlia Swamp.

Indicator species monitoring for Longwalls 23-27 includes 20 tagged individuals of *Epacris obtusifolia* (in Swamps 19, 30, 33, 35, 94, 101, 111a, 125, 135, 136, 137a, 137b and 138), *Pultenaea aristata* (in Swamps 19, 30, 33, 35, 94, 101, 111a, 135, 136, 137a and 138), *Sprengelia incarnata* (in Swamps 19, 33, 35, 94, 101, 125, 135, 136, 137a and 138) and *Banksia robur* and *Callistemon citrinus* in Swamp 28 and control Swamps Woronora River 1, Woronora River south arm and Dahlia Swamp.

The vegetation survey results for spring 2023 and autumn 2024 have been assessed in accordance with the Longwalls 308-310 Biodiversity Management Plan. The results of the spring 2023 and autumn 2024 survey in relation to the Biodiversity Management Plan TARP are summarised in Section 6.8.

The spring 2023 and autumn 2024 Longwalls 20-22 and Longwalls 23-27 Vegetation Monitoring Reports prepared by Eco Logical Australia (Eco Logical) describe the results of these surveys, and are provided as Appendices I1, I2, I3 and I4, respectively.

6.3.1.2 Longwalls 301-304

The upland swamp vegetation monitoring program used for Longwalls 301-304 (visual, transect/quadrat and indicator species monitoring) is consistent with those used for the Longwalls 20-22 and Longwalls 23-27 upland swamp vegetation monitoring programs. Upland swamp vegetation monitoring is conducted biannually (in autumn and spring) at a number of swamps overlying or adjacent to Longwalls 301-304 and at a number of control swamps (Figure 9).

In autumn 2024, visual inspections were conducted for swamps overlying or adjacent to Longwalls 301-304 (Swamps 40, 41, 46, 47, 48, 49, 50, 51/52, 53 and 58) and in control Swamps 101, 111a, 125, 135, 136, 137a, 137b and 138 to record evidence of potential subsidence impacts.

Transect/quadrat monitoring was also conducted in autumn 2024 at Swamps 40, 41, 46, 48, 50, 51/52 and 53. Control Swamps 101, 111a, 125, 135, 136, 137a, 137b and 138, were selected for comparison and the same transect/quadrat monitoring methodology was used to survey each of these swamps. Swamps 46 and 51/52 were subject to WaterNSW hazard reduction burns following the autumn 2017 baseline survey and prior to the spring 2017 survey, resulting in vegetation along transects in these swamps no longer being comparable to the control swamps. Similarly, sections of Swamps 40, 47, 48, 49 and 50 were burnt in a WaterNSW hazard reduction burn during the autumn 2021 survey period, although only a portion of each was directly affected and the majority of the previous vegetation community still remains.

Indicator species monitoring for Longwalls 301-304 previously included 20 tagged individuals of *Epacris obtusifolia* (in Swamps 40, 51/52, 53, 101, 136 and 137a) and *Sprengelia incarnata* (in Swamps 40, 51/52, 53, 101, 136 and 137b). However, subsequent to the autumn 2017 baseline survey and prior to the spring 2017 survey, Swamp 51/52 was subject to WaterNSW hazard reduction burns, resulting in the death of indicator species in Swamp 51/52. As a result, indicator species monitoring in Swamp 51/52 was removed from the monitoring program.

The vegetation survey results for autumn 2024 have been assessed in accordance with the Longwalls 308-310 Biodiversity Management Plan. The results of the autumn 2024 survey in relation to the Biodiversity Management Plan TARP are summarised in Section 6.8. The results of the Longwalls 301-304 upland swamp vegetation monitoring program (up to and including the autumn 2024 survey) can be summarised as follows:

- Visual inspections did not identify any cracking of exposed bedrock areas or swamp sediments in either longwall or control swamps as a result of mine subsidence.
- Areas in which active erosion was observed were generally minor and limited to flow paths along existing tracks (Swamp 46) or transects (Swamps 40, 41, 48 and 51/52).

- The autumn 2024 survey was conducted following a period of average rainfall, with the above-average rainfall throughout the months of November 2023 and December 2023 followed by average rainfall in January 2024 and below-average rainfall February 2024. During the autumn 2024 survey, rainfall was well below average in March 2024 and above average in April and May 2024. The conditions leading up to, and throughout, the survey period reflect the variability of seepage recorded in longwall and control valley side swamps.
- Vegetation in autumn 2023 at both longwall and control sites was found to be in a generally good condition. An exception to this included common senescence observed within a patch of shrubs in an isolated area of control Swamp 137a. Isolated dieback and senescence of individual plants was observed in both longwall and control sites, although healthy individuals of all species observed with dieback were also observed throughout the sites.
- Species richness within individual valley side swamps in autumn 2024 was within the range recorded in previous seasons for most longwall and control swamps and was consistent with the fluctuations observed within the baseline monitoring period. The exception to this were the longwall Swamps 46 and 50 which equalled, or increased above, previously recorded levels and longwall Swamp 48 which decreased below previously recorded levels. In autumn 2024, a large increase in species richness compared to the previous season, spring 2023, was recorded at five longwall sites (Swamps 40, 41, 46, 50 and 53). One longwall site recorded a large decrease in species richness (Swamp 48) and one site recorded a small decrease (Swamp 51/52). Species richness decreased in two of the five control sites, with decreases in species richness ranging from moderate (Swamp 137a) to small (Swamp 137b), compared to spring 2023. A moderate increase in species richness was recorded at two control sites (Swamps 135 and 136) in autumn 2024. No change in species richness was observed in control Swamp 101 between spring 2023 and autumn 2024.
- Fluctuations in species cover/abundance and condition were recorded across all sites throughout the reporting period. No patterns of increasing or decreasing cover/abundance, or declines in vegetation condition, were identified during the autumn 2024 monitoring in relation to individual species across sites or groups of species (i.e. swamp indicator species, generalist species, shrubs, ground covers) within sites.
- In autumn 2024, the proportion of upland swamp indicator species which were dead was greater at longwall sites than control sites for *Epacris obtusifolia.* This trend has been observed since the baseline monitoring period. Since the large increase in the proportion of dead indicator species observed for control sites in autumn 2018, the seasonal increases have been consistent between longwall and control sites. Mortality of tagged indicator species may be attributed to environmental conditions including the stress associated with drying out of shallow soils during periods of below-average rainfall.
- In autumn 2024, the mean vegetation condition of tagged *Epacris obtusifolia* individuals was lower than the range observed across the baseline monitoring seasons for both longwall and control sites. As these declines have occurred at both longwall and control swamps, it is considered to reflect the natural fluctuations in plant health associated with herbivory, resource competition, ageing plants and, in particular, the ongoing drought conditions following an extended period of below-average rainfall from July 2017 to February 2020.
- The flowering status of tagged indicator species, as recorded in the mean reproductive status shows that across all seasons, flowering has been highly variable, particularly within control sites. The mean reproductive status of tagged indicator species has also been variable between longwall and control swamps in individual seasons. Flowering in autumn 2024 was higher for most sites compared to previous autumn surveys for both longwall and control sites.
- The upland swamp performance indicator '*The vegetation in upland swamps is not expected to experience changes significantly different to changes in control swamp*s' has not been exceeded for any of the Longwalls 301-304 upland swamps to date.

The spring 2023 and autumn 2024 Longwalls 301-304 Vegetation Monitoring Reports prepared by Eco Logical are provided as Appendices I5 and I6, respectively.

6.3.1.3 Longwalls 305-307

The upland swamp vegetation monitoring program used for Longwalls 305-307 (visual and transect/quadrat monitoring) is consistent with those used for the Longwalls 20-22, Longwalls 23-27 and Longwalls 301-304 upland swamp vegetation monitoring programs. Upland swamp vegetation monitoring is conducted biannually (in autumn and spring) at a number of swamps overlying or adjacent to Longwalls 305-307 and at a number of control swamps (Figure 9).

In autumn 2024, visual inspections were conducted in Swamps 69, 70, 71a, 71b, 72 and 73, and transect/quadrat monitoring was conducted in Swamp 71a overlying or adjacent to Longwalls 305-307. Control Swamps 101, 111a, 125, 135, 136, 137a, 137b, and 138 were selected for comparison with the swamps over Longwalls 305-307 and the same transect/quadrat monitoring methodology was used to survey each of these swamps. Swamps 69, 70, 71a and 71b were subject to WaterNSW hazard reduction burns in 2016 and 2017.

The vegetation survey results for autumn 2024 have been assessed in accordance with the Longwalls 308-310 Biodiversity Management Plan. The results of the autumn 2024 survey in relation to the Longwalls 308-310 Biodiversity Management Plan TARP are summarised in Section 6.8. The results of the Longwalls 305-307 upland swamp vegetation monitoring program (up to and including the autumn 2024 survey) can be summarised as follows:

- Visual inspections in autumn 2024 did not identify any areas of cracking of exposed bedrock areas or swamp sediments in longwall swamps, other than minor cracks in exposed bedrock which have previously been recorded (e.g. weathering artefact and fire damage in Swamp 137b).
- Areas in which active erosion was observed were minor and limited to pre-existing tracks (Swamp 125). The exception to this was Swamp 73 where moderate to severe erosion occurred along existing water flow paths, resulting in loss and deposition of sediments and exposure of plant roots. The presence and new growth of ground layer species in these areas in spring 2023 indicated erosion was not active and recovery was occurring. In autumn 2024, evidence of further water erosion was observed in Swamp 73 where the midsection of this swamp has collapsed, and sand gouging and deposited debris was recorded. While erosion caused by high water flows was evident, the ground layer ranged from sparse to healthy throughout most of the swamp with new growth recorded in some species.
- Vegetation in autumn 2024 at both longwall and control sites was found to be generally in good condition with no unusual areas of vegetation senescence observed. An exception to the generally good condition of vegetation was a noted yellowing tinge to most shrub species throughout control Swamp 137a. Isolated dieback and senescence of individuals was observed in both longwall and control sites, although healthy individuals of all species observed with dieback were also observed throughout the sites.
- The vegetation structure, dominant species and estimated cover for each stratum has been variable across the baseline monitoring period and the three monitoring seasons since the commencement of longwall mining (spring 2020 and spring 2023), with variations recorded between sites, seasons and strata. This variability is considered to reflect both the natural variations in the height and cover/abundance of vegetation structural layers through time, as well as the subjective nature of data collection and impacts from fire.
- Fluctuations in species cover/abundance and condition were recorded across all sites. No patterns of increasing or decreasing cover/abundance were identified in relation to individual species across sites or groups of species (i.e. swamp indicator species, generalist species, shrubs, ground covers) within sites.

- Species richness within individual valley side swamps in spring 2023 was within the range previously recorded across all previous monitoring seasons for the single longwall site (Swamp 71a) and all control sites. Species richness moderately increased in two of the five control sites (Swamp 135 and 136) between spring 2023 and autumn 2024, and no change in species richness was observed in control Swamp 101. Species richness declined in two of the five control sites, with decreases in species richness ranging from moderate (Swamp 137a) to small (Swamp 137b), compared to spring 2023.
- The upland swamp performance indicator, '*The vegetation in upland swamps is not expected to experience changes significantly different to changes in control swamps*' has not been exceeded in autumn 2024.

The spring 2023 and autumn 2024 Longwalls 305-307 Vegetation Monitoring Reports prepared by Eco Logical are provided as Appendices I7 and I8, respectively.

6.3.1.4 Longwalls 308-310

In autumn 2024, visual inspections were conducted for swamps overlying or adjacent to Longwalls 308-310 (Swamps 61, 62, 63, 64, 78, 79, 80, 81, 82, 83, 88, 89, 90, and 92SH and S92TTT) and in control Swamps 101, 111a, 125, 135, 136, 137a, 137b and 138 to record evidence of potential subsidence impacts.

Transect/quadrat monitoring was also conducted in autumn 2023 at Swamps 62, 64, 78, 79, 80, 81, 82, 89, 90, 92SH and 92TTT. Control Swamps 101, 111a, 125, 135, 136, 137a, 137b and 138, were selected for comparison and the same transect/quadrat monitoring methodology was used to survey each of these swamps.

The vegetation survey results for autumn 2024 have been assessed in accordance with the Longwalls 308-310 Biodiversity Management Plan. The results of the autumn 2024 survey in relation to the Biodiversity Management Plan TARP are summarised in Section 6.8. The results of the Longwalls 308-310 upland swamp vegetation monitoring program (up to and including the autumn 2024 survey) can be summarised as follows:

- Visual inspections did not identify any cracking of exposed bedrock areas or swamp sediments in either longwall or control swamps.
- Areas in which active erosion was observed in autumn 2024 ranged from minor to severe and was limited to flow paths, rock edges and along existing tracks in two control sites (Woronora River 1 and Woronora River south arm) and five longwall (Swamps 64, 78, 89, 90 and 92TTT) sites. No increase to previously recorded minor erosion impacts along existing tracks in two control sites.
- For Banksia Thicket/Sedgeland-Heath swamps abundant seepage was recorded along the drainage line in longwall Swamp 64, while minor seepage was recorded in longwall Swamps 78, 81, 82, 90, 92SH and 92TTT and in control Swamps 135, 137a and 138. Minor seepage was generally observed on terminal steps or along transect paths and creek lines.
- For Tea Tree Thicket control swamps, seepage was minor at Woronora River south arm and Dahlia Swamp and moderate at Woronora 1 Swamp. Seepage was present along existing tracks, transects and/or the main drainage line, which tends to run through the centre of each swamp.
- A metallic sheen was observed on seepage and standing water in a number of longwall and most control sites, ranging from widespread across the swamp (Swamps 101, 125, 135, 136, 137a and 138) to isolated occurrences within the swamp (Swamps 71a, 72, and 137b).

- With regard to changes in water colour, iron-staining or seepage with a metallic sheen on the surface was observed across both longwall and control sites in autumn 2024. Where standing water or seepage occurred, generally the water was clear, with minor to moderate iron-staining recorded within two longwall (Swamps 78 and 89) and four control sites (Swamps 101, 135 and 137a). Common iron-stained seepage was also observed across rock platforms at control Swamp 111a. Abundant metallic sheen on standing water was recorded in control site Dahlia Swamp, whereas minor to moderate metallic sheens were observed in four longwall (Swamps 81, 88, 90 and 92TTT) and two control sites (Swamps 101 and 125). Both the metallic sheen and the iron-staining of seepage and mud is known to be caused by naturally occurring iron bacteria, which proliferate when high rainfall releases an abundance of iron from sandstone rock and soils. The changes in water colour observed in autumn 2024 may be explained by the moderate rainfall conditions which occurred during the survey season.
- Vegetation in autumn 2024 at both longwall and control sites was found generally to be in a good condition. Isolated dieback and senescence of individual plants was observed in both longwall and control sites, although healthy individuals of all species observed with dieback were also observed throughout the sites.
- The vegetation structure, dominant species and estimated cover for each stratum has been variable across the baseline monitoring period and the two monitoring seasons since the commencement of longwall mining (autumn 2023, spring 2023 and autumn 2024), with variations recorded between sites, seasons and strata. This variability is considered to reflect both the natural variations in the height and cover/abundance of vegetation structural layers through time, as well as the subjective nature of data collection.
- No weed species were observed within any of the longwall sites during the autumn 2024 visual inspections. However, weed species were observed within two control sites, during the autumn 2024 visual inspections.
- In autumn 2024, four species of conservation significance were recorded at upland swamp control monitoring sites, namely *Darwinia diminuta, Eucalyptus luehmanniana, Tetratheca neglecta* and *Pultenaea aristata*. These species were recorded in healthy condition.
- Since the start of the baseline monitoring period (spring 2021) there has been a declining trend in species richness across most longwall and control sites. Similar fluctuations in species richness between longwall and control sites indicate that changes may be attributable to environmental conditions, including the stress associated with extremely high rainfall throughout 2022 and in February 2023.
- The upland swamp performance indicator '*The vegetation in upland swamps is not expected to experience changes significantly different to changes in control swamps'* has not been exceeded in autumn 2024.

The spring 2023 and autumn 2024 Longwalls 308-310 Vegetation Monitoring Report prepared by Eco Logical are provided as Appendix I9 and I10, respectively.

6.3.2 Upland Swamp Groundwater Monitoring

Swamp substrate water levels are assessed against the following upland swamp groundwater performance indicator in the Longwalls 308-310 Biodiversity Management Plan:

> *Surface cracking within upland swamps resulting from mine subsidence is not expected to result in measurable changes to swamp groundwater levels when compared to control swamps or seasonal variations in water levels experienced by upland swamps prior to mining*.

The upland swamp groundwater performance indicator was updated in the Longwalls 311-316 Biodiversity Management Plan as follows:

> *Subsidence impacts are not expected to result in measurable changes to swamp groundwater levels when compared to control swamps or seasonal variations in water levels experienced by upland swamps prior to mining.*

As described in Section 6.2.6, semi-quantitative comparisons of the swamp substrate water levels of Swamps 25, 30, 35 and 50 with control swamps and rainfall records do not show a definitive mining effect and the dry conditions are regarded as a natural response to reduced rainfall (Appendices C1 and C2).

The swamp substrate hydrographs for Swamps 33, 35, 40, 41, 46, 51, 52, 53, 71a and 72 indicate that the correlation of swamp substrate with the rainfall trend is strong (Appendices C1 and C2). Data analysis for the reporting period indicates the seven-day moving averages for all swamps apart from Swamp 77-3 were at or above the swamp's minimum recorded in the baseline period (Appendices C1 and C2) The seven-day moving average minimum level of Swamp 77-3 were below the baseline minimum towards the end of 2024.

Within the Longwalls 311-316 Biodiversity Management Plan, no trigger is assigned to either Swamp 20 or Swamp 28 due to these swamps previously having been impacted by mining. Though for completeness they have been briefly summarised below.

The upland swamp groundwater performance indicator has been exceeded at Swamp 20 since 2012. Swamp 20 substrate water levels changed from being permanently saturated to being periodically saturated as a result of the passing of Longwall 21 (Chart 65 and Appendices C1 and C2). Rainfall events in 2020 and 2021 saw short-term increases in the water levels. Over the first half of 2022, the substrate piezometer showed a more permanent increase in water levels with the piezometer remaining fully saturated over the entire period, excluding a brief period in February 2023 when water levels were close to the sensor level. This correlates with the intensive rainfall events experienced over the first half of 2022. Over late 2022, the substrate levels showed a declining trend to the sensor level, and the swamp is once again showing temporally saturated behaviour during the first half of 2023. In late 2023, the substrate level was generally at the sensor level, with a slight increase observed towards the end. In 2024, the water levels in Swamp 20 and control swamps showed similar trends, with Swamp 20 showing a more pronounced response to the weather conditions.

A mining effect to the substrate water levels of Swamp 28 (overlying Longwall 24) was identified in 2016 based on the incomplete recovery of substrate water levels following rainfall events (Chart 66 and Appendices C1 and C2). Swamp 28 was considered to have an impact from mining of Longwall 25, although no effect on swamp substrate water levels occurred when Longwall 24 passed directly beneath the monitoring site (Appendices C1 and C2). The substrate piezometer at Swamp 28 returned to dry conditions from September 2017, remaining so until a rainfall event in February 2020, where the Swamp 28 substrate piezometer was re-saturated, returning to a saturation and recession pattern as observed prior to the drought. This behaviour was also observed at the two control swamp piezometers (Swamps 137a and 137b; Chart 66). The substrate piezometer at Swamp 28 indicated saturated conditions until December 2020. Over 2022, the substrate has been permanently saturated with groundwater levels constantly about 1 m above the sensor level in the first half of 2022, decreasing to 0.5 m by the end of the 2022. This decreasing trend continued into 2023, before a recharge event in February 2023 caused a rapid increase in substrate levels. The substrate water level gradually decreased to approximately sensor level from mid to late 2023. In the first half of 2024, water levels generally increased to near saturation, with a brief decrease observed in March 2024. Compared to the water levels in control swamps, Swamp 28 displayed a similar trend but showed less responsiveness. During the second half of 2024, Swamp 28 showed a similar trend to the control swamps.

As discussed in Section 6.2.6, the Swamp 28 substrate piezometer was concluded to not have been impacted by mining despite an impact being observed to the deep sandstone piezometer (ATC Williams, 2024). Following further analysis of monitoring data to date, it has been determined that the mining effect to the substrate water levels of Swamp 28 was concluded during a period of substantial drought. The substrate piezometer at Swamp 28 returned to pre-drought saturation and recession patterns following rainfall in February 2020, which was also observed at control Swamps 137a and 137b. As such, the conclusion that a mining impact was observed at the Swamp 28 substrate piezometer is no longer supported (Appendix C2).

The subsidence impacts on the substrate water levels of Swamp 20 and Swamp 28 have triggered assessments against the biodiversity subsidence impact performance measure, *Negligible impact on threatened species, populations, or ecological communities*. The Swamp 20 and Swamp 28 threatened flora and fauna assessments by Ecoplanning and Niche Environment and Heritage Pty Ltd (Niche) are provided in Appendices J1 and J3, respectively. The assessments conclude that the subsidence impact performance measure has been met.

6.3.3 Riparian Vegetation Monitoring

Riparian vegetation monitoring is conducted at a number of sites on the Waratah Rivulet and Eastern Tributary, overlying Longwalls 20-27 and downstream of Longwalls 20-27 (Figure 13).

The vegetation survey results for autumn 2024 have been assessed in accordance with the Longwalls 308-310 Biodiversity Management Plan. The results of the autumn 2024 survey in relation to the Biodiversity Management Plan Trigger Action Response Plan are summarised in Table 10 in Section 6.8. The results of the Longwalls 20-22 and Longwalls 23-27 autumn 2024 riparian vegetation monitoring surveys can be summarised as follows:

- Water levels at all riparian sites along the Waratah Rivulet, both Longwall (MRIP01 and MRIP02) and control (MRIP03 and MRIP04,) were similar or slightly lower to the previous spring 2023 survey.
- All riparian sites were subject to high water flows immediately prior to, and during, the autumn 2024 surveys. In all instances, high water flows resulted in impacts including flood-swept and prone vegetation, loss of individual plants, burial of vegetation by adjacent vegetation, and burial by woody flood debris and sediment. Erosion, bank scouring and undercutting was observed at most sites in autumn 2022 and was generally only slightly extended in spring 2022. These impacts were greatly exacerbated in autumn 2023, however stayed largely unchanged in spring 2023 and autumn 2024 with minimal increase growing and undercutting at most riparian sites. Erosion, bank scouring and sediment deposition impacted all sites in autumn 2023 as a result of flood impacts. These impacts occurred throughout all sites and in worse cases included erosion and undercutting along both banks, leaving roots and bedrock exposed, trees uprooted, significant deposition of sediment and debris and the loss of entire sections of slabs and rock shelves.
- Vegetation was generally observed in good condition across and adjacent to all riparian monitoring sites in autumn 2024, despite the flood impacts. Exceptions to the generally good condition of vegetation within these riparian sites was limited to isolated and scattered individuals observed with dieback and flood impacts including prone vegetation and burial by flood debris.
- In autumn 2024, the percent cover and height of the structural layers was generally similar to that recorded for previous seasons. Across all seasons (since the surveys commenced in spring 2008), the vegetation structure, dominant species and estimated cover for each stratum has varied between sites and between seasons within sites, with no clear trends in vegetation cover across sites.

- Species richness in autumn 2024 sites was generally similar to previous seasons, with most values falling within the range observed across previous seasons for individual sites. When comparing species richness in autumn 2024 to spring 2023, a decrease in species richness occurred at one longwall site (MRIP02 – two species), and at one control (compromised) site (MRIP08 – four species) (Charts 86 and 87).
- Up to and including the autumn 2024 survey, mean vegetation condition has decreased over the entire survey period for the three riparian indicator species *Lomatia myricoides*, *Prostanthera linearis* and *Schoenus melanostachys*, within both longwall and control sites, with the extent of decline greatest for *Prostanthera linearis* and only a minor decline observed for *Lomatia myricoides*.
- In autumn 2024, the mean reproductive status for tagged riparian indicator species was similar, and minimal, at longwall and control sites for *Lomatia myricoides* and *Prostanthera linearis* whilst for *Schoenus melanostachys* it was higher at longwall sites than control sites. The mean reproductive status of *Prostanthera linearis* and *Schoenus melanostachys* has been considerably more variable between seasons, and between longwall and control sites within seasons, than for *Lomatia myricoides*, preventing any discernible trend from being detected.
- Five species of conservation significance were recorded at riparian vegetation monitoring sites in autumn 2024, namely *Darwinia diminuta*, *Eucalyptus luehmanniana, Pultenaea aristata, Hibbertia nitida* and *Lomandra fluviatilis*. Generally, the significant species observed were recorded in a good condition.
- Ten introduced species were observed in riparian monitoring sites: *Ageratina adenophora* (Crofton Weed) (MRIP01), *Chloris virgata* (Rhodes Grass) (MRIP10), *Conzya* sp. (Fleabane) (MRIP02, MRIP04 and MRIP10), *Dimorphotheca sinuata* (African Daisy) (MRIP03), *Gamochaeta* sp. (Cudweed) (MRIP02), *Isolepis prolifera* (Budding Club-Rush) (MRIP03), *Poa* sp. (Meadow-grass) (MRIP06), *Rubus fruticosus* species aggregate (Blackberry) (MRIP02), *Senecio madagascariensis* (Fireweed) (MRIP10) and *Solanum nigrum* (Blackberry Nightshade) (MRIP10).

The spring 2023 and autumn 2024 Longwalls 20-22 and Longwalls 23-27 Vegetation Monitoring Reports prepared by Eco Logical are provided in Appendices I1, I2, I3 and I4, respectively.

6.3.4 Aquatic Biota and Their Habitats

The aquatic ecology monitoring programs for Longwalls 20-22 and Longwalls 23-27 were designed to monitor subsidence-induced impacts on aquatic ecology (referred to as stream monitoring) and the response of aquatic ecosystems to the implementation of potential future stream remediation works (referred to as pool monitoring). The locations of the monitoring sites are shown on Figure 14.

The Longwalls 308-310 Biodiversity Management Plan include post-mining monitoring and management of potential subsidence impacts and environmental consequences associated with Longwalls 20-22 and Longwalls 23-27. No additional aquatic ecology monitoring sites have been established for Longwalls 301-310.

Multivariate and univariate statistical procedures (Permutational Multivariate Analyses of Variance [PERMANOVA] and Plymouth Routines in Multivariate Ecological Research [PRIMER] software packages) are used to examine temporal and spatial patterns in macroinvertebrates and macrophytes sampled within the study area. Specifically, PERMANOVA's are used to test hypotheses related to differential changes (e.g. before-versus-after commencement of mining) in multivariate and univariate (e.g. total number of taxa, total abundance and abundances of the most important taxonomic groups identified from the samples) estimates occurring in streams or pools subject to mining (i.e. potential 'impact' streams), in comparison to independent streams or pools that are not subject to mine subsidence (i.e. control places).

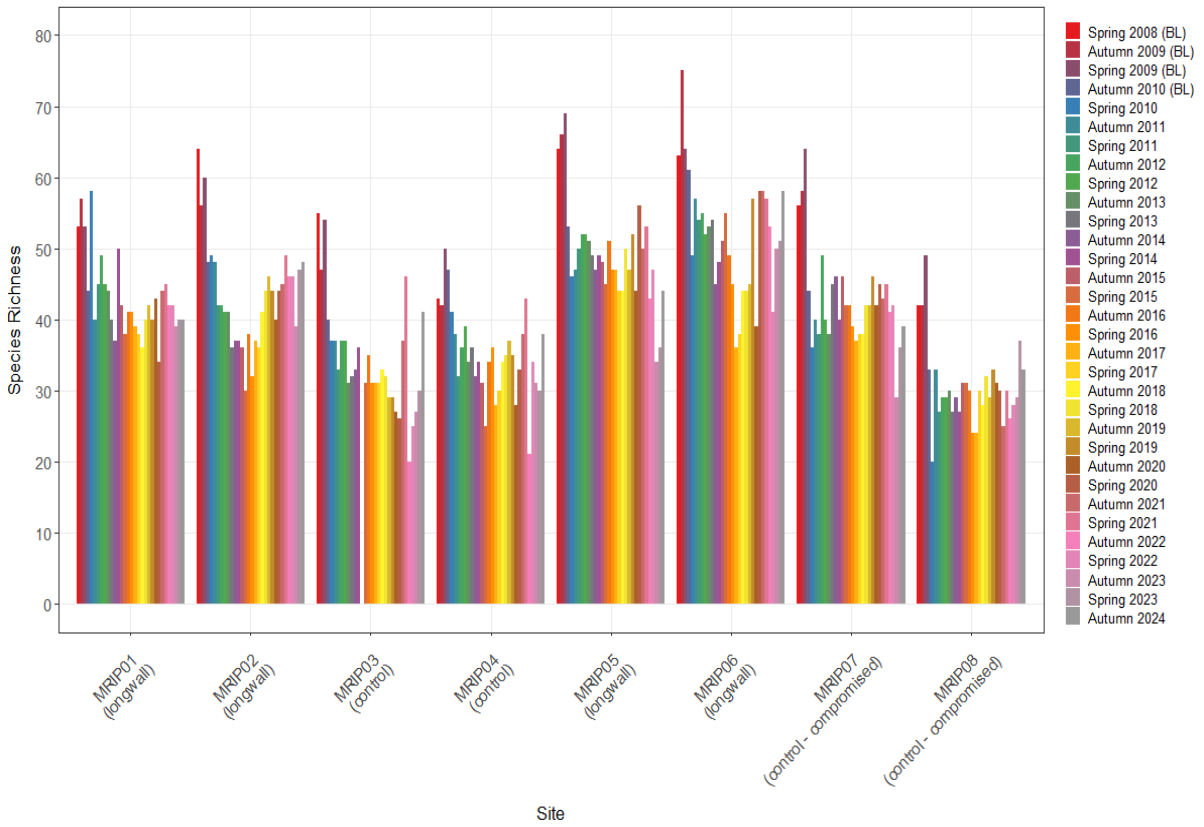


Chart 86 Native Species Richness within Riparian Monitoring Sites across All Seasons – Longwalls 20-22 Monitoring Program

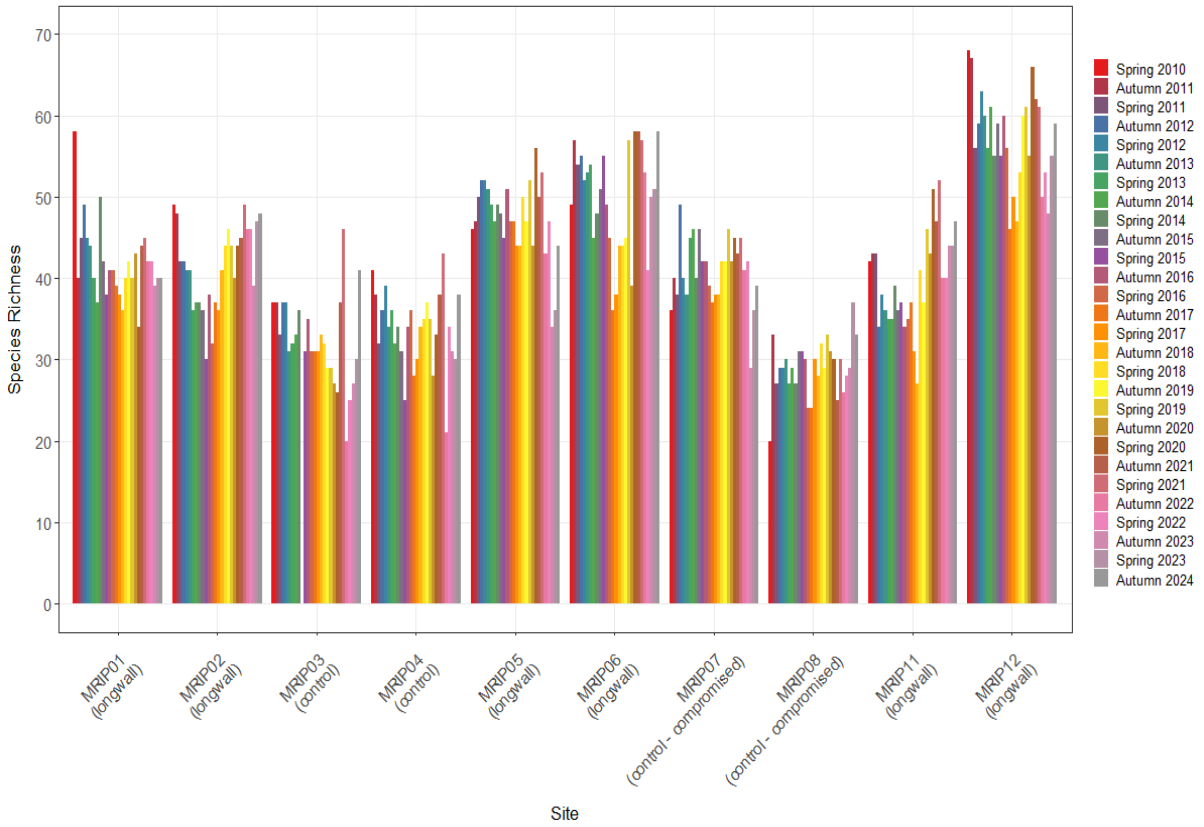


Chart 87 Native Species Richness within Riparian Monitoring Sites across All Seasons – Longwalls 23-27 Monitoring Program

The spring 2023 Longwalls 20-27 and autumn 2024 Longwalls 20-27 Aquatic Ecology Monitoring Reports prepared by Bio-Analysis Pty Ltd are provided in Appendices K1 and K2, respectively.

The results of the Longwalls 20-27 aquatic ecology programs (up to and including the autumn 2024 survey) are summarised below.

6.3.4.1 Stream Monitoring Program

Eastern Tributary

The results of the Longwalls 20-27 riparian vegetation monitoring surveys on the Eastern Tributary[9] in autumn 2024 can be summarised as follows:

- At Location C1, during autumn 2022, spring 2022, autumn 2023, spring 2023 and autumn 2024, quantitative analyses detected a significant mining-related impact to aquatic macroinvertebrate fauna, namely a reduction in mean numbers of the freshwater shrimp family, Atyidae, post-extraction of the Longwalls 20-22. Quantitative analyses have continued to find no changes to other performance indicators.
- At Location C2, there has been evidence of significant mining-related reductions in mean numbers of Atyidae post-extraction of the Longwalls 20-22, in spring 2015, autumn 2021, spring 2021, autumn 2022, autumn 2023, spring 2023 and autumn 2024. Multivariate analyses detected evidence of changes to the structure of assemblages of aquatic macroinvertebrates at Location C2 from spring 2019 to autumn 2023, but not subsequently, as a result of mining activities of Longwalls 23-27. Mean numbers of Atyidae collected were significantly fewer within survey periods between autumn 2016 and 2018 and between autumn 2020 and spring 2021, but not subsequently.
- At Location C3, statistical analyses have not detected significant changes in aquatic macroinvertebrate or aquatic macrophyte indicators that would indicate an impact from mining.
- At Location C4, analyses show that the structure of the macroinvertebrate assemblage sampled from spring 2019 to autumn 2023 surveys differed significantly from assemblages collected within the before-period. Temporal patterns in diversity of macroinvertebrates and mayflies (Leptophlebiidae) at Location C4 have become significantly variable between periods since autumn 2018, in relation to the control locations. Significantly fewer Atyidae were collected at Location C4 in autumn 2016, spring 2018, spring 2019 and autumn 2020, but not subsequently. The structure of the aquatic macrophyte assemblage at Location C4 has differed significantly from assemblages within the before-period since autumn 2018.

The subsidence impacts at Locations C2 and C4 have triggered an assessment against the biodiversity subsidence impact performance measure, *Negligible impact on threatened species, populations, or ecological communities*, which have been undertaken by Ecoplanning and Niche (Appendices J2 and J3). The assessments conclude that the subsidence impact performance measure has been met.

Waratah Rivulet

The results of the Longwalls 20-27 riparian vegetation monitoring surveys on the Waratah Rivulet in autumn 2024 can be summarised as follows:

- An iron precipitate/micro-organism complex has commonly been observed at Locations WT3, WT4 and WT5 since sampling commenced in spring 2008. Cracking of bedrock in the stream channel due to subsidence was first noted at Location WT3 in spring 2013. Mining-related cracking does not appear to have occurred at Locations WT4 or WT5.

[9] The Eastern Tributary is also known as Tributary C. Locations ET1 to ET4 shown on Figure 14 are the same as Locations C1 to C4 discussed in this section of the Annual Review, and in Appendices J1 and J2.

- To date, analyses comparing temporal changes in components of assemblages of macroinvertebrates and macrophytes at Locations WT3, WT4 and WT5 on the Waratah Rivulet with control locations have not detected significant changes that would indicate an impact during or after mining of the Longwalls 20-22 underground area.
- Univariate analyses, however, have detected a significant change in mean diversity of macroinvertebrates at Location WT3, in spring 2016, autumn 2018 and subsequent surveys (including autumn 2024). A significant mining related impact to mean numbers of Atyidae was detected at Location WT3 in spring 2021, autumn 2022, spring 2022, autumn 2023, spring 2023 and autumn 2024. Atyidae have declined significantly at WT3 but not at the control locations.
- There were no conspicuous differences in mean diversity at Locations WT4 or WT5 in relation to the control locations. Mean abundance of macroinvertebrates and mean numbers of Leptophlebiidae and Atyidae did not differ at Location WT4 or WT5 in relation to the control locations between the before- and after-mining periods.
- There were no detectable changes to aquatic macrophytes at the Waratah Rivulet locations in relation to the control locations that could be associated with mining.

The subsidence impacts at Location WT3 triggered an assessment against the biodiversity subsidence impact performance measure, *Negligible impact on threatened species, populations, or ecological communities*, which have been undertaken by Ecoplanning and Niche (Appendices J2 and J3). The assessments conclude that the subsidence impact performance measure has been met.

6.3.4.2 Pool Monitoring Program

Eastern Tributary

As described in the Longwalls 308-310 Biodiversity Management Plan, Pools ETAG, ETAH, ETAI and ETAK on the Eastern Tributary monitored by the previous pool monitoring program were impacted by mine subsidence in late 2016 or early 2017. Since that time, Pools ETAG, ETAH, ETAI and ETAK have often been dry or contained insufficient aquatic habitat for sampling as a result of the mine subsidence impacts. As described in Section 10.3.2, Metropolitan Coal is conducting stream remediation activities on the Eastern Tributary in accordance with the Metropolitan Coal Stream Remediation Plan.
Monitoring of Pools ETAG and ETAH will recommence subsequent to the conduct of stream remediation activities at Pool ETAH and will be conducted biannually[10]. Monitoring of Pools ETAI and ETAK will recommence subsequent to the conduct of stream remediation activities at Pool ETAK and will be conducted biannually[11].

The relevant control pools on the Woronora River (larger Pool WP and/or smaller Pools WP-A, WP-B and WP-C) and O'Hares Creek (larger Pool OC and/or smaller Pools OC-A, OC-B and OC-C) will be monitored biannually when sampling of the pools described above recommences.

[10] Monitoring will commence after the first stream remediation campaign at Pool ETAH has been conducted (i.e. once the stream remediation activities have moved from the site).

[11] Monitoring will commence after the first stream remediation campaign at Pool ETAK has been conducted (i.e. once the stream remediation activities have moved from the site).

6.3.4.3 Assessment of Subsidence Impacts and Environmental Consequences on Aquatic Habitats and Biodiversity

The key potential subsidence impacts and environmental consequences for streams described in the Project EA, Preferred Project Report and Metropolitan Coal Biodiversity Management Plans include impacts on aquatic habitats (e.g. alteration of hydrology, pool habitat, in-stream connectivity and water quality), and on biodiversity (e.g. aquatic macrophytes, macroinvertebrates, fish and riparian vegetation). In summary, the key potential environmental consequences described in the Project EA, Preferred Project Report, and Metropolitan Coal Biodiversity Management Plans include:

- Changes in stream flows as a result of fracturing of bedrock and the consequent diversion of a portion of the total stream flow as underflow. The effects of underflow would be most noticeable during periods of low flow and on the frequency of no flow, while the effects on the frequency and magnitude of high flows would be negligible.
- Changes in pool water levels and in-stream connectivity - underflow has been observed to result in lower water levels in pools as they become hydraulically connected with the fracture network. During prolonged dry periods when flows recede to low levels, the number of instances where loss of flow continuity between pools increases with a greater proportion of these lower flows being conveyed entirely in the subsurface fracture network.
- Impacts on water quality following cracking of the stream bed that can reduce the quality of habitat for aquatic biota (e.g. generation of iron flocculent material).
- Minor stream bank erosion, where changes in channel gradients result in increases in flow energy.
- Impacts on aquatic macrophytes plants (e.g. as a result of changes in hydrology described above) resulting in exposure and desiccation or smothering of plants by iron flocculent material. Aquatic macrophytes have evolved reproductive strategies to cope with the variable nature of flow in streams and wetlands within Australia. Obligate water plants generally require permanent water, however, they can recolonise once water becomes available again.
- Localised impacts on aquatic macroinvertebrates as a result of changes in aquatic habitat/hydrology described above. The Project is unlikely to have any significant long-term impacts on assemblages of macroinvertebrates.
- The conveyance of surface water flows to sub-surface fractures in the area affected by subsidence has the potential to reduce available habitat for fish and connectivity among sections of the stream channel, impeding fish passage.

The results of aquatic ecology monitoring are considered to be consistent with the potential subsidence impacts and environmental consequences described in the Project EA, Preferred Project Report and the Metropolitan Coal Water Management Plans and Biodiversity Management Plans.

The subsidence impacts on Locations C2, C4 and WT3 during the reporting period on the Eastern Tributary and Waratah Rivulet have triggered assessments against the biodiversity subsidence impact performance measure, *Negligible impact on threatened species, populations, or ecological communities*. The threatened flora and fauna assessments prepared by Ecoplanning and Niche are provided in Appendices J2 and J3, respectively. The assessments conclude that the subsidence impact performance measure has been met.

Subsidence impacts on Tributary B have resulted in no surface flow along the stream in the vicinity of Location B1 for an extended period of time. This change in aquatic habitat/hydrology has resulted in long term impacts to the aquatic macroinvertebrate assemblage at this location (Location B1) and downstream at Location B2. This has not resulted in an exceedance of the biodiversity subsidence impact performance measure, *Negligible impact on threatened species, populations or ecological communities*.

Metropolitan Coal will continue to conduct stream remediation of pools on the Eastern Tributary in accordance with the Metropolitan Coal Stream Remediation Plan (Section 10.3.2.).

6.3.5 Amphibian Surveys

Monitoring programs have been developed for Longwalls 20-22, Longwalls 23-27, Longwalls 301-307 and Longwalls 308-317 to monitor amphibian species, with a focus on the habitats of the two threatened species, Giant Burrowing Frog (*Heleiporus australiacus*) and Red-crowned Toadlet (*Pseudophryne australis*) associated with tributaries. The threatened species Littlejohn's Tree Frog (*Litoria littlejohni*) was located for the first time in 2016, and occasionally thereafter. The locations of the monitoring sites are shown on Figure 14.

In previous reporting periods four individual Amphibian Survey Reports were completed for Longwalls 20-22, Longwalls 23-27, Longwalls 301-307 and Longwalls 308-317. For this reporting period during spring/summer 2024, all four reports have been prepared and combined into one report by Cenwest Environmental Services (Cenwest) (Appendix L). The number of surveys and survey locations remain unchanged from previous years.

Sites are surveyed annually in spring/summer (i.e. October to February) during suitable weather conditions. The spring/summer 2023/2024 survey was carried out in two separate surveys each comprising six days and six nights, the first in November 2023 (19th – 25th). The second survey period was conducted in March 2024 (4th – 10th).

6.3.5.1 Longwalls 20-22 Amphibian Monitoring

The spring/summer 2023/2024 survey is the 14th amphibian survey for Longwalls 20-22. All six test sites above Longwalls 20-22 have been undermined for periods ranging from eight to eleven years (Figure 14). Habitats of five test sites (1, 2, 4, 5 and 6) have been impacted by longwall mining.

Three amphibian species were recorded by the spring/summer 2023/2024 survey, including three in test sites and two in control sites, being representatives from the two families *Myobatrachidae* and *Hylidae*. Species diversity across individual sites varied from one to two in test sites and from one to two in control sites. The most species-diverse sites, with two species present, were sites 1, 2, 3 and 10, followed by sites 4, 6, 7, 8 and 12 with one species observed during the 2023/2024 survey. Site 1 was unavailable for surveying in both 2021 and 2022 survey periods due to high river flows creating unsafe conditions. Individuals of the Giant Burrowing Frog have been recorded during the 2009 (1 control site), 2011 (1 test site, 1 control site), 2016 (1 control site) surveys and 2020 surveys (1 control site). No Giant Burrowing Frog individuals were recorded during the 2021 and 2022 survey periods but it was located as a tadpole in 2023 at Site 10. Littlejohn's Tree Frog was recorded for the first time for Longwalls 20-22, spring/summer 2017 survey at control site 10. In 2018 and 2020 it was observed again at sites 10 and 11, respectively. During the 2023/2024 survey period, the Common Eastern Froglet (*Crinia signifera)* was located at both test and control sites. The Bibron's Toadlet *(Psuedophryne bibrioni)* was observed at two test sites, and the Green Stream Frog *(Litoria phyllochroa) was located at a test site.* No breeding events were recorded in the spring/summer 2023/2024 survey. No breeding events were recorded for the Giant Burrowing Frog, Red-crowned Toadlet or Littlejohn's Tree Frog.

Since the commencement of the Longwalls 20-22 amphibian monitoring program, species diversity across all sites has varied between four (2022) and 11 (2009) species. At test sites, species diversity has varied between three (2018, 2022 and 2023) and nine (2009) species and at control sites, between two (2013 and 2023) and nine (2011) species. During the survey period, species diversity at test sites was given as three, and at control sites, was given as two.

6.3.5.2 Longwalls 23-27 Amphibian Monitoring

The spring/summer 2023/2024 survey is the 14th amphibian survey for Longwalls 23-27. All test sites above Longwalls 23-27 had been undermined prior to the commencement of the spring/summer 2016 survey. Habitats of two sites (13 and 14) have been impacted by longwall mining. However, both sites 13 and 14 have usually demonstrated a varying degree of amphibian species diversity when compared to the remaining survey sites over 14 survey years.

Five amphibian species were recorded by the spring/summer 2023/2024 survey, including five in test sites and two in control sites, being representatives from the two families *Myobatrachidae* and *Hylidae*. The most widespread frog was the Common Eastern Froglet, recorded at six sites. The Red-crowned Toadlet has been recorded at least once in each survey year except in 2017, 2022 and 2023. Littlejohn's Tree Frog was recorded for the first time for Longwalls 23-27 during the spring/summer 2017 survey at control site 18, and again at site 18 in 2019 but has not been recorded since. The Giant Burrowing Frog was located as tadpoles at site 22 during the 2021 survey period. One species previously observed for the first time in 2021, Bibron's Toadlet, was again located in 2022 at site 20 as adult toadlets. The Green Stream Frog not located between 2010 - 2017 was located for the first time in 2018, again in 2021 and 2022 but not in 2023. Other frogs not observed in this survey year (2023) but present in one or more of the preceding years 2010-2022, included Red-crowned toadlet, Spotted grass Frog, the Smooth Toadlet (*Uperoleia laevigata*), the Blue Mountains Tree Frog, the Jervis Bay Tree Frog, Broad-palmed Frog, Littlejohn's Tree frog, Lesueur's Frog and Stony Creek Frog (*Litoria wilcoxii).*

No breeding events were recorded in the spring/summer 2023 survey.

Since the commencement of the Longwalls 23-27 amphibian monitoring program, species diversity across all sites has varied between three (2017 and 2022) and eight (2010, 2019 and 2021). At test sites, species diversity has varied between two (2017 and 2022) and seven (2010 and 2015) species and at control sites, between one (2020) and seven (2019) species. During the survey period, species diversity at test sites was given as five, and at control sites, was given as two.

6.3.5.3 Longwalls 301-307 Amphibian Monitoring

Baseline amphibian surveys were conducted in spring/summer 2015 at six test sites (23, 24, 25, 26, 27 and 28) overlying Longwalls 301-304, and in spring/summer 2018 at two test sites overlying Longwalls 305-307 (Figure 14). The control sites for Longwalls 301-307 consist of the 11 existing sites associated with Longwalls 20-22 (sites 7-12) and Longwalls 23-27 (sites 18-22). The spring/summer 2023 survey was the ninth spring/summer survey for Longwalls 301-304, and the seventh survey conducted since the commencement of Longwalls 301-303.

At the time of the spring/summer 2023 surveys, Sites 23-30 overlying Longwalls 301-307 had been undermined.

In the spring/summer 2023 survey, three amphibian species were recorded at test sites. Brown-striped Frog (*Limnodynastes peronii*) was located at site 25, Smooth Toadlet was located at Site 25 and Common Eastern Froglet was located at sites 25-30. The Giant Burrowing Frog and Littlejohn's Tree Frog has not been located at test sites 23-30 over eight years.

No breeding events were recorded in the spring/summer 2023 survey. No breeding events were observed for the Red-crowned Toadlet, the Giant Burrowing Frog, Brown-striped Frog and Littlejohn's Tree Frog.

6.3.5.4 Longwalls 308-317 Amphibian Monitoring

Baseline surveying of six test sites associated with Longwalls 301–307 commenced in spring/summer 2015 with two additional survey sites added to the spring/summer 2018 survey. Nine additional sites were added to the amphibian monitoring program in spring/summer 2019, located in the vicinity of Longwalls 308-317 (Sites 31 to 39). At the time of the spring/summer 2023 surveys, Site 32 overlying Longwalls 308-317 had been undermined, and Sites 33 and 39 were within the 35-degree angle of draw.

In the spring/summer 2023 survey, three amphibian species were recorded at test sites; the Common Eastern frog as adults and tadpoles, the Brown Striped frog as adults and tadpoles, and Bibron's Toadlet as adults. No threatened species were located in the period 2019–2023. The Common Eastern Froglet was observed at Site 31 and Sites 36 and 37, the Brown-striped Frog was observed at Site 31 and 36, and the Bibron's Toadlet was observed at Site 36.

No species were observed breeding in spring/summer 2023 survey. The total number of sites used by all species, 2019-2023 is 17/27 sites. The total breeding events for test sites over four years is 10. The species with no breeding events observed over three years at each site varied from 13-17.

6.3.5.5 Statistical Analysis of Amphibian Monitoring Results

A feature of the amphibian surveys to date is the high numbers of zero records that dominate the data, indicating a non-normal distribution (i.e. a skewed distribution of data). This means that the results of the amphibian surveys cannot be analysed by simple parametric statistics such as Chi^2 or an ANOVA. A Poisson regression[12] analysis has been carried out by Dr Bernard Ellem for Cenwest to analyse the amphibian survey results obtained to date (i.e. to spring/summer 2023). The four data sets (Longwalls 20-22, 23-27, 301-307 and 308-317) have been analysed together to increase the resolution of the analyses.

Data gathered from 2009 – 2023, indicated no adverse impact from mining had been detected for the amphibian assemblage at the 95% confidence level based on abundance and diversity measures for Longwalls 20-22, 23-27, 301-307 and 308-317, including the Giant Burrowing Frog, the Red-crowned Toadlet and Littlejohn's Tree Frog.

Notwithstanding, and as reported previously in the Metropolitan Coal 2018, 2019, 2020, 2021, 2022 and 2023 Annual Reviews, a significant difference between the test and control sites at the 95% confidence level at sites 15, 16 and 17 for the spring/summer 2014 survey was initially detected by analyses undertaken following the Longwalls 23-27 spring/summer 2017 survey. The impact was not detected by the Poisson regression analyses conducted following the 2014, 2015 and 2016 surveys and may be a result of the improved capacity of the model over time as the data set builds. However, an ongoing impact could not be detected in the three subsequent years – 2015, 2016 and 2017.

Statistical analysis for the 2024 survey period has determined there are significant differences between test and control sites at the 95% confidence level. Thus, the Performance Indicator, '*The amphibian assemblage at mined sites is not expected to experience changes significantly different to the amphibian assemblage at control sites'*, has been (technically) exceeded. This difference has been determined by using the equivalent of a t-test used in parametric statistical analysis.

However, the Performance Indicator refers to the amphibian assemblage (17 amphibian populations) as a whole. Hence whilst an exceedance has been detected, it is not possible to determine which species have been impacted by longwall mining, nor can it be determined if the three threatened species have been adversely impacted.

[12] Poisson regression is a generalised linear model form of regression analysis used to model count data and contingency tables.

Assuming that there is a similar distribution of amphibian species across the Woronora Plateau as occurs above the mining domain, any adverse impact of mining, is likely diluted at landscape level.

Other factors that are of interest in interpreting the analysis include:

- Additional analysis carried out by Dr Ellem Bernard suggests that there is some evidence that independent of potential adverse impacts from mining on the amphibian population, the amphibian population is in slow decline. However, more data are needed to confirm this possibility.
- It is very unlikely that significant variability in weather events could explain an adverse impact since handling variability is built into the experimental design and the analysis.
- This year's analysis particularly homed in on test sites where potential impact pathways have been observed such as loss of flow in streams, cracking across streams, and diversion of stream flows. The results show there is a reduction in amphibian populations at Physical Impact Sites.
- The available data cannot distinguish between species including threatened species, but only if there has been an impact on the population as a whole. This understanding is built into the null hypothesis i.e. '*The amphibian assemblage at mined sites is not expected to experience changes significantly different to the amphibian assemblage at control sites'*.

Amelioration of impacts of mining on amphibians requires the protection of groundwater levels in swamps, and re-establishing water flow in permanent creeks where an impact has occurred. It is recommended that the crack sealing (i.e. stream remediation) that has been carried out should continue to be undertaken in accordance with the approved Stream Remediation Plan.

An amphibian monitoring program is required to assist the approval process for the mine to the year 2030. The results of 15 years survey provide an excellent baseline of amphibian populations within Woronora Catchment Area and above the previous Longwalls. A revision of this survey methodology to monitor the new proposed Longwall 311-316 mining area is proposed by Metropolitan Coal to place greater focus on threatened amphibians and their habitat. As part of a redesign of amphibian monitoring it is advised that new survey methods be adopted that would reduce the time period for comparative results (i.e. enable before, after, control, impact analysis) and focus survey effort on the three threatened species.

In addition, it has been recommended that the three threatened species within the proposed mine area be monitored closely, remembering that in order to determine a statistical difference to baseline (control) sites these latter will require survey at the same survey method and intensity. To this end the 2009-2024 Survey found several baseline areas which would serve this purpose namely Bee Creek Swamp, Woronora Swamp and Honeysuckle Creek.

6.4 LAND MANAGEMENT

The Metropolitan Coal Longwalls 308-310 Land Management Plan was prepared to manage the potential environmental consequences of Longwalls 308-310 extraction on cliffs, overhangs, steep slopes and land in general in accordance with Condition 6, Schedule 3 of the Project Approval.

The Metropolitan Coal Longwalls 311-316 Land Management Plan was prepared to manage the potential environmental consequences of Longwalls 311-316 extraction on cliffs, overhangs, steep slopes and land in general in accordance with Condition 6, Schedule 3 of the Project Approval.

The Longwalls 311-316 Land Management Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences associated with Longwalls 20-27, Longwalls 301-303, Longwall 304, Longwalls 305-307 and Longwalls 308-310.

Sections 6.4.1 and 6.4.2 provide a summary of the land assessments for the reporting period. Section 6.8 provides a summary of the assessments against the cliffs and overhangs, steep slopes and land in general subsidence impact performance indicators and measures for the reporting period.

6.4.1 Cliffs and Overhangs

Visual inspections of cliffs and overhangs were conducted monthly when mining of Longwalls 20-22 and/or Longwalls 23-27 were within 400 m of sites COH1, COH2, COH3, COH4, COH5, COH6, COH6A, COH7, COH8, COH9, COH10, COH14, COH15 and COH16 (Figure 16) and following the completion of each longwall to record evidence of subsidence impacts. A vertical tension crack (approximately 50 mm wide and 15 m long) on the cliff face and a small rock fall (approximately 1.5 m long, 0.5 m wide and 0.5 cubic metres) were recorded at site COH2 (Figure 16) in December 2013 during the mining of Longwall 22. No additional subsidence impacts at the cliff or overhang sites were recorded following the completion of Longwall 27.

Visual inspections of sites COH9, COH10, COH11, COH12, COH13 and COH16 were conducted monthly when mining of Longwall 308-310 were within 450 m of the site and following the completion of Longwall 308-310. No subsidence impacts at any of the sites were identified during the reporting period.

Visual inspections for subsidence impacts will be conducted at sites COH10, COH11, COH12, COH13, COH18 and COH19 during and after the extraction of Longwalls 311, in accordance with the Longwalls 311-316 Land Management Plan.

The Project EA, Preferred Project Report and Metropolitan Coal Land Management Plans predicted that the length of potential cliff instabilities would be expected to be less than 3% of the lengths of the cliffs. The total length of cliffs and associated overhangs within the Project underground mining area is approximately 1,069 m. Less than 3% of the total length of cliffs (and associated overhangs) within the mining area have experienced mining-induced rock fall.

6.4.2 Steep Slopes and Land in General

Visual inspections for subsidence impacts on steep slopes and land in general are conducted by Metropolitan Coal and its contractors as part of routine works conducted in the catchment.

No subsidence impacts on steep slopes or land in general were identified by Metropolitan Coal or its contractors during the reporting period. No management measures were required to be implemented.

The recorded subsidence impacts are consistent with the potential subsidence impacts described in the Project EA, Preferred Project Report and Metropolitan Coal Land Management Plans. The size and extent of surface cracking at the steep slopes and land in general would be similar to that observed previously at Metropolitan Coal, and that the maximum predicted systematic strains would be of sufficient magnitude to result in the fracturing of sandstone and, hence, there is potential for rock falls, particularly where rock ledges are marginally stable.

6.5 HERITAGE MANAGEMENT

The Metropolitan Coal Longwalls 308-310 Heritage Management Plan was prepared to manage the potential environmental consequences of the Longwalls 308-310 Extraction Plan on Aboriginal heritage sites or values in accordance with Condition 6, Schedule 3 of the Project Approval.

The Metropolitan Coal Longwalls 311-316 Heritage Management Plan was prepared to manage the potential environmental consequences of the Longwalls 311-316 Extraction Plan on Aboriginal heritage sites or values in accordance with Condition 6, Schedule 3 of the Project Approval.

The Longwalls 311-316 Heritage Management Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences associated with Longwalls 20-22, Longwalls 23-27, Longwalls 301-303, Longwall 304, Longwalls 305-307 and Longwalls 308-310.

Sections 6.5.1 and 6.5.2 provide a summary of the heritage assessments for the reporting period. Section 6.8 provides a summary of the assessments against the Aboriginal heritage sites subsidence impact performance indicators and measures.

6.5.1 Longwalls 20-27, Longwalls 301-303 and Longwall 304

Aboriginal heritage monitoring programs have been implemented at Metropolitan Coal for Longwalls 20-22, Longwalls 23-27, Longwalls 301-303 and Longwall 304 to monitor the impacts and environmental consequences of Project related subsidence on Aboriginal heritage sites. The monitoring programs have been undertaken by a suitably qualified archaeologist (with experience in rock art recording and management) and representatives of the Aboriginal stakeholders.

Of the 77 Aboriginal heritage sites that have been subject to monitoring for Longwalls 20-22, Longwalls 23-27, Longwalls 301-303 and/or Longwall 304, 13 have been determined to have changes due to mining induced subsidence.

Five Aboriginal heritage sites (FRC 15, FRC 281, FRC 283, FRC 284 and MET 1) have been determined to have changes due to mining induced subsidence from Longwalls 20-22 (Figure 17). The observed impacts at each site were as follows:

- Site FRC 15 – vertical cracking, not coincident with any art.
- Site FRC 281 – multiple cracks running either through or adjacent to the motifs (although the majority of art showed no damage or changes).
- Site FRC 283 – cracking of the rear wall of the shelter, not coincident with any art.
- Site FRC 284 – fracturing of the rear wall of the shelter and exfoliation, not coincident with any art.
- Site MET 1 – two vertical cracks along the rear wall and ceiling of the shelter, not coincident with any art.

Seven Aboriginal heritage sites (FRC 28, FRC 29, FRC 34, FRC 60, FRC 176, FRC 275 and FRC 301) have been determined to have changes due to mining induced subsidence from Longwalls 23-27 (Figure 17). The observed impacts at each site were as follows:

- Site FRC 28 – vertical cracking of the rear shelter wall, opening of horizontal planes/joints and movement of the rock shelf that is part of the shelter floor, not coincident with any art.
- Site FRC 29 – horizontal crack along the back wall and a joining vertical crack, not coincident with any art.
- Site FRC 34 – horizontal cracking along the roof of the shelter and cracking over the most southern hand stencil on the back panel.
- Site FRC 60 – three vertical cracks along the back wall of the shelter, no art recorded at this shelter, the artefacts could not be relocated.
- Site FRC 176 – where vertical cracking along the northern and southern ends of the shelter was observed, not coincident with art.
- Site FRC 275 – opening of horizontal bedding plane at rear of the shelter, five vertical hairline cracks along the back wall of the shelter, not coincident with any art.
- Site FRC 301 – surface cracking on the rock platform, not coincident with the grinding grooves.

One Aboriginal heritage site, FRC 76, was determined to have changes due to mining induced subsidence from Longwalls 301-303. The observed impacts were as follows:

- Site FRC 76 – opening of the horizontal bedding plane along the back wall, not coincident with any art.

The Longwall 304 monitoring survey found there were no further changes from mining observed at FRC 76 and no subsidence related changes were observed at site FRC 77, FRC 78, FRC 86, FRC 90 and FRC 309.

Aboriginal heritage site monitoring results for Longwalls 20-27 and Longwalls 301-304 have been assessed against the Aboriginal heritage subsidence impact performance measure:

> *Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts.*

For the purpose of measuring performance against the Aboriginal heritage subsidence impact performance measure, sites are considered to be "affected by subsidence impacts" if they exhibit one or more of the following consequences that cannot be attributed to natural weathering or deterioration:

- overhang collapse;
- cracking of sandstone that coincides with Aboriginal art or grinding grooves; and
- rock fall that damages Aboriginal art.

The mining area is defined by the Project Approval and is shown on Figure 1 of this report (labelled as Project Underground Mining Area Longwalls 20-27 and 301-317). There are 189 Aboriginal heritage sites within the mining area.

Of the sites at which changes due to mining induced subsidence have occurred, sites FRC 34 and FRC 281 have been affected by subsidence impacts as a result of cracking of sandstone that coincides with Aboriginal art. This means that less than 2% of sites within the mining area have been affected by subsidence impacts. In addition to the changes recorded as a result of mining induced subsidence, natural weathering processes can also result in changes/deterioration of Aboriginal heritage sites.

Metropolitan Coal acknowledges that all Aboriginal heritage sites are considered to be culturally significant to the Aboriginal people who have a traditional connection to Country.

The Aboriginal heritage monitoring results are consistent with the potential subsidence impacts and environmental consequences described in the Project EA, Preferred Project Report and Metropolitan Coal Heritage Management Plans, including the potential for open sites and overhang sites to be impacted by the cracking of sandstone resulting from mine subsidence. The observed rate of subsidence effects at the time of the Project EA and Preferred Project Report was that up to 10% of sites experienced an effect such as cracking, accelerated weathering or blockfall. It was expected that the majority of identified Aboriginal heritage sites would experience no significant change, particularly when compared to natural deteriorating processes unrelated to mining.

6.5.2 Longwalls 305-307

In accordance with the Metropolitan Coal Longwalls 305-307 Heritage Management Plan, monitoring of Aboriginal heritage sites FRC 67, FRC 68, FRC 70, FRC 71, FRC 76, FRC 77, FRC 78, FRC 85, FRC 86, FRC 87, FRC 90, FRC 91, FRC 93, FRC 117, FRC 309, FRC 310 and FRC 325 was undertaken within three months of the completion of Longwall 305.

The Longwall 305 monitoring survey found there were no further changes from mining observed at FRC 76 and no subsidence related changes were observed at sites FRC 67, FRC 68, FRC 70, FRC 71, FRC 77, FRC 78, FRC 85, FRC 86, FRC 87, FRC 90, FRC 91, FRC 93, FRC 117, FRC 309, FRC 310 and FRC 325.

In accordance with the Metropolitan Coal Longwalls 305-307 HMP, monitoring of Aboriginal heritage sites FRC 67, FRC 68, FRC 70, FRC 71, FRC 76, FRC 77, FRC 78, FRC 85, FRC 86, FRC 87, FRC 90, FRC 91, FRC 93, FRC 117, FRC 309, FRC 310, FRC 325, FRC 97, FRC 101, FRC 180, FRC 254, FRC 311, FRC 316, FRC 320, FRC 321, and FRC 325 was undertaken for Longwall 306 in August 2022 after delays due to ongoing heavy rainfall events between January and July 2022 and resultant catchment closures enforced by WaterNSW.

The Longwall 306 Aboriginal Cultural Heritage Monitoring Report found that no mining related changes were recorded at sites FRC 67, FRC 68, FRC 70, FRC 71, FRC 76, FRC 77, FRC 78, FRC 85, FRC 86, FRC 87, FRC 90, FRC 91, FRC 93, FRC 117, FRC 309, FRC 310, FRC 325, FRC 97, FRC 101, FRC 180, FRC 254, FRC 311, FRC 316, FRC 320, FRC 321, and FRC 325.

6.5.3 Longwalls 308-310

In accordance with the Metropolitan Coal Longwalls 308-310 Heritage Management Plan, monitoring of Aboriginal heritage sites FRC 67, FRC 68, FRC 70, FRC 71, FRC 87, FRC 93, FRC 94, FRC 97, FRC 101, FRC 180, FRC 184, FRC 185, FRC 186, FRC 187, FRC189, FRC 191, FRC 194, FRC 195, FRC 198, FRC 199, FRC 254, FRC 310, FRC 311, FRC 313, FRC 316, FRC 323, FRC 324, FRC 340, FRC 344, FRC 345 and MET 6 was undertaken within three months of the completion of Longwall 308. None of the Aboriginal sites were observed to display changes or mining related impacts.

The Longwall 309 monitoring surveys found there were no subsidence related changes observed at sites FRC 67, FRC 68, FRC 70, FRC 71, FRC 87, FRC 93, FRC 94, FRC, 95, FRC 97, FRC 101, FRC 164, FRC 180, FRC 184, FRC 185, FRC 186, FRC 187, FRC 189, FRC 191, FRC 194, FRC 195, FRC 198, FRC 199, FRC 254, FRC 310, FRC 311, FRC 312, FRC 313, FRC 314, FRC 315, FRC 316, FRC 317, FRC 323, FRC 324, FRC 340, FRC 244, FRC 345, NEW 1, NEW 2, NEW 10, NEW 22, NT 33, NT 34, NT 3 and MET 6.

Aboriginal heritage site monitoring results for Longwalls 20-27 and 301-310 have been assessed against the Aboriginal heritage subsidence impact performance measure:

> *Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts.*

For the purpose of measuring performance against the Aboriginal heritage subsidence impact performance measure, sites are considered to be “affected by subsidence impacts” if they exhibit one or more of the following consequences that cannot be attributed to natural weathering or deterioration:

- overhang collapse;
- cracking of sandstone that coincides with Aboriginal art or grinding grooves; and
- rock fall that damages Aboriginal art.

The mining area is defined by the Project Approval and is shown on Figure 1 of this report (labelled as Project Underground Mining Area Longwalls 20-27 and 301-317). There are 189 Aboriginal heritage sites within the mining area.

Of the sites at which changes due to mining induced subsidence have occurred, sites FRC 34 and FRC 281 have been affected by subsidence impacts as a result of cracking of sandstone that coincides with Aboriginal art. This means that less than 2% of sites within the mining area have been affected by subsidence impacts. In addition to the changes recorded as a result of mining induced subsidence, natural weathering processes can also result in changes/deterioration of Aboriginal heritage sites.

Metropolitan Coal acknowledges that all Aboriginal heritage sites are considered to be culturally significant to the Aboriginal people who have a traditional connection to Country.

6.6 BUILT FEATURES MANAGEMENT

The Metropolitan Coal Longwalls 308-310 Built Features Management Plan was prepared to manage the potential environmental consequences of the Metropolitan Coal Longwalls 20-22, Longwalls 23-27 Longwalls 301-303, Longwall 304 and Longwalls 305-307 Extraction Plans on built features in accordance with Condition 6, Schedule 3 of the Project Approval.

The Metropolitan Coal Longwalls 311-316 Built Features Management Plan was prepared to manage the potential environmental consequences of the Metropolitan Coal Longwalls 20-22, Longwalls 23-27 Longwalls 301-303, Longwall 304, Longwalls 305-307 and Longwalls 311-316 Extraction Plans on built features in accordance with Condition 6, Schedule 3 of the Project Approval.

During the reporting period, Metropolitan Coal continued subsidence monitoring to infrastructure in consultation with the infrastructure owners. The maximum observed total conventional subsidence along the 300 XL Line West was slightly greater than predicted for the reporting period. The maximum observed incremental and total subsidence and tilt due to the extraction of Longwall 310 are slightly greater than predicted. The maximum observed incremental and total tensile and compressive strain are greater than predicted.

As a result, the Sydney Water pipelines and TfNSW infrastructure are at Level 1 significance in accordance with the relevant Metropolitan Coal Longwalls 308-310 Built Features Management Plan TARP (Table 10).

During the reporting period, the following non-survey monitoring occurred:

- Water Pipeline – visual inspections of pipeline route.
- Visual inspection of M1 Motorway cuttings, culverts and bridges.

Monitoring of infrastructure owned by TfNSW and Sydney Water was conducted during the reporting period for subsidence impacts. Monitoring for TfNSW and Sydney Water concluded at the completion of Longwall 310 in keeping with the Built Features Management Plans.

The Project Approval requires Metropolitan Coal not to exceed the following built features subsidence impact performance measure:

> *Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing.*

The built features subsidence impact performance measure was not exceeded during the reporting period.

The Project Approval also requires Metropolitan Coal not to exceed the subsidence impact performance measure for items of heritage or historical significance at the Garrawarra Centre:

> *Negligible damage (fine or hairline cracks that do not require repair), unless the owner of the item and the appropriate heritage authority agree otherwise in writing.*

The subsidence impact performance measure for items of heritage or historical significance at the Garrawarra Centre was not exceeded during the reporting period.

6.7 PUBLIC SAFETY MANAGEMENT

The Metropolitan Coal Longwalls 308-310 Public Safety Management Plans were prepared to manage the potential consequences of the Metropolitan Coal Longwalls 308-310 Extraction Plan on public safety within the underground mining areas in accordance with Condition 6, Schedule 3 of the Project Approval.

The Metropolitan Coal Longwalls 311-316 Public Safety Management Plans were prepared to manage the potential consequences of the Metropolitan Coal Longwalls 311-316 Extraction Plan on public safety within the underground mining areas in accordance with Condition 6, Schedule 3 of the Project Approval.

Monitoring of cliffs and overhangs, steep slopes and land in general has been conducted for subsidence impacts in accordance with the Metropolitan Coal Longwalls 308-310 and Longwalls 311-316 Land Management Plan. Monitoring of infrastructure items has been conducted in accordance with the Metropolitan Coal Built Features Management Plans. No subsidence impacts were identified during the reporting period that were considered to pose a risk to public safety.

Further, no subsidence safety incidents were reported by visitors, personnel or contractors to Metropolitan Coal in the underground mining area during the reporting period.

6.8 ASSESSMENT OF ENVIRONMENTAL PERFORMANCE

The subsidence impact performance indicators and performance measures in Table 10 were developed to address the predictions of subsidence impacts and environmental consequences on water resources, watercourses, biodiversity, land, heritage, built features and public safety included in the Project Environmental Assessment, Preferred Project Report, and Metropolitan Coal Longwalls 308-310 and Longwalls 311-316 Extraction Plan.

Assessments against the subsidence impact performance indicators and performance measures have been conducted for the reporting period in Table 10.

Table 10
Assessment of Environmental Performance – Underground Mining Area and Surrounds

Performance Measure	Performance Indicator	Monitoring Site(s) Being Assessed	Parameters	Highest Significance Level/Trigger Recorded		Comments	Subsidence Impact Performance Indicator Exceeded?	Subsidence Impact Performance Measure Exceeded?
WATER MANAGEMENT								
Negligible Reduction to the Quantity of Water Resources Reaching the Woronora Reservoir								
Negligible reduction to the quantity of water resources reaching the Woronora Reservoir	*Changes in the quantity of water entering Woronora Reservoir are not significantly different post-mining compared to pre-mining, that are not also occurring in the control catchment(s)*	WaterNSW gauging station on Waratah Rivulet (GS 2132102)	Surface water flow	Level 1	The median of the ratios does not fall below the 35th percentile of the baseline data.	Surface water flow was at Level 1 throughout the reporting period.	No	No
Negligible Reduction to the Quality of Water Resources Reaching the Woronora Reservoir								
Negligible reduction to the quality of water resources reaching the Woronora Reservoir	*Changes in the quality of water entering Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations that are not also occurring at control site WOWQ2*	Site WRWQ9 on the Waratah Rivulet	Iron (Fe) Manganese (Mn) Aluminium (Al) [Field filtered]	Level 1	Data analysis indicates no water quality parameter exceeds the adjusted baseline mean plus two standard deviations.	Dissolved iron, dissolved aluminium and dissolved manganese were at Level 1 throughout the reporting period.	No	No
		Site ETWQ AU on the Eastern Tributary	Iron (Fe) Manganese (Mn) Aluminium (Al) [Field filtered]	Level 1	Data analysis indicates no water quality parameter exceeds the adjusted baseline mean plus two standard deviations.	Dissolved iron was at Level 1 from January to April and August to December 2024. Dissolved aluminium was at Level 1 from January to April and June to December 2024	No	No
				Level 2	Data analysis indicates any water quality parameter exceeds the adjusted baseline mean plus two standard deviations for one month.	Dissolved aluminium was a Level 2 in May 2024. Dissolved manganese was a Level 2 in March 2024.	No	No
				Level 3	Data analysis indicates: • any water quality parameter exceeds the adjusted baseline mean plus two standard deviations for two consecutive months; or • over a three month period the water quality parameter exceeds the adjusted mean plus two standard deviations in the first month, the adjusted mean plus one standard deviation in the next month and the adjusted mean plus two standard deviations in the third month; or • the six month mean exceeds the adjusted baseline mean plus one standard deviation for two consecutive assessment periods (i.e. over two six monthly reports); and there was not a similar exceedance of the trigger at the control site.	Dissolved iron was at a Level 3 From May to July 2024. Dissolved manganese was at Level 3 from January, February and April to December 2024.	Yes	No Assessments conducted by Associate Professor Barry Noller (Appendix F)

Table 10 (Continued)
Assessment of Environmental Performance – Underground Mining Area and Surrounds

Performance Measure	Performance Indicator	Monitoring Site(s) Being Assessed	Parameters	Highest Significance Level/Trigger Recorded		Comments	Subsidence Impact Performance Indicator Exceeded?	Subsidence Impact Performance Measure Exceeded?
WATER MANAGEMENT (Continued)								
No Connective Cracking Between the Surface and the Mine and Negligible Leakage from Woronora Reservoir								
No connective cracking between the surface and the mine	*Visual inspection does not identify abnormal water flow from the goaf, geological structure, or the strata generally*	Underground	Inspections of development workings for water accumulation	Level 1	Normal water flow identified from the goaf, geological structure, or the strata generally.	-	No	No
	The 20-day average mine water make does not exceed 1 ML/day	Underground	• Metered water reticulated into the mine (mine inflow) • Metered water reticulated out of the mine (mine outflow) • Moisture content into and out of the mine through the mine ventilation system (mine inflow and outflow) • In-situ moisture content of the coal (mine inflow) • Moisture content of ROM coal conveyed out of the mine at the drift portal (mine outflow)	Level 1	20-day average mine water make is less than or equal to 0.5 ML/day.	The 20-day average daily mine water make was approximately 0.12 ML/day during the reporting period.	No	No
	Significant departure from the predicted envelope of the vertical potentiometric head profile at Bore PHGW2A does not occur.	Bore PHGW2A	Groundwater pressures/levels	Level 1	PHGW2A Head Profile is consistent with the shape of and does not lie significantly to the left of the predicted High Inflow Model Curve.	-	No	No
	Significant departure from the predicted envelope of the vertical potentiometric head profile at Bore PM02 does not occur	Bore PM02	Groundwater pressures/levels	Level 1	PM02 Head Profile is consistent with the shape of and does not lie significantly to the left of the predicted High Inflow Model Curve.	-	No	No
	Significant departure from the predicted envelope of the vertical potentiometric head profile at Bore PM01 does not occur	Bore PM01	Groundwater pressures/levels	Level 1	PM01 Head Profile is consistent with the shape of and does not lie significantly to the left of the predicted High Inflow Model Curve.	-	No	No

Table 10 (Continued)
Assessment of Environmental Performance – Underground Mining Area and Surrounds

Performance Measure	Performance Indicator	Monitoring Site(s) Being Assessed	Parameters	Highest Significance Level/Trigger Recorded		Comments	Subsidence Impact Performance Indicator Exceeded?	Subsidence Impact Performance Measure Exceeded?
WATER MANAGEMENT (Continued)								
No Connective Cracking Between the Surface and the Mine and Negligible Leakage from Woronora Reservoir (Continued)								
No connective cracking between the surface and the mine **Negligible leakage from the Woronora Reservoir**	*The hydraulic gradient to the Woronora Reservoir at full supply level from Bore PHGW2A is reduced by no more than 40% from that measured to 30 June 2017.*	Bore PHGW2A (97.5 m)	Groundwater pressures/levels	Level 1	PHGW2A >= 186.92 m AHD.	-	No	No
	The hydraulic gradient to the Woronora Reservoir at full supply level from Bore 9EGW2A is reduced by no more than 40% from that measured to 30 June 2017.	Bore 9EGW2A (107.5 m)	Groundwater pressures/levels	Level 2	9EGW2A < 186.32 m AHD and > 179.35 m AHD	Bore 9EGW2A was at Level 2 from January to June 2024.	No	No
	The hydraulic gradient to the Woronora Reservoir at full supply level from Bore 9EGW2A is reduced by no more than 40% from that measured to 30 June 2017.	Bore 9EGW2A (107.5 m)	Groundwater pressures/levels	Level 3	9EGW2A <=179.35 m AHD	9EGW2A was turned off to allow the passage of Longwall 311 between June and October 2024. After re-connection, the water level was at Significance Level 3 but returned to Level 2 following rainfalls on 8 December 2024.	Yes	No Assessment against the performance measure conducted by SLR (2024) (Appendix H)
	The hydraulic gradient to the Woronora Reservoir at full supply level from Bore PM02 is reduced by no more than 40% from that measured to 30 June 2017.	*Bore PM02* *(100 m)*	Groundwater pressures/levels	Level 1	PM02 ≥ 183.86 m AHD.	-	No	No
	The hydraulic gradient from transect bore T5 to bore T3 is reduced by no more than 10% from that measured on 30 June 2017	*Bores T5 to T3*	Groundwater levels	Level 3	T5-T3 =< 16.13 m	The T5-T3 TARP was at level 3 from January to June 2024.	Yes	No Assessment against the performance measure conducted by SLR (2024). Investigation to be undertaken in Q3 2024. (Appendix G)
	The hydraulic gradient from transect bore T5 to bore T2 does not reduce outside the range seen during the baseline period.	*Bores T2 and T5*	Groundwater levels	Level 1	T5 - T2 >= 7.82 m	The T5-T2 TARP was at level 1 from July to December 2024.	No	No
	The hydraulic gradient from transect bore T2 to the Woronora Reservoir remains positive (towards the Reservoir).	*Bore T2 and the Woronora Reservoir*	Groundwater levels	Level 1	T2 - Woronora Reservoir Level > 0 m	The T2 TARP was at level 1 from July to December 2024.	No	No

Table 10 (Continued)
Assessment of Environmental Performance – Underground Mining Area and Surrounds

Performance Measure	Performance Indicator	Monitoring Site(s) Being Assessed	Parameters	Highest Significance Level/Trigger Recorded		Comments	Subsidence Impact Performance Indicator Exceeded?	Subsidence Impact Performance Measure Exceeded?
WATER MANAGEMENT (Continued)								
Negligible Reduction to the Quality of Water Resources in the Woronora Reservoir								
Negligible reduction in the water quality of Woronora Reservoir	*Changes in the quality of water in the Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations*	Woronora Reservoir (site DW01) (subject to data availability from WaterNSW)	Total Manganese (Mn)	Level 2	The current year's duration exceedance curve for a water quality parameter in Woronora Reservoir (total iron, total manganese and total aluminium) is above the baseline 10 year ARI but below the baseline 20 year ARI exceedance curve for any range of the duration percentages from 0% to 75%.	Total manganese was above the baseline 10 year ARI exceedance curve.	Yes	No Assessment against the performance measure conducted by ATC Williams (2025) (Appendix B2)
			Total Aluminium (Al) Total Iron (Fe)	Level 3	The current year's duration exceedance curve for a water quality parameter in Woronora Reservoir (total iron, total manganese and total aluminium) is above the baseline 20 year ARI exceedance curve for any range of the duration percentages from 0% to 75%.	Total iron and aluminium were above the baseline 20 year ARI exceedance curve.		
Negligible Environmental Consequences on Waratah Rivulet								
Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P)	***No Diversion of Flows, No Change in the Natural Drainage Behaviour***							
	No change to the natural drainage behaviour of Pools P, Q, R, S, T, U, V and W	Pools P to W on Waratah Rivulet	Streambed cracking and drainage behaviour	Level 1	No mine-induced surface cracking or impacts to natural drainage behaviour observed.	Pools P to W were at Level 1 throughout the reporting period.	No	No
	Analysis of water level data for Pools P, T, U, V and W indicates the water level is at or above the pool's previous minimum	Pools P, T, U, V and W on Waratah Rivulet	Pool water level	Level 1	The water level in Pools P, T, U, V or W has not been below the pool's previous minimum.	Pools P to W were at Level 1 throughout the reporting period.	No	No
	Analysis of water level data for Pools Q, R and S indicates the water levels are above that required to maintain water over the downstream rock bar	Pools Q, R and S on the Waratah Rivulet	Pool water level	Level 1	The water level in Pools Q, R or S has been above that required to maintain water over the downstream rock bar.	Pools Q, R and S were at Level 1 throughout the reporting period.	No	No
Negligible Environmental Consequences on Waratah Rivulet								
Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P)	***Minimal Iron Staining***							
	Visual inspection of the Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir does not show significant changes in the extent or nature of iron staining that isn't also occurring in the Woronora River (control site)	Waratah Rivulet, from Pool P to the full supply level of the Woronora Reservoir	Nature and extent of iron staining	Level 1	The extent or nature of iron staining in the Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir has not changed.	-	No	No

Table 10 (Continued)
Assessment of Environmental Performance – Underground Mining Area and Surrounds

Performance Measure	Performance Indicator	Monitoring Site(s) Being Assessed	Parameters	Highest Significance Level/Trigger Recorded		Comments	Subsidence Impact Performance Indicator Exceeded?	Subsidence Impact Performance Measure Exceeded?
WATER MANAGEMENT (Continued)								
Negligible Environmental Consequences on Waratah Rivulet (Continued)								
Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P)	***Minimal Gas Releases***							
	Gas releases in Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir have not increased beyond those observed up to the commencement of Longwall 301 extraction	Waratah Rivulet, from Pool P to the full supply level of the Woronora Reservoir	Free Carbon Dioxide as CO_2 (mg/L) Methane (mg/L)	Level 1	Free carbon dioxide concentrations are equal to or less than 4 mg/L in Waratah Rivulet pools from Pool P to the full supply level of the Woronora Reservoir. Methane concentrations are equal to or less than 0.159 mg/L in Waratah Rivulet pools from Pool P to the full supply level of the Woronora Reservoir.	Pool P was at Level 1 in months January to February, April to September and November 2024 (free carbon dioxide concentrations). Pool U was at Level 1 in January to September and November to December 2024 (free carbon dioxide concentrations). Pool P and U were at level 1 for all months in 2024 (free methane concentrations).	No	No
				Level 2	Free carbon dioxide concentrations are above 4 mg/L and equal to or less than 13 mg/L in Eastern Tributary pools between the full supply level of the Woronora Reservoir and the maingate of Longwall 26. Methane concentrations are above 0.159 mg/L and equal to or less than 0.478 mg/L in Eastern Tributary pools between the full supply level of the Woronora Reservoir and the maingate of Longwall 26.	Pool P was at Level 2 in December 2024 (free carbon dioxide concentrations). Pool U was at Level 2 in October 2024 (free carbon dioxide concentrations).	No	No
				Level 3	Free carbon dioxide concentrations are above 13 mg/L in Waratah Rivulet pools from Pool P to the full supply level of the Woronora Reservoir. Methane concentrations are above 0.478 mg/L in Waratah Rivulet pools from Pool P to the full supply level of the Woronora Reservoir	Pool P recorded Level 3 gas releases for dissolved CO2 for the month of March and October 2024.	Yes	No Assessment conducted by Associate Professor Barry Noller (Appendix E)

Table 10 (Continued)
Assessment of Environmental Performance – Underground Mining Area and Surrounds

Performance Measure	Performance Indicator	Monitoring Site(s) Being Assessed	Parameters	Highest Significance Level/Trigger Recorded		Comments	Subsidence Impact Performance Indicator Exceeded?	Subsidence Impact Performance Measure Exceeded?
WATER MANAGEMENT (Continued)								
Negligible Environmental Consequences on Eastern Tributary								
Negligible environmental consequences over at least 70% of the stream length (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26	***No Diversion of Flows, No Change in the Natural Drainage Behaviour***							
	No change to the natural drainage behaviour of Pools ETAS, ETAT and ETAU	Pools ETAS, ETAT and ETAU on the Eastern Tributary	Stream cracking and drainage behaviour	Level 1	No mine-induced surface cracking at Pool ETAS or Pool ETAT; no increase in previous cracking at Pool ETAU. No impacts to natural drainage behaviour observed.	Pools ETAS, ETAT and ETAU were at Level 1 throughout the reporting period.	No	No
	Analysis of water level data for Pool ETAS/ETAT and Pool ETAU indicates the water levels are above that required to maintain water over the downstream rock bar	Pools ETAS, ETAT and ETAU on the Eastern Tributary	Pool water level	Level 1	The water levels in Pool ETAS/ETAT and Pool ETAU have been above that required to maintain water over the downstream rock bar.	Pool ETAS/ETAT and Pool ETAU were at Level 1 throughout the reporting period.	No	No
	Minimal Iron Staining							
	N/A	Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26	Nature and extent of iron staining	On 14 October 2016, Metropolitan Coal reported the exceedance of the Eastern Tributary performance measure in relation to iron staining to the DP&E (now DPHI) and other relevant agencies. Iron staining/flocculent is present at a number of stream features between the maingate of Longwall 26 and the full supply level of the Woronora Reservoir. Metropolitan Coal to monitor the nature and extent of iron staining on the Eastern Tributary during the mining of Longwalls 305-3037 Metropolitan Coal to implement contingency measures (stream remediation measures) in accordance with the Project Approval.		-	N/A	Yes
	Minimal Gas Releases							
	Gas releases in Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26 have not increased beyond those observed up to the commencement of Longwall 301 extraction	Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26	Free Carbon Dioxide as CO_2 (mg/L) Methane (mg/L)	Level 1	Free carbon dioxide concentrations are equal to or less than 4 mg/L in Eastern Tributary pools between the full supply level of the Woronora Reservoir and the maingate of Longwall 26. Methane concentrations are equal to or less than 0.159 mg/L in Eastern Tributary pools between the full supply level of the Woronora Reservoir and the maingate of Longwall 26.	Pools ETAG, ETAH, ETAI, ETAJ, ETAL, ETAM, ETAN, ETAO, ETAP, ETAQ, ETAR, ETAS, ETAT, ETAU were at Level 1 throughout the reporting period.	No	No

Table 10 (Continued)
Assessment of Environmental Performance – Underground Mining Area and Surrounds

Performance Measure	Performance Indicator	Monitoring Site(s) Being Assessed	Parameters	Highest Significance Level/Trigger Recorded		Comments	Subsidence Impact Performance Indicator Exceeded?	Subsidence Impact Performance Measure Exceeded?
BIODIVERSITY MANAGEMENT								
Upland Swamp Vegetation Monitoring								
Negligible impact on Threatened Species, Populations, or Ecological Communities	*The vegetation in upland swamps is not expected to experience changes significantly different to vegetation in control swamps*	Swamps 16, 17, 18, 20, 24 and 25 overlying or adjacent to Longwalls 20-22 Swamps 19, 28, 30, 31, 32, 33, 34, 35, 36 and 94 overlying or adjacent to Longwalls 23-27 Swamps 40, 41, 47, 48, 49, 50, 53 and 58 overlying or adjacent to Longwalls 301-303 and Longwall 304 Swamp 72 within the 35° angle of draw and/or predicted 20 mm subsidence contour of Longwall 305-307 Swamps 61, 62, 63, 64, 78, 79, 80, 81, 82, 83, 88, 89, 90, 92SH and 92TTT overlying or adjacent to Longwalls 308-310 Control Swamps 101, 111a, 125, 135, 136, 137a, 137b, 138, Bee Creek Swamp, Woronora River 1, Woronora River south arm and Dahlia Swamp	Visual inspections Transect/ quadrat data Population monitoring of indicator species	Level 1	Data analysis indicates: • there is not a declining trend in the condition of longwall swamp vegetation; and • there are no significant changes in vegetation between the mined and control swamps.	Swamps 16, 17, 18, 19, 20, 24, 25, 30, 31, 32, 33, 34, 35, 36, 47, 49, 58, 61, 63, 72, 83, 88 and 94.	No	No
				Level 2	Data analysis indicates: • there is a declining trend in the condition of longwall swamp vegetation over time, however a similar trend is occurring in control swamp vegetation; and • there are significant differences in vegetation between the mined and control swamps, however, the data indicates longwall swamp vegetation is consistent with the baseline monitoring results.	<u>Swamp 20:</u> In spring 2022, there was a declining trend in vegetation condition as indicated by the two indicator species observed in Swamp 20. Whilst a declining trend has been observed in control sites, it has not been as pronounced as seen in the longwall site in recent seasons. However, dieback of *Gleichenia spp.* across Swamp 20 has ceased and full recovery is apparent, with abundant growth of this species throughout the swamp. Continue to monitor. <u>Swamp 28:</u> The previous declining trend in vegetation condition of the Tea Tree Thicket component of Swamp 28 with regards to condition of understorey species and decline in species richness continues to stabilise in autumn 2024. Similar trends are apparent in the vegetation of some control sites. Continue close monitoring of trends in vegetation to assess the contribution of dry climatic condition versus mine subsidence impacts. <u>Swamps 40, 41, 48, 50 and 53:</u> Vegetation monitoring indicates a significant difference in vegetation condition between longwall (Swamps 40, 41, 48, 50 and 53) and control swamps in autumn 2024, however swamp vegetation is consistent with the baseline monitoring results. Continue close monitoring of trends in vegetation to assess the contribution of dry climatic conditions versus mine subsidence impacts. <u>Swamps 62, 64, 78, 79, 80, 81, 82, 89, 90, 92SH and 92TTT:</u> Analysis of vegetation monitoring data indicates a significant difference in species richness between longwall and control swamps in autumn 2024. However, statistical analysis does not indicate a significant difference in vegetation condition or cover / abundance between longwall and control sites. Visual observations indicate Swamp vegetation is consistent with the baseline monitoring results.	No	No

Table 10 (Continued)
Assessment of Environmental Performance – Underground Mining Area and Surrounds

Performance Measure	Performance Indicator	Monitoring Site(s) Being Assessed	Parameters	Highest Significance Level/Trigger Recorded		Comments	Subsidence Impact Performance Indicator Exceeded?	Subsidence Impact Performance Measure Exceeded?
BIODIVERSITY MANAGEMENT (Continued)								
Upland Swamp Groundwater Monitoring								
Negligible impact on Threatened Species, Populations, or Ecological Communities	*Surface cracking within upland swamps resulting from mine subsidence is not expected to result in measurable changes to swamp groundwater levels when compared to control swamps or seasonal variations in water levels experienced by upland swamps prior to mining*[5]	Swamp 20 Swamp 28	Groundwater levels	N/A	N/A	Previously assessed as being impacted by mine subsidence.	Yes	To be assessed annually by relevant specialists
		• Swamp 25 overlying LWs 20-22 • Swamps 30, 33 and 35 overlying LW23-27 • Swamps 40, 41, 46, 51, 52 and 53 overlying LW301-303 • Swamp 50 overlying LW304 • Swamps 71a and 72 within the 35° angle of draw and/or predicted 20 mm subsidence contour of LW305-307 • Swamps 62, 64, 82 and 89 within the 35° angle of draw and/or predicted 20 mm subsidence contour of Longwalls 308-310 • Swamps 74, 75, 81, 89, 106, 113, 115 and 119 within the 35° angle of draw and/or predicted 20 mm subsidence contour of LW311-316. • Control Swamps 101, 137a, 137b, 106, 76, 14 and Bee Creek Swamp		Level 1	Data analysis for Longwalls 20-27 swamps indicates: • the seven-day moving average for Swamps 25, 30, 33 and 35 is at, or above, the minimum established for the swamp's full length of record; and Data analysis for Longwalls 301-316 swamps indicates: • the seven-day moving average for Swamps 40, 41, 46, 51, 52, 53, 71a, 62, 64, 82, and 92 is at or above the minimum established for the swamp's full length of record: and • the seven-day moving average for Swamp 50 was at or above the minimum established for the swamp's full length of record during the July to December 2023 reporting period.	Swamps 25, 30, 33, 35, 40, 41, 46, 50, 51, 52, 53, 71a, 72, 62, 64, 82 and 89 were Level 1 from January to December 2024.	No	No
	Subsidence impacts are not expected to result in measurable changes to swamp groundwater levels when compared to control swamps or seasonal variations in water levels experienced by upland swamps prior to mining.	• Site 76-1, 76-2 and 76-3 in Swamp 76. • Site 77-1, 77-2 and 77-3 in Swamp 77. • Site 92-1, 92-2 and 92-3 in Swamp 92. • Control Swamps 101, 137a and 137b. • Control Swamps 76, 14, 106 and Bee Creek Swamp.	Groundwater levels	Level 1	• Data analysis indicates the seven-day moving average for Swamps 76, 77 and 92 is at or above the minimum established for the swamp's full length of record	Swamps 76-1, 76-2, 76-3, 77-1, 77-2, 92-1, 92-2 and 92-3 were Level 1 from October to December 2024.	No	No
			Groundwater levels	Level 2	Data analysis indicates: • the seven-day moving average for Swamps 76, 77 and 92 is below the minimum established for the swamp's full length of record; and • semi-quantitative comparisons with control swamps and rainfall record indicates that dry swamp conditions are natural.	Swamp 77-3 was Level 2 from October to December 2024.	No	No

Table 10 (Continued)
Assessment of Environmental Performance – Underground Mining Area and Surrounds

Performance Measure	Performance Indicator	Monitoring Site(s) Being Assessed	Parameters	Highest Significance Level/Trigger Recorded		Comments	Subsidence Impact Performance Indicator Exceeded?	Subsidence Impact Performance Measure Exceeded?
BIODIVERSITY MANAGEMENT (Continued)								
Riparian Vegetation Monitoring								
Negligible impact on Threatened Species, Populations, or Ecological Communities	*Impacts to riparian vegetation are expected to be localised and limited in extent, similar to the impacts previously experienced at Metropolitan Coal*	Locations adjacent to riparian vegetation monitoring sites (MRIP01 to MRIP12) and areas traversed whilst accessing the monitoring sites: • sites MRIP01, MRIP02, MRIP05, MRIP06 and MRIP09 overlying Longwalls 20-22; • sites MRIP11 and MRIP12 overlying Longwalls 23-27; • sites MRIP03, MRIP04 and MRIP10 downstream of Longwall 23A; and • sites MRIP07 and MRIP08 downstream of Longwalls 23-27.	The extent of vegetation subject to vegetation dieback	Level 2	Vegetation monitoring: • does not identify an increase in the extent of vegetation dieback compared to that observed at site MRIP02 on the Waratah Rivulet and between sites MRIP05 and MRIP09 on the Eastern Tributary; and • does not identify vegetation dieback greater than 50 cm from the stream at sites MRIP01, MRIP03, MRIP04, MRIP06, MRIP07, MRIP08 or MRIP10, as a result of mine subsidence.	In spring 2023 and autumn 2024, Sites MRIP01, MRIP02, MRIP03, MRIP04, MRIP05, MRIP06, MRIP07, MRIP08, MRIP09, MRIP10, MRIP11 and MRIP12 were at Level 2. Scouring of the stream bank and erosion resulting from high water flows following heavy rain events. The extent of dieback at sites previously observed with riparian vegetation dieback (MRIP02, MRIP05, MRIP09 and MRIP12) had not increased in the current survey and vegetation recovery was apparent.	No	No
Monitoring of Aquatic Biota, Stream Monitoring								
Negligible impact on Threatened Species, Populations, or Ecological Communities	*The aquatic macroinvertebrate and macrophyte assemblages in streams are not expected to experience long-term impacts as a result of mine subsidence.*	Two sampling sites (approximately 100 m in length) at the following locations: • Location WT3 on Waratah Rivulet, Locations ET1, ET3 and ET4 on the Eastern Tributary overlying Longwalls 20-27. • Location WT4 on the Waratah Rivulet, adjacent to Longwalls 20-27. • Location WT5 on the Waratah Rivulet and Location ET2 on the Eastern Tributary downstream of Longwalls 20-27. • Control Locations: WR1 on Woronora River; and OC on O'Hares Creek.	Aquatic macroinvertebrates Aquatic macrophytes	Level 1	Data analysis indicates no significant changes in relation to control places pre-mining compared to post-extraction occur in the aquatic macroinvertebrate and/or macrophyte assemblages at Locations WT3, WT4 or WT5 on the Waratah Rivulet or Locations ET1, ET2, ET3 or ET4 on the Eastern Tributary during the mining of Longwalls 308-310.	Locations WT4 and WT5, and ET3.	No	No

Table 10 (Continued)
Assessment of Environmental Performance – Underground Mining Area and Surrounds

Performance Measure	Performance Indicator	Monitoring Site(s) Being Assessed	Parameters	Highest Significance Level/Trigger Recorded		Comments	Subsidence Impact Performance Indicator Exceeded?	Subsidence Impact Performance Measure Exceeded?
BIODIVERSITY MANAGEMENT (Continued)								
Monitoring of Aquatic Biota, Stream Monitoring (Continued)								
Negligible impact on Threatened Species, Populations, or Ecological Communities	*The aquatic macroinvertebrate and macrophyte assemblages in streams are not expected to experience long-term impacts as a result of mine subsidence.*	Two sampling sites (approximately 100 m in length) at the following locations: • Location WT3 on Waratah Rivulet, Locations ET1, ET3 and ET4 on the Eastern Tributary overlying Longwalls 20-27. • Locations WT4 on the Waratah Rivulet, adjacent to Longwalls 20-27. • Location WT5 on the Waratah Rivulet and Location ET2 on the Eastern Tributary downstream of Longwalls 20-27. • Control Locations: WR1 on Woronora River; and OC on O'Hares Creek.	Aquatic macroinvertebrates Aquatic macrophytes	Level 1	Data analysis indicates significant (not long-term), changes in relation to control places pre-mining compared to post-extraction occur in the aquatic macroinvertebrate and/or macrophyte assemblages at Locations WT3, WT4 or WT5 on the Waratah Rivulet or Locations ET1, ET2, ET3 or ET4 on the Eastern Tributary during the mining of Longwalls 308-310.	Locations WT4 and WT5 and ET3 were Level 1 in spring 2023 and autumn 2024.	No	No
				Level 2	Data analysis indicates significant long-term changes[6] in relation to control places pre-mining compared to post-extraction occur in the aquatic macroinvertebrate and/or macrophyte assemblages at Locations WT3, WT4 or WT5 on the Waratah Rivulet or Locations ET1, ET2, ET3 or ET4 on the Eastern Tributary during the mining of Longwalls 308-310..	Location ET1: significant decline in mean numbers of Atyidae during autumn and spring 2022, autumn and spring 2023 and autumn 2024. Location ET4: decreased numbers of Atyidae in autumn 2016, spring 2018, spring 2019 and autumn 2020, but not subsequently.	No	No.
				Level 3	Data analysis indicates significant long-term changes in relation to control places pre-mining compared to post-extraction occur in the aquatic macroinvertebrate and/or macrophyte assemblages at Locations WT3, WT4 or WT5 on the Waratah Rivulet or Locations ET1, ET2, ET3 or ET4 on the Eastern Tributary during the mining of Longwalls 308-310.	Location WT3: altered diversity of macroinvertebrate taxa in spring 2016, autumn 2018 and subsequent surveys, including autumn 2024. Location WT3: significant decline in mean numbers of Atyidae during spring 2021, autumn and spring 2022, autumn and spring 2023 and autumn 2024. Location ET2: significant change in assemblages of macroinvertebrates observed in spring 2019 and by subsequent surveys. Altered numbers of Atyidae between spring 2015 and autumn 2018, between autumn 2020 and autumn 2022, autumn 2023 and spring 2023 and autumn 2024. Location ET2: Significant change to the assemblage of macrophytes during autumn 2021 and subsequent surveys. Location ET4: significant change to assemblage of macroinvertebrates detected between spring 2019 and autumn 2023 but not subsequently; altered patterns of diversity of macroinvertebrate taxa since autumn 2018; altered macrophyte assemblage since autumn 2018.	Yes	No Assessment conducted by Niche (Appendix J3).

Table 10 (Continued)
Assessment of Environmental Performance – Underground Mining Area and Surrounds

Performance Measure	Performance Indicator	Monitoring Site(s) Being Assessed	Parameters	Highest Significance Level/Trigger Recorded		Comments	Subsidence Impact Performance Indicator Exceeded?	Subsidence Impact Performance Measure Exceeded?
Amphibian Monitoring								
Negligible impact on Threatened Species, Populations, or Ecological Communities	*The amphibian assemblage is not expected to experience changes significantly different to the amphibian assemblage at control sites*	• Test sites 1 to 6 overlying Longwalls 20-22 • Test sites 13 to 17 overlying Longwalls 23-27 • Test sites 23 to 28 overlying Longwalls 301-303 • Test sites 29 and 30 overlying Longwalls 305-307 • Test sites 12 and control sites 7 to 12 and 18 to 22	Amphibian species diversity and relative abundance	Level 3	Data analysis identifies a significant change in the amphibian population for more than one survey period.	Sites 1 to 6, 13 to 17 and 23 to 30.	Yes	Cenwest recommends an additional round of survey data be collected and analysed.
LAND MANAGEMENT								
Cliffs and Overhangs, Steep Slopes and Land in General								
Less than 3% of the total length of cliffs (and associated overhangs) within the mining area experience mining-induced rock fall	*Cliff sites COH11, COH12, COH13, COH16 and/or COH17 experience cliff instabilities that do not require management measures to be implemented*	Cliff sites COH11, COH12, COH13, COH16 and COH17	Cliff instabilities	Level 1	No subsidence impacts (i.e. cliff instabilities) recorded.	No cliff instabilities were recorded at cliff sites COH9, COH10, COH11, COH12, COH13 and COH16.	No	No
	Cliff sites COH10, COH11, COH12, COH13, COH18 and/or COH19 experience cliff instabilities that do not require management measures to be implemented.	Cliff sites COH10, COH11, COH12, COH13, COH18 and COH19	Cliff instabilities	Level 1	No subsidence impacts (i.e. cliff instabilities) recorded.	No cliff instabilities were recorded at cliff sites COH10, COH11, COH12, COH13, COH18 and COH19.		
	Steep slopes and land in general experience sandstone fracturing/cracking and rock falls that do not require management measures to be implemented	Steep slopes and land in general within 600 m of Longwalls 20-27 and Longwalls 301-316	Sandstone fracturing/cracking and rock falls	Level 1	No subsidence impacts (i.e. sandstone fracturing/cracking and rock falls) recorded on steep slopes or land in general not previously recorded within 600 m of LW20-27 or LW301-316 (after LW311 commencement).	No sandstone fracturing/cracking or rock falls were recorded on steep slopes or land in general.	No	No
HERITAGE MANAGEMENT								
Aboriginal Heritage Sites Monitoring								
Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts	*Less than 7% of Aboriginal heritage sites within the mining area are affected by subsidence impacts*	Monitoring of Aboriginal heritage sites with the potential to be impacted by subsidence related to the extraction of Longwalls 308-316	Cracking of sandstone at open sites Cracking and/or exfoliation of sandstone, blockfall, displacement, breakage and/or collapse of sandstone overhang sites Damage or deterioration of art motifs	Level 1	Monitoring results indicate sites FRC 281 and FRC 34 have been affected by subsidence impacts.	No Aboriginal cultural heritage sites were recorded as having been affected by subsidence impacts by the post-Longwalls 309 and 310 monitoring surveys.	No	No

Table 10 (Continued)
Assessment of Environmental Performance – Underground Mining Area and Surrounds

Performance Measure	Performance Indicator	Monitoring Site(s) Being Assessed	Parameters	Highest Significance Level/Trigger Recorded		Subsidence Impact Performance Indicator Exceeded?	Subsidence Impact Performance Measure Exceeded?
BUILT FEATURES MANAGEMENT – TfNSW							
Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing	• *measured absolute horizontal movements;* • *distortion of bridge elements;* • *cracking of bridge elements;* • *pavement cracking and deformation;* • *visual consequences of slope movement; and* • *defects in culverts.*	Ground, Bridge 2 (Princes Highway Underpass), Cawley Road Overbridge, Cuttings, Culverts, Pavement and others	Subsidence effects parameters	Level 1	Expected subsidence conditions	No	No
BUILT FEATURES MANAGEMENT – SYDNEY WATER							
Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing	• *No more than repairable (minor) leakages of the water pipelines occur due to mining; and* • *No more than repairable (minor) defects (cracks, etc.) in the structural integrity of the pipes and associated connections occur due to mining.*	Pipelines	Subsidence effects parameters, observable subsidence ground deformations or surface cracks, cracks or leaks, loss of flow/pressure, and faults	Level 1	Expected subsidence conditions	No	No
PUBLIC SAFETY MANAGEMENT							
Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing	*Public safety will be ensured in the event that any hazard to the general public arising from subsidence effects becomes evident.*	Cliffs and overhangs, steep slopes and land in general Built features	Public safety	Level 1	Expected subsidence conditions	No	No

1 A detailed assessment of this performance indicator was undertaken for a previous six monthly period (when the Level 3 trigger was first identified) and concluded that it had not been exceeded (HEC, 2019). The performance indicator will be considered to be exceeded if the median falls below the 20th percentile and the same is not also occurring in the control catchment.

2 The no diversion of flows, no change in natural drainage behaviour component of this performance measure was exceeded during the mining of Longwalls 23-27, triggering contingency measures for the impacted pools. This TARP monitors pools not impacted during the mining of Longwalls 23-27.

3 The minimal iron staining component of this performance measure was exceeded during the mining of Longwalls 23-27, triggering contingency measures for the impacted pools. The nature and extent of iron staining on the Eastern Tributary will continue to be monitored during the mining of Longwalls 305-307.

4 Subsequent to the autumn 2017 baseline survey and prior to the spring 2017 survey, Swamp 46 and Swamp 51/52 were subject to WaterNSW hazard reduction burns.

5 This performance indicator has been exceeded at Swamp 20 since 2012 and at Swamp 28 since 2016. Swamp water levels at Swamp 20 and Swamp 28 will continue to be analysed on a six monthly basis and assessments against the performance measure will be conducted every second year.

6 The performance indicator *The aquatic macroinvertebrate and macrophyte assemblages in pools are not expected to experience long-term impacts as a result of mine subsidence* has not been exceeded at Pools ETAG, ETAH, ETAI and ETAK. In accordance with the Longwalls 305-307 Biodiversity Management Plan, assessment against the performance indicator at these pools will be undertaken after one year of the completion of stream remediation on the Eastern Tributary.

7 ENVIRONMENTAL PERFORMANCE – SURFACE FACILITIES AREA

This section provides a summary of the key environmental monitoring results for noise, air quality, traffic and waste at the surface facilities area, an assessment of environmental performance, and a description of the management measures implemented during the reporting period.

The environmental performance of surface facilities water management is described in Section 8.

Each section indicates which management plan contains details of the surface facilities management and monitoring. The Metropolitan Coal management plans are available on the Peabody website (http://www.peabodyenergy.com).

7.1 NOISE MANAGEMENT

The Metropolitan Coal Noise Management Plan has been prepared for the surface facilities area in accordance with Condition 8, Schedule 4 of the Project Approval.

Real-time Noise Monitoring

Real-time noise monitoring for the Project is undertaken using an unattended statistical noise logger located at the northern boundary of 16 Oxley Place (Figure 18). Real-time noise monitoring is used as an internal noise management tool and not for compliance purposes.

The real-time noise monitor records noise levels 24 hours a day, 7 days a week, and a graphical summary of the previous 24 hours of noise is sent to mine staff via email on a daily basis.

A real-time noise performance indicator, *The $L_{Aeq(5\ minute)}$ night-time noise level does not exceed 50 dB(A) for six consecutive 5 minute samples*, has been developed in consideration of façade reflection and as an alert to the potential exceedance of the noise acquisition criteria.

Real-time noise monitoring includes an audio function which allows the monitor to record audio of the noise signal and an 'alarm' function whereby noise data is processed and compared against the real-time noise performance indicator. The audio of these events can then be reviewed to see if the cause is Project related, allowing Metropolitan Coal to investigate the causes and potential controls for high Project related noise events.

The real-time noise performance indicator is considered to be exceeded if the $L_{Aeq(5\ minute)}$ night-time noise level exceeds 50 A-weighted decibels (dB[A]) for six consecutive 5 minute samples.

The real-time noise performance indicator was triggered 72 times during the reporting period, compared to 157 times in 2023, 95 times in 2022, 36 times in 2021, 55 times in 2020 and 53 times in 2019. Heavy rain and thunderstorms were the primary source of triggers during the reporting period, with overflying aircraft, birds, and vehicles on Parkes Street and yard, also identified during the review. On five occasions activities in the yard attributed to the mine were identified. In these cases, the Yard Manager was contacted to reinforce the need for yard crews to minimise noise.

Attended Noise Monitoring

Consistent with the Metropolitan Coal Noise Management Plan, attended noise monitoring for the Project has consisted of quarterly monitoring at 16 Oxley Place, 53 Parkes Street, 50 Parkes Street and 36 Old Station Road (sites representative of the nearest residences to the Project [Figure 18]) to quantify the intrusive noise emissions from the mine, including coal processing and transportation operations that contribute to the overall level of ambient noise.

Noise monitoring is conducted for 15 minute periods during the daytime, evening and night-time over two consecutive days and nights and compared to applicable Noise Impact Assessment Criteria, Noise Mitigation Criteria and Noise Acquisition Criteria (refer Section 7.5 and Appendix M).

The attended quarterly noise monitoring and compliance results for the reporting period are available in the quarterly monitoring reports prepared by SLR (Appendix M). A comparison of the quarterly attended monitoring results at each location for the period September 2010 to December 2024 is provided in Figures 19a to 19d.

In summary, during 2024, attended monitoring indicated exceedances of the noise criteria detailed in Conditions 1, 2 and 3, Schedule 4 of Project Approval (08_0149) as follows:

- Daytime (L_{Aeq}):
  - Monitoring at 16 Oxley Place in Quarter 1 measured a level of 54 dBA which was non-compliant with the Noise Impact Assessment Criterion (50 dBA) and exceeded the daytime Noise Mitigation Assessment Criterion (53 dBA).
  - No exceedances of the Noise Acquisition Criterion (55 dBA) were recorded.
- Evening (L_{Aeq}):
  - Monitoring at 16 Oxley Place in Quarter 2 measured a level of 48 dBA which was conditionally non-compliant with the Noise Impact Assessment Criterion (45 dBA).
  - No exceedances of the Evening Noise Mitigation Criterion (48 dBA) or Noise Acquisition Criterion (50 dBA) were recorded.
- Night-time (L_{Aeq}):
  - No exceedances of the Night-time Noise Impact Assessment Criterion (45 dBA), Noise Mitigation Criterion (48 dBA) or Noise Acquisition Criterion (50 dBA) were recorded.
- Night-time (L_{A1}):
  - Monitoring at 16 Oxley Place in Quarters 1, 2 and 3 measured noise levels of 53 dBA, 57 dBA and 56 dBA respectively, which were conditionally non-compliant with the Night-time L_{A1} Noise Impact Assessment Criterion (50 dBA).

Identification of Sustained Non-compliances – Attended Noise Monitoring

A conditional sustained non-compliance has been defined as two consecutive quarters of non-compliant noise monitoring results at the same representative attended noise monitoring location, coinciding with normal mine operations.

Sustained non-compliances with respect to the intrusive (L_{Aeq}) Noise Impact Assessment Criteria or the (L_{A1}) Noise Impact Assessment Criteria (Table 2; Condition 1, Schedule 4 of the Project Approval) have been identified in Quarters 2 and 3 at 16 Oxley Place during 2024.

Further details are provided in Section 7.4.

Noise Management

Operational noise levels from the Metropolitan Coal Mine were materially higher prior to the approval of the Metropolitan Coal Project in June 2009.

A range of operational noise control measures have been implemented since that time, in association with extensive upgrades of existing infrastructure at the surface facilities area, including the upgrade of the CHPP. Extensive noise reduction works have been implemented progressively and noise monitoring and modelling has been used to identify areas where additional reasonable and feasible noise attenuation measures could be implemented. The Metropolitan Coal 2010 to 2023 Annual Reviews describe the noise mitigation measures implemented prior to 2024.

The extensive and long running noise control program has reduced noise emissions at nearby residences. However, Metropolitan Coal has found the number of remaining, reasonable and feasible noise controls is diminishing.

During 2017, in consultation with the DP&E, Metropolitan Coal prepared a technical review of remaining available feasible noise mitigation measures and an associated evaluation of the reasonableness of these options (the Noise Mitigation Assessment) (SLR, 2017). This assessment was independently peer reviewed by Hatch. The reasonable and feasible contingency mitigation measures identified by Metropolitan Coal included:

- Ensuring all crusher tower and washery doors are closed at all times (except when being accessed).
- Progressively replacing the idlers on all surface conveyors with low noise idlers.

Following DP&E's review of the Noise Mitigation Assessment, Metropolitan Coal signed a Voluntary Undertaking which formalised the implementation of the mitigation measures identified by the 2017 Noise Mitigation Assessment. This included a timeframe for implementation of the identified mitigation measures (i.e. all existing conveyor idlers were replaced with low noise idlers by 31 December 2018), subsequent remodelling of noise levels and consultation with residents with predicted residual noise exceedances above the noise mitigation criteria who had not previously accepted noise mitigation was undertaken in 2019.

In accordance with the Voluntary Undertaking, Metropolitan Coal completed an assessment in 2018 of Metropolitan's noise levels under the Noise Policy for Industry (released in 2017) and provided to DP&E in April 2018.

In 2020 Metropolitan Coal met with DPIE to discuss the findings of the assessment of Metropolitan's noise levels under the Noise Policy for Industry. DPIE requested that Metropolitan Coal commission a peer review of all noise mitigation and monitoring to date which was completed by Recognition Research in June 2020. In 2021, Metropolitan Coal met with DPIE to discuss the findings of the peer review. Metropolitan will continue to purchase and install equipment with a lower noise profile as opportunities arise such as new equipment purchases and upgrades.

Metropolitan Coal will continue to implement noise monitoring, management and modelling in accordance with the Metropolitan Coal Noise Management Plan.

It is noted that Metropolitan Coal did not receive any requests for at-receiver noise mitigation in accordance with Condition 3, Schedule 4 of Project Approval (08_0149) in 2024. Metropolitan Coal has previously offered double glazing noise mitigation voluntarily to a number of the nearest private residences.

Operational Noise Complaints

During the reporting period, three complaints were received regarding noise. One complaint pertained to a metallic clanging noise emanating from the stockpile area which was identified as a metal chute on the conveyor system. The chute was promptly lined to eliminate the noise, and the complainant informed of the actions taken. A second complaint pertained to a high-pitched reversing alarm at the stockpile area. A full audit of all surface equipment failed to identify a source, but a number of broad-spectrum alarms were adjusted to a lower dBA level. Subsequently in early 2025 a high-pitched tipping alarm was identified on one of the site dump trucks which was promptly replaced with a broad-spectrum alarm. The third complaint related to a loud banging noise from Metropolitan's yard area which the complainant thought was unreasonable on a Sunday morning, however it was a Monday. This fact notwithstanding, the need to minimise noise in the yard in the early morning was reiterated to yard personnel.

7.2 AIR QUALITY AND GREENHOUSE GASES MANAGEMENT

The Metropolitan Coal Air Quality and Greenhouse Gas Management Plan has been prepared for the surface facilities area in accordance with Condition 13, Schedule 4 of the Project Approval.

Zephyr Environmental Pty Ltd (Zephyr) has reviewed the environmental performance of the Project in relation to air quality for the reporting period. The report prepared in support of this Metropolitan Coal 2024 Annual Review is provided in Appendix N.

Dust Deposition

Metropolitan Coal monitors monthly dust deposition rates at ten dust gauges (DG1 to DG10; Figure 20), consistent with EPL No. 767 and the Metropolitan Coal Air Quality and Greenhouse Gas Management Plan.

Sampling during the reporting period was conducted at all monitoring points at the frequencies described in Conditions M2.1 and M2.2 of EPL No. 767. During 2024, all of the potential 120 samples (10 sites over 12 months) were deployed during the period and therefore represents 100% data capture.

The results of the dust deposition monitoring are assessed against air quality performance indicators and air quality impact assessment criteria. The results of the assessment are provided in Section 7.4 and key aspects are summarised below.

The performance indicator for annual average deposited dust of 3 grams per square metre per month (g/m^2/month) was met at all the dust deposition gauges (D1 to D10) during the reporting period (Chart 88).

The annual average dust deposition rate at all dust gauges did not exceed 4 g/m^2/month. Compliance was thus achieved with the annual average performance criterion for dust deposition during the reporting period (Chart 89).

Annual average dust deposition rates at each gauge from 2011 to 2024 are shown in Chart 89. From 2011 to 2024, there were no clear trends in dust deposition rates; however, relatively higher dust deposition rates were recorded exceeding the annual average performance indicator of 3 g/m^2/month at DG3 in 2011, 2015 and 2019, and at DG4 in 2015. There were no exceedances of the annual average performance criterion of 4 g/m^2/month at DG3 in 2024. The annual average dust deposition rate at each gauge in 2024 was within or below the range previously recorded for the dust gauges.

The Project EA (modelling for Years 3 and 15) predicted that the annual average dust deposition due to the Project plus background would not be above the applicable 4 g/m^2/month amenity criterion at any receiver (modelling for Years 3 and 15). The air quality monitoring results are consistent with the Project EA predictions in relation to dust deposition.

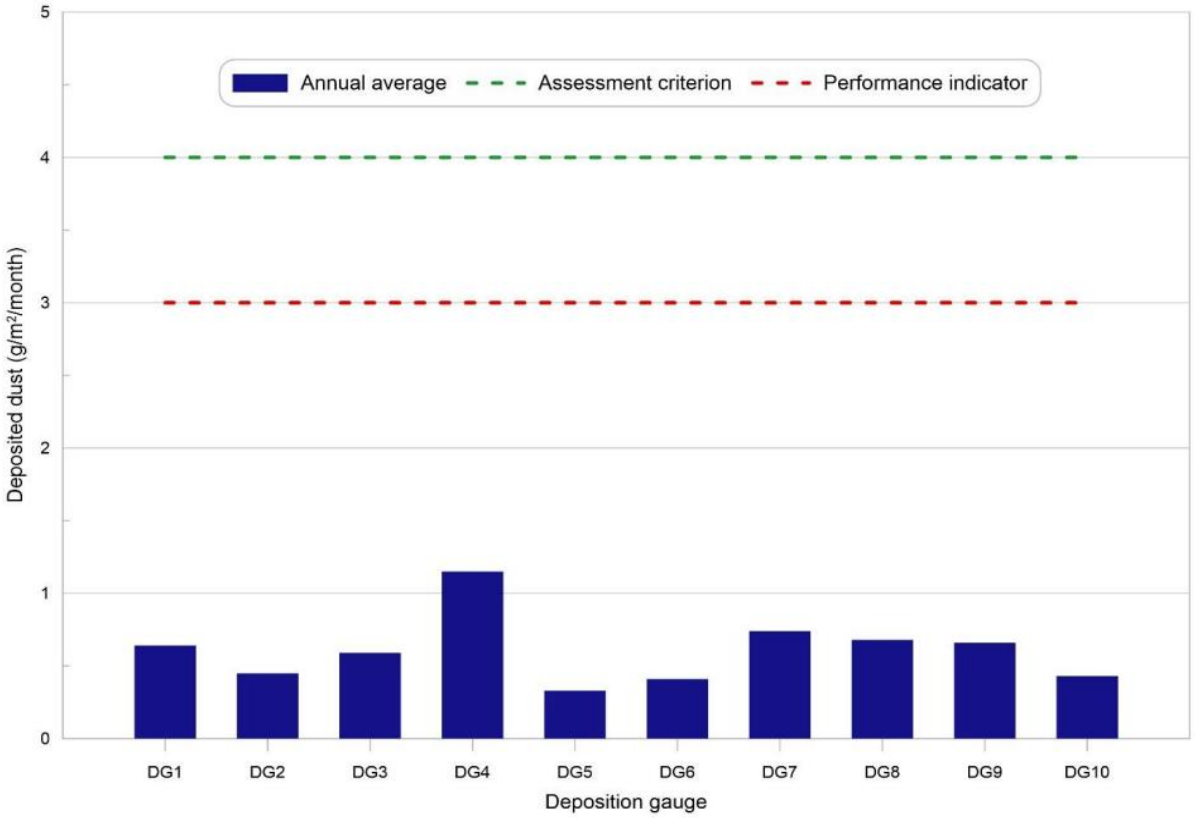


Chart 88 Annual Average Dust Deposition Rates Measured at Dust Gauges (DG1 to DG10)

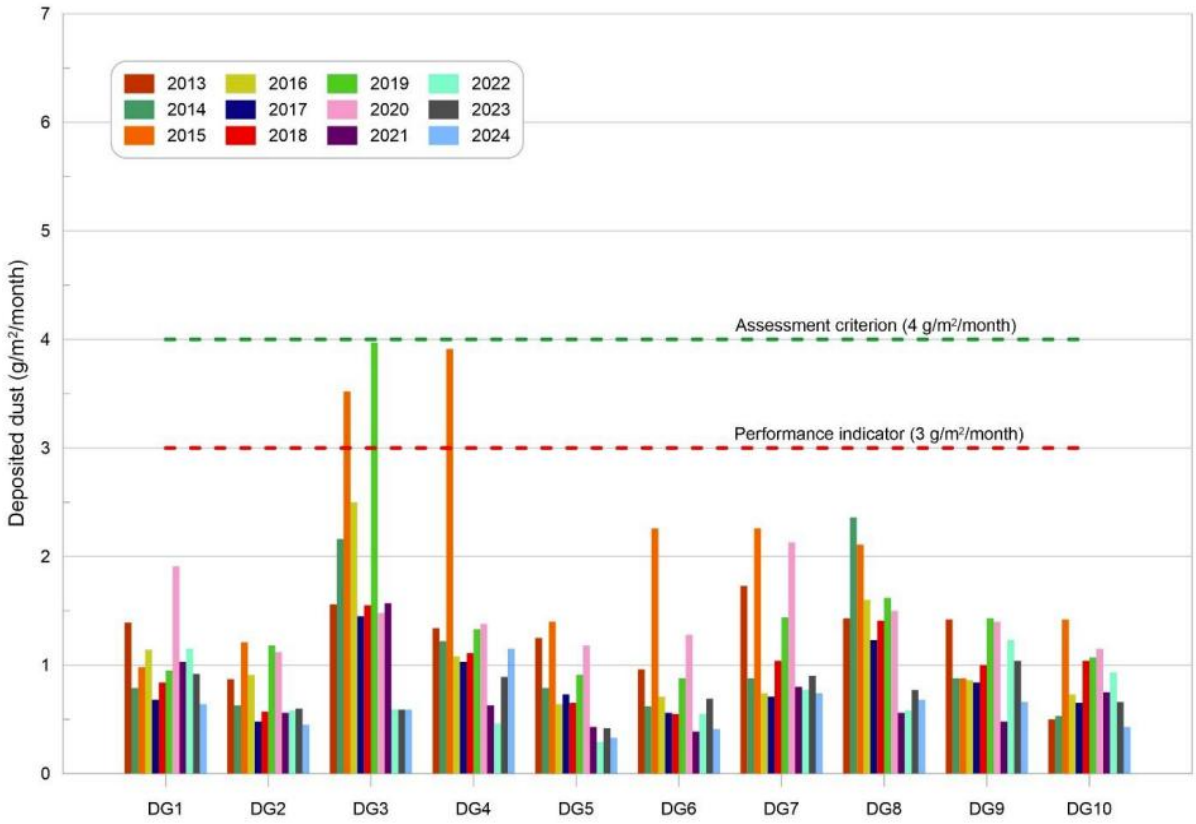


Chart 89 Annual Average Dust Deposition Rates at DG1 to DG10 from 2011 to 2023

Particulate Matter

One Tapered Element Oscillating Microbalance (TEOM) and one High Volume Air Sampler (HVAS) are located near the surface facilities area (Figure 20). The TEOM allows for continuous measurement of particulate matter less than 10 micrometres in diameter (PM_{10}) concentrations at ten-minute intervals, while the HVAS provides an average PM_{10} concentration for a specific 24-hour period, on a one-day-in-six cycle.

Sampling of PM_{10} during the reporting period was conducted at all monitoring points at the frequencies described in Conditions M2.1 and M2.2 of EPL No. 767. The results of the PM_{10} monitoring are assessed against air quality performance indicators and air quality impact assessment criteria. The results of the assessment are provided in Section 7.4 and key aspects are summarised below.

The annual average PM_{10} concentrations (measured by the HVAS) from 2007 to 2024 are shown on Chart 90. The annual average PM_{10} concentration measured at the HVAS for the reporting period was 11.7 micrograms per cubic metre (µg/m^3), which is lower than the annual average PM_{10} performance indicator of 25 µg/m^3 and well below the annual average PM_{10} air quality impact assessment criterion of 30 µg/m^3 (Chart 90).

There was one exceedance of the PM_{10} 24-hour average performance indicator concentration (37.5 µg/m^3) recorded by the TEOM during 2024 (Chart 91) and no exceedances recorded by the HVAS (Chart 92).

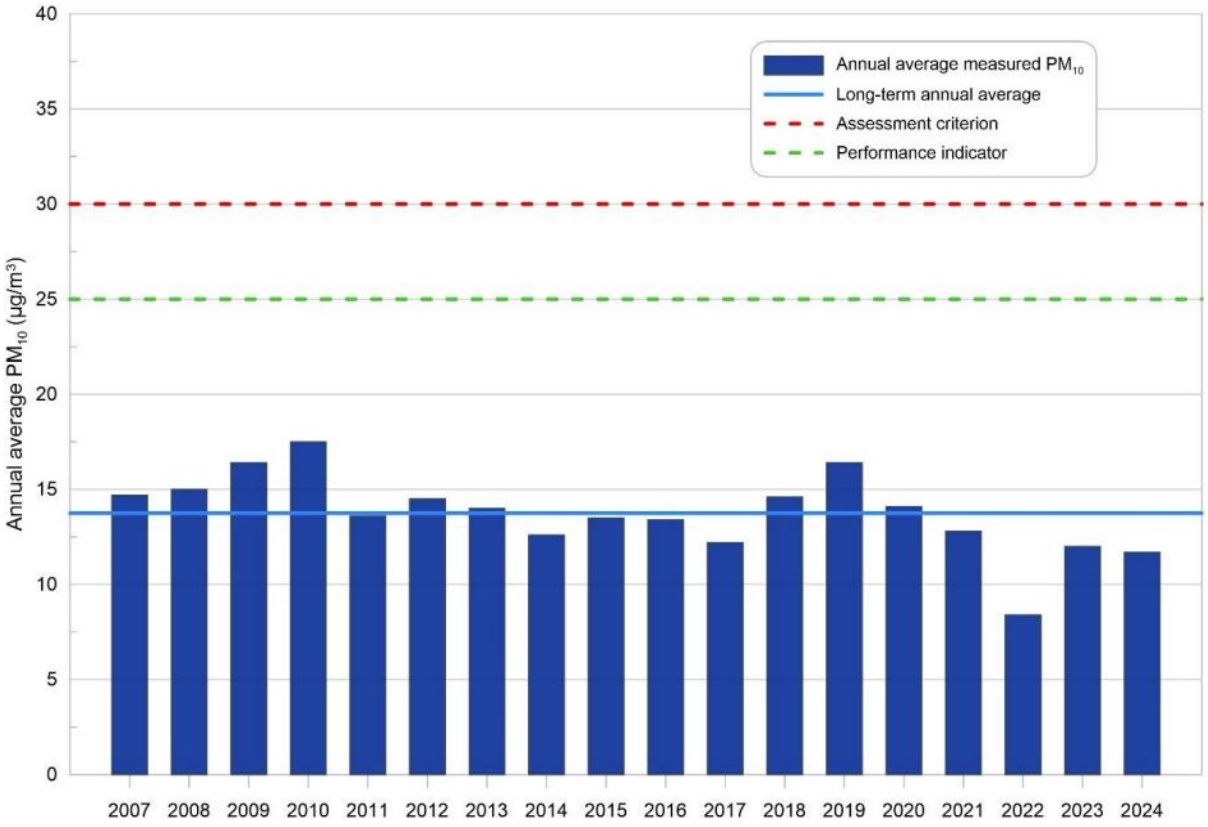


Chart 90 Annual Average PM_{10} Concentrations from 2007 to 2024 (measured by the HVAS)

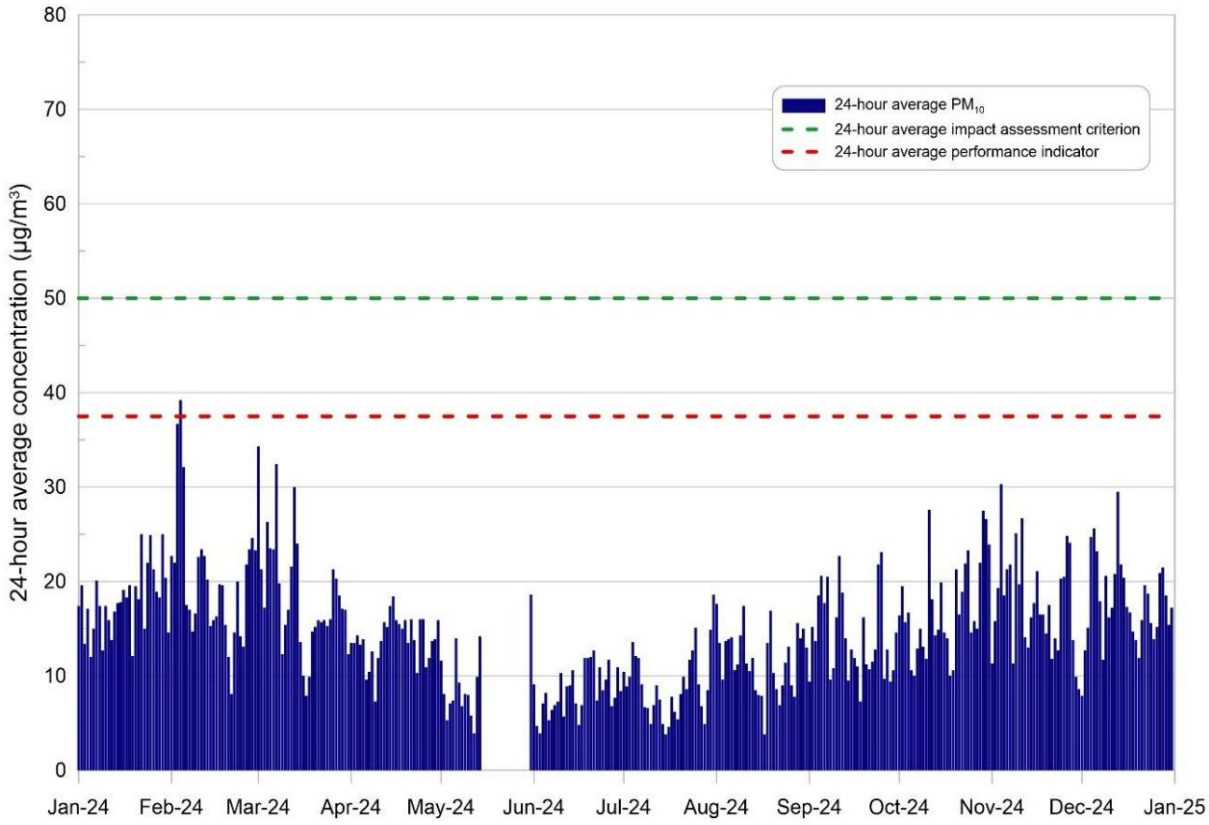


Chart 91 24-hour Average PM_{10} Concentrations (measured by the TEOM)

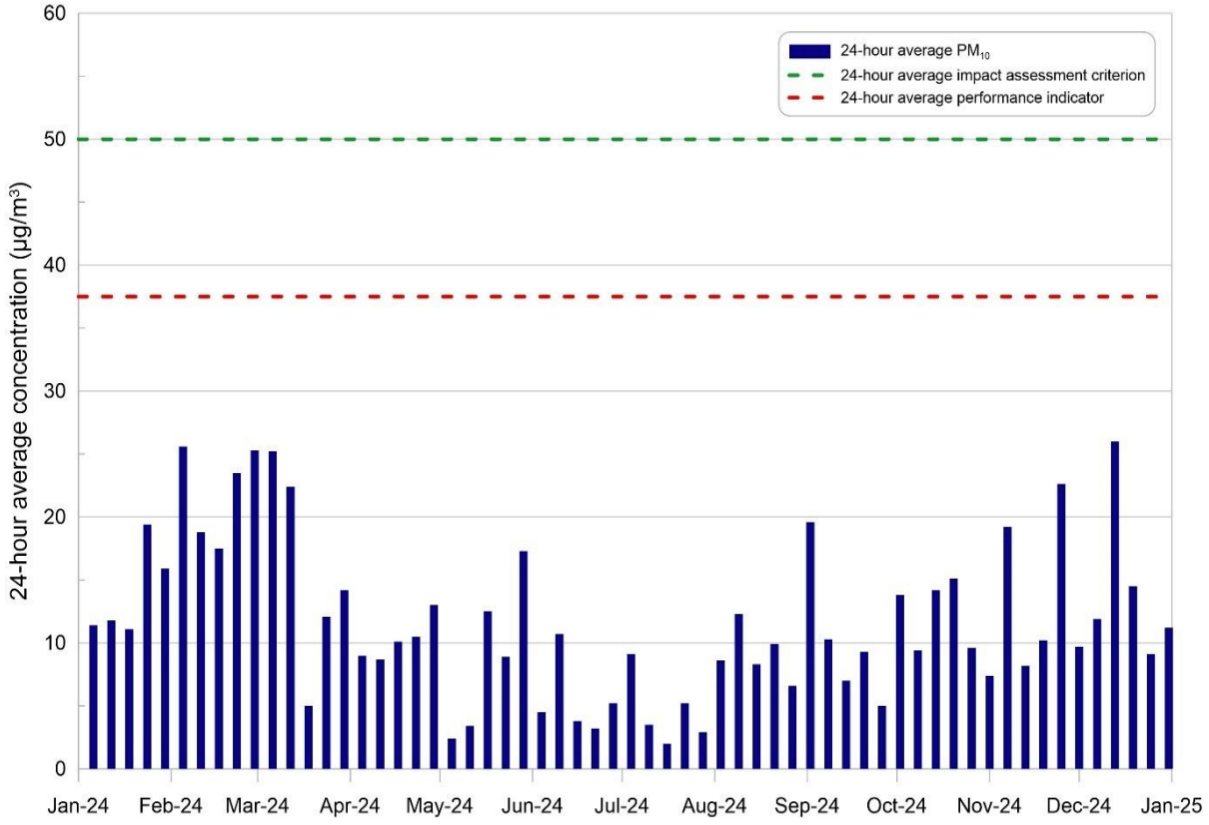


Chart 92 24-hour Average PM_{10} Concentrations (measured by the HVAS)

The highest 10-minute average PM_{10} concentration measured at the TEOM for the reporting period was 148.4 µg/m^3 on 23 December 2024 which was below the air quality performance indicator for the 10-minute average PM_{10} concentration of 150 µg/m^3.

The predicted annual average PM_{10} (Project plus background) concentrations modelled for Years 3 and 15 in the Project EA were not predicted to be above the 30 µg/m^3 assessment criterion at any receiver. The maximum 24-hour average PM_{10} concentrations modelled for Years 3 and 15 by the Project EA were not predicted to exceed the assessment criterion (Project only) of 50 µg/m^3 at any receiver. Residences located in close proximity to the major surface facilities area on Parkes Street were predicted to experience maximum 24-hour average PM_{10} concentrations close to the criteria (i.e. 49 µg/m^3) in Year 15 due to their close proximity to the coal stockpiles and train loading activities.

The monitoring results in 2024 are thus considered to be lower than the Project EA predictions in relation to particulate matter.

Management Measures

A number of ongoing air quality management measures were implemented at Metropolitan Coal to manage and mitigate air quality impacts, as reported in previous Annual Reviews. Metropolitan Coal will continue to seek opportunities to manage and mitigate air quality impacts at the site.

7.3 WASTE MANAGEMENT

The Metropolitan Coal Waste Management Plan has been prepared for the surface facilities area in accordance with Condition 25, Schedule 4 of the Project Approval to identify waste streams and monitor the quantities generated, identify waste management measures to minimise waste generation, and ensure that waste generated by Metropolitan Coal is appropriately stored, handled and disposed.

Waste generated by Metropolitan Coal can include tyres, oil, sewage effluent, paint, lead acid batteries, coal rejects, waste rock, office waste (e.g. paper, plastics, and cardboard), scrap metal, general inert waste (e.g. concrete, timber, pipe, rope and rags), underground waste (e.g. packaging, cloths and pipe), oil/fuel filters, aerosol cans, absorbents (e.g. spent oil spill material) and food waste.

Metropolitan Coal monitors waste generated on a monthly basis through waste disposal receipts provided by Metropolitan Coal's waste contractors. Figure 21(a) shows the amount of general waste disposed of in 2024 compared with previous calendar years. Approximately 867,455 kilograms (kg) of general waste was disposed of at a licensed landfill facility in 2024. Approximately 63,960 kg of diesel particulate filters from underground mine equipment was also disposed of at a licensed landfill facility during the reporting period.

Waste recycled by Metropolitan Coal during the reporting period included waste oil (7,300 kg), scrap metal (387,344 kg) and paper and cardboard (5,340 kg). Figure 21(b-e) shows the amount of waste oil, scrap metal and office waste recycled in 2024, respectively, compared with previous calendar years.

The coal reject backfill emplacement project continued in 2024 emplacing 34,339 tonnes (t) of coal reject underground.

The Wollongong City Council is continuing works to confirm the suitability of Metropolitan Coal rejects to be beneficially re-used at the Helensburgh Landfill in consultation with the NSW EPA.

Metropolitan Coal is also continuing to investigate use of coal washer refuse (CWR) in the production of chailings, a bio-char like product used to increase nutrient and moisture holding capacity in soils. The NSW EPA has granted a draft Exemption and Order for the use of chailings in a field trial, to assess its effectiveness in improving soils.

The education program continued to be implemented during the reporting period to increase the awareness of mine site personnel in relation to waste management and measures to minimise the generation of waste. Metropolitan Coal will continue to seek opportunities for additional waste minimisation and for the recycling and re-use of materials at the site.

7.4 ASSESSMENT OF ENVIRONMENTAL PERFORMANCE

The performance indicators, impact assessment criteria and Project Approval conditions in Table 11 assess the performance of environmental management at the surface facilities area including those related to noise, air quality, greenhouse gases, odour, traffic, waste and visual impacts for the reporting period and reflect the predictions included in the Project EA, Preferred Project Report and the surface facilities management plans (Noise Management Plan, Air Quality and Greenhouse Gas Management Plan, Traffic Management Plan, Surface Facilities Water Management Plan and Waste Management Plan).

Table 11
Assessment of Environmental Performance – Surface Facilities Area

Monitoring Aspect	Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition	Indicator, Criteria or Condition Met?	Comments
NOISE			
Real-time Noise Performance Indicator	*The $L_{Aeq(5\ minute)}$ night-time noise level does not exceed 50 dB(A) for six consecutive 5 minute samples.*	No	The Real Time Noise Performance Indicator was triggered 72 times during the reporting period. In all but five cases, source was determined to be non-mine related.
Noise Impact Assessment Criteria (Project Approval Table 2, Condition 1, Schedule 4)	Day $L_{Aeq(15\ minute)}$ – 50 dBA	Yes	One non-compliance with respect to the Noise Mitigation Criterion was recorded at 16 Oxley Place during the reporting period (Appendix M). No sustained exceedances of the Daytime Noise Impact Assessment Criterion were identified by monitoring during the reporting period (Appendix M).
	Evening $L_{Aeq(15\ minute)}$ – 45 dBA	Yes	No exceedance of the Noise Impact Assessment Criterion was recorded during the reporting period (Appendix M). No sustained exceedances of the Evening Noise Impact Assessment Criterion were identified by monitoring during the reporting period (Appendix M).
	Night $L_{Aeq(15\ minute)}$ – 45 dBA	Yes	No exceedance of the Noise Impact Assessment Criterion was recorded during the reporting period (Appendix M). No sustained exceedances of the Night Noise Impact Assessment Criterion were identified by monitoring during the reporting period (Appendix M).
	Night $L_{A1(1\ minute)}$ – 50 dBA	No	Three conditionally non-compliant exceedances with respect to the night-time maximum Noise Impact Assessment Criterion were identified by noise monitoring at 16 Oxley Place during the reporting period (Appendix M). A sustained exceedances of the Night Noise Impact Assessment Criterion was identified by monitoring during the reporting period (Appendix M).

Table 11 (Continued)
Assessment of Environmental Performance – Surface Facilities Area

Monitoring Aspect	Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition	Indicator, Criteria or Condition Met?	Comments
NOISE (Continued)			
Noise Mitigation Criteria (Project Approval Table 4, Condition 3, Schedule 4)	Day $L_{Aeq(15\ minute)}$ – 53 dBA	Yes	No sustained exceedances of the day Noise Mitigation Criterion were identified by monitoring during the reporting period (Appendix M).
	Evening $L_{Aeq(15\ minute)}$ – 48 dBA	Yes	No sustained exceedances of the evening Noise Mitigation Criterion were identified by monitoring during the reporting period (Appendix M).
	Night $L_{Aeq(15\ minute)}$ – 48 dBA	Yes	No sustained exceedances of the night Noise Mitigation Criterion were identified by monitoring during the reporting period (Appendix M).
Noise Acquisition Criteria (Project Approval Table 3, Condition 2, Schedule 4)	Day $L_{Aeq(15\ minute)}$ – 55 dBA	Yes	No sustained exceedances of the day, evening or night-time Noise Acquisition Criterion were identified by monitoring during the reporting period (Appendix M).
	Evening $L_{Aeq(15\ minute)}$ – 50 dBA	Yes	
	Night $L_{Aeq(15\ minute)}$ – 50 dBA	Yes	
Rail Noise (Project Approval Conditions 4, 5 and 6, Schedule 4)	*4. The Proponent shall only use locomotives that are approved to operate on the NSW rail network in accordance with noise limits L6.1 to L6.4 in RailCorp's EPL (No. 12208) and ARTC's EPL (No. 3142) or a Pollution Control Approval issued under the former Pollution Control Act 1970.*	Yes	All locomotives used by Metropolitan Coal are approved for operations in accordance with the noise limits in the relevant EPL.
	5. The Proponent shall use its best endeavours to minimise night-time movements of rolling stock on the Metropolitan rail spur.	Yes	Metropolitan Coal has endeavoured to minimise night-time movements of rolling stock on the Metropolitan rail spur.
	6. In the event of any rail noise or vibration issues that may arise from the haulage of coal over the life of the Project, the Proponent shall liaise with the CCC and the rail service provider to facilitate resolution of these issues and implement additional noise reduction measures where appropriate.	Yes	No issues with rail noise or vibration were identified during the reporting period.

Table 11 (Continued)
Assessment of Environmental Performance – Surface Facilities Area

Monitoring Aspect	Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition	Indicator, Criteria or Condition Met?	Comments
NOISE (Continued)			
Notification of Landowners (Project Approval Condition 1, Schedule 5)	1. *If the results of the monitoring required in schedule 4 identify that impacts generated by the project are greater than the relevant impact assessment criteria in schedule 4, except where a negotiated agreement has been entered into in relation to that impact, then the Proponent shall, within 2 weeks of obtaining the monitoring results, notify the Executive Director Mineral Resources, the affected landowners and tenants (including tenants of mine owned properties) accordingly, and provide quarterly monitoring results to each of these parties until the results show that the project is complying with the criteria in schedule 4.*	Yes	In October and November 2024 (i.e. following conclusive identification of the sustained non-compliances and review of associated noise modelling), Metropolitan Coal notified relevant nearby residents that the most recent noise modelling continues to predict are experiencing noise levels exceeding the Noise Impact Assessment Criteria contained in the Project Approval. The notifications also advised the residents of the ongoing efforts on site the further mitigate noise levels.
AIR QUALITY			
Air Quality Performance Indicators [1,2]	PM_{10} indicator = 150 µg/m^3 (10-minute averaging period assessed using TEOM data)	Yes	There were no exceedances of the 24-hour average performance indicator concentration.
	PM_{10} indicator = 37.5 µg/m^3 (24-hour averaging period assessed using TEOM data)	Yes	There was a single exceedance of the 24-hour average performance indicator concentration, measured at 39.2 µg/m3 on 4 February 2024. An investigation concluded that the exceedance was consistent with an elevated regional air quality event.
	PM_{10} indicator = 37.5 µg/m^3 (24-hour averaging period assessed using HVAS data)	Yes	There were no exceedances of the 24-hour average performance indicator concentration.

Table 11 (Continued)
Assessment of Environmental Performance – Surface Facilities Area

Monitoring Aspect	Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition	Indicator, Criteria or Condition Met?	Comments
AIR QUALITY (Continued)			
Air Quality Performance Indicators[1,2] (Continued)	PM_{10} indicator = 25 µg/m^3 (Annual averaging period assessed using HVAS data)	Yes	An annual average of PM_{10} concentration of 11.7 µg/m^3 was recorded by the HVAS.
	Maximum total deposited dust level = 3 g/m^2/month (Annual averaging period)[3]	Yes	The annual average dust deposition rates for each of the sites indicate that compliance with the deposited dust performance indicator was achieved at every one of the dust gauges during the reporting period.
Air Quality Impact Assessment Criteria (Project Approval Condition 11, Schedule 4)	TSP Criteria[4] = 90 µg/m^3 (Annual averaging period)	Yes	Based on the annual average PM_{10} concentrations recorded by the HVAS monitoring instrument, the annual average TSP is anticipated to be less than 29.3 µg/m^3, significantly below the TSP air quality impact assessment criterion of 90 µg/m^3.
	PM_{10} Criteria[4] = 30 µg/m^3 (Annual averaging period)	Yes	An annual average PM_{10} concentration of 13.2 µg/m3 was recorded by the HVAS monitoring instrument.
	PM_{10} Criteria[4] = 50 µg/m^3 (24 hour averaging period)	Yes	There were no exceedances of the 24-hour average PM_{10} impact assessment criterion of 50 µg/m^3 observed using the TEOM instrument.
	Maximum total deposited dust level = 4 g/m^2/month (Annual averaging period)	Yes	The maximum annual average dust deposition rate was below 4 g/m^2/month or less during the reporting period at all dust gauges.
ODOUR			
Odour (Project Approval Condition 9, Schedule 4)	*9. The Proponent shall not cause or permit the emission of offensive odours from the site, as defined under Section 129 of the POEO Act.*	Yes	No odour complaints were received during the reporting period.
GREENHOUSE GASES			
Greenhouse Gas Emissions (Project Approval Condition 10, Schedule 4)	*10. The Proponent shall implement all reasonable and feasible measures to minimise:* *(a) energy use on site; and* *(b) the scope 1, 2 and 3 greenhouse gas emissions produced on site,* *to the satisfaction of the Director-General.*	Yes	Metropolitan Coal has implemented the viable energy saving measures contained within their Energy Savings Action Plan.

Table 11 (Continued)
Assessment of Environmental Performance – Surface Facilities Area

Monitoring Aspect	Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition	Indicator, Criteria or Condition Met?	Comments
TRAFFIC			
Annual Road Maintenance Performance Indicators	*When annual road maintenance contribution negotiations are required, the negotiations should commence with the relevant councils and/or DP&I by 31 August.*	Yes	No negotiations with the Wollongong City Council, Campbelltown City Council and Wollondilly Shire Council were required during the reporting period.
	Annual road maintenance contributions to relevant councils are made by 30 November.	Yes	Metropolitan Coal did not transport any coal wash reject from the site by road in the 2024 calendar year.
Coal Transport Off-site Performance Indicators	*Coal transported off-site by road in a calendar year does not reach 150,000 tonnes prior to 31 October.*	Yes	Metropolitan Coal did not transport any product coal from the site by road in the 2024 calendar year.
Coal Transport Off-site Performance Indicators (Continued)	*Product coal truck movements to the Corrimal Cokeworks and Coalcliff Cokeworks do not exceed 22 and 27 movements respectively in any one day.*	Yes	Metropolitan Coal has ceased the transport of product coal to Corrimal Cokeworks and Coalcliff Cokeworks. No product coal was transported by road during the reporting period.
Limits on Approval (Project Approval Condition 6[b], Schedule 2)	*The Proponent shall not:* *(a) ...* *(b) transport more than 2.8 million tonnes of product coal from the site in a calendar year.*	Yes	Metropolitan Coal transported a total of 1,611,094 t of product coal and 571,101 t of coal wash reject from site by rail in the 2024 calendar year.
Transport (Project Approval Conditions 17, 18, 19, 20 and 21, Schedule 4)	*17. By the end of 2010, the Proponent shall:* *(a) undertake a road safety audit of the Parkes Street and Colliery Road intersection, in consultation with the RTA and WCC; and* *(b) implement any recommendations of this audit,* *to the satisfaction of the Director-General[5].*	Yes, the road safety audit has been undertaken. Further actions required in relation to the audit recommendations.	The Road Safety Audit of the Mine Access Road and Parkes Street intersection was conducted in September 2010 in accordance with Condition 17(a), Schedule 4 of the Project Approval. The Road Safety Audit recommended an upgrade of the Parkes Street and Colliery Road intersection. However, Metropolitan Coal was unable to address all of the recommended intersection upgrades due to the inability to obtain a mutually acceptable outcome with the Wollongong City Council. Metropolitan Coal engaged a road safety expert to review whether the works undertaken are sufficient to address the original risk identified, or whether alternative/additional actions can be undertaken to address the risk. The review indicated that the civil works associated with the full intersection upgrade were not achievable within the Colliery Road Crown Land lease area. Metropolitan Coal continues to consult further in relation to the intersection upgrade where opportunities arise.

Table 11 (Continued)
Assessment of Environmental Performance – Surface Facilities Area

Monitoring Aspect	Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition	Indicator, Criteria or Condition Met?	Comments
TRAFFIC (Continued)			
Transport (Project Approval Conditions 17, 18, 19, 20 and 21, Schedule 4) (Continued)	*18. From the end of 2009, the Proponent shall make a suitable annual contribution to WCC, WSC, and CC for the maintenance of local roads that are used as haulage routes by the project. If there is any dispute over the amount of the contribution, the matter must be referred to the Director-General[5] for resolution.*	Yes	No haulage of CWR via Wollongong City Council, Campbelltown City Council or Wollondilly Shire Council roads was undertaken in 2024.
	19. The Proponent shall not: *(a) load coal or coal reject onto trucks, or transport it off site by road, outside the hours of 7am and 6pm Monday to Friday;* *(b) transport more than 170,000 tonnes of coal off site by road in a calendar year;* *(c) transport any coal off site to the Port Kembla Coal Terminal by road;* *(d) permit the departure of more than 25 trucks containing product coal for delivery to the Corrimal Cokeworks on any given day; or* *(e) permit the departure of more than 30 trucks containing product coal for delivery to the Coalcliff Cokeworks on any given day.*	Yes	The loading and transport of coal product and coal reject has been undertaken in accordance with Condition 19, Schedule 4 of the Project Approval.
	20. During emergencies (such as the disruption of rail services) the Proponent may exceed the restrictions in condition 19 above with the written approval of the Director-General[5].	Yes	Metropolitan Coal did not transport product coal or CWR by road to PKCT during the reporting period.
	21. The Proponent shall monitor the amount of coal and coal reject transported from the site by road and rail each year, and report the results of this monitoring on its website every six months.	Yes	The results of coal and coal reject transport monitoring have been provided on Metropolitan Coal's website and updated every six months.

Table 11 (Continued)
Assessment of Environmental Performance – Surface Facilities Area

Monitoring Aspect	Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition	Indicator, Criteria or Condition Met?	Comments
WASTE			
Waste Generation Performance Indicator	*Waste generation has been minimised, as evidenced by:* • *an increase in the amount or type of waste recycled;* • *a decrease in the amount of waste generated that is disposed of to licensed landfill facilities; and/or* • *no practicable opportunities for additional waste minimisation have been identified to those currently being implemented.*	Yes	Metropolitan Coal has minimised waste generation during the reporting period. The underground emplacement project reduced the off-site disposal of coal reject by approximately 34,339 t during the reporting period. No further practicable opportunities for waste minimisation were identified.
Storage of Waste Performance Indicator	*Waste has been separated and stored according to type in appropriate storage facilities (e.g. sealed containers for liquid waste).*	Yes	Waste on-site is adequately sorted and stored according to waste type prior to collection. Weekly site inspections are conducted by the Metropolitan Environment Department to ensure waste is separated and stored in accordance with the Metropolitan Coal Waste Management Plan.
Handling and Disposal of Waste Performance Indicator	*The transport of particular waste types has been tracked in accordance with NSW EPA waste tracking requirements.* *Metropolitan Coal's waste management contracts, where relevant, specify that the waste is to be transported by an appropriately licensed contractor and disposed of at an appropriately licensed facility.*	Yes	All transport of waste from the Metropolitan Coal site has been tracked in accordance with the NSW EPA waste tracking requirements. Metropolitan Coal's waste management contracts specify waste is to be removed by an appropriately licensed contractor and disposed of at an appropriately licensed facility.
Waste Generation (Project Approval Condition 24, Schedule 4)	*24. The Proponent shall:* *(a) minimise the waste (including coal reject) generated by the project; and* *(b) ensure that the waste generated by the project is appropriately stored, handled, and disposed of,* *to the satisfaction of the Director-General.*	Yes	Metropolitan Coal has minimised waste (including coal reject) generated during the reporting period. The underground emplacement project had reduced the off-site transport of coal reject by approximately 34,339 t during the reporting period. Waste on-site is adequately sorted and stored according to waste type prior to collection. Weekly site inspections are conducted by the site Environment Department to ensure waste is separated and stored in accordance with the Metropolitan Coal Waste Management Plan. Metropolitan Coal's waste management contracts specify waste is to be removed by an appropriately licensed contractor and disposed of at an appropriately licensed facility.

Table 11 (Continued)
Assessment of Environmental Performance – Surface Facilities Area

Monitoring Aspect	Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition	Indicator, Criteria or Condition Met?	Comments
VISUAL			
Visual Impacts (Project Approval Condition 23, Schedule 4)	*23. The Proponent shall minimise the visual impacts, and particularly the off-site lighting impacts, of the surface facilities area and two ventilation shaft sites to the satisfaction of the Director-General.*	Yes	N/A

Note: $L_{Aeq(15\ minute)}$ = intrusive equivalent noise level; $L_{A1(1\ minute)}$ = short-term noise level; dBA = A-weighted decibels; PM_{10} = Particulate matter less than 10 microns; HVAS1 = High Volume Air Sampler 1; TEOM1 = Tapered Element Oscillating Microbalance 1; $\mu g/m^3$ = micrograms per cubic metre; g/m^2/month = grams per square metre per month; TSP = total suspended particulate matte; t = tonnes; CWR = coal washery refuse; PKCT = Port Kembla Coal Terminal. .

1 Total measured level excluding extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities.

2 Background PM_{10} concentrations due to all other sources plus the incremental increase in PM_{10} concentrations due to the mine alone.

3 Dust deposition assessment criteria are to be measured using DG1 to DG10 excluding DG4, which is a control dust gauge that is located at the Helensburgh Golf Course some 2 km from the mine's surface facilities area.

4 PM_{10} air quality impact assessment criteria are to be measured using HVAS data.

8 WATER MANAGEMENT

A Metropolitan Coal Surface Facilities Water Management Plan has been prepared for the surface facilities area and ventilation shaft site in accordance with Condition 15, Schedule 4 of the Project Approval.

This section details the water use, licensed discharge and water quality monitoring results for the surface facilities area and the management measures implemented during the reporting period. The environmental performance of water management in the underground mining area and surrounds is described in Section 6.2.

The surface facilities area is located in a steep-sided valley adjacent to the town of Helensburgh and next to Camp Gully (Figure 2). The site water management system comprises a series of collection dams, sumps and treatment systems. The system is operated to avoid the mixing of clean water runoff and mine water, minimise off-site release of runoff, and to provide water supply requirements on-site.

Water Use

The main uses of water on-site are to supply underground mining operations and the coal washery. Metropolitan Coal draws its water from three main sources, namely, Camp Gully, the potable town water supply and water captured on-site.

Camp Gully runs adjacent to the southern edge of Metropolitan Coal's surface facilities area (Figure 22). Metropolitan Coal's extraction of water from Camp Gully is specifically regulated by the Camp Creek Weir Surface Water Certificate of Title and more generally by the *Water Act 1912* and the *Water Management Act 2000*.

Metropolitan Coal's annual entitlement under the Camp Gully extraction licence is 130 megalitres (ML). A concrete weir was historically constructed on Camp Gully (approximately 1930s) to facilitate the extraction of water for the mine. Metropolitan Coal did not source any water from Camp Gully during the reporting period.

The use of potable water (sourced from Sydney Water) for mine purposes occurs when insufficient water is available from Camp Gully and/or on-site harvesting. Potable water is sourced from two mains, one of which supplies the bathhouses and drinking water utilities and one that supplements water supplies for mining purposes. Use of potable water is recorded and minimised in accordance with the site's commitments under the Water Savings Action Plan. Metropolitan Coal used approximately 400 ML of potable town water (as recorded by the Sydney Water meters) during 2024 (a monthly average of approximately 33 ML), in comparison to 442 ML in 2023, 398 ML in 2022, 239 ML in 2021, 301 ML in 2020 and 387 ML in 2019.

The use of potable water per tonne of ROM coal produced is variable and is generally higher during periods of low rainfall (Chart 93). Ongoing site auditing during the reporting period has not identified incidences of potable water being used where there is a viable alternative. In 2024 potable water consumption continued to correlate well with ROM production throughout the year.

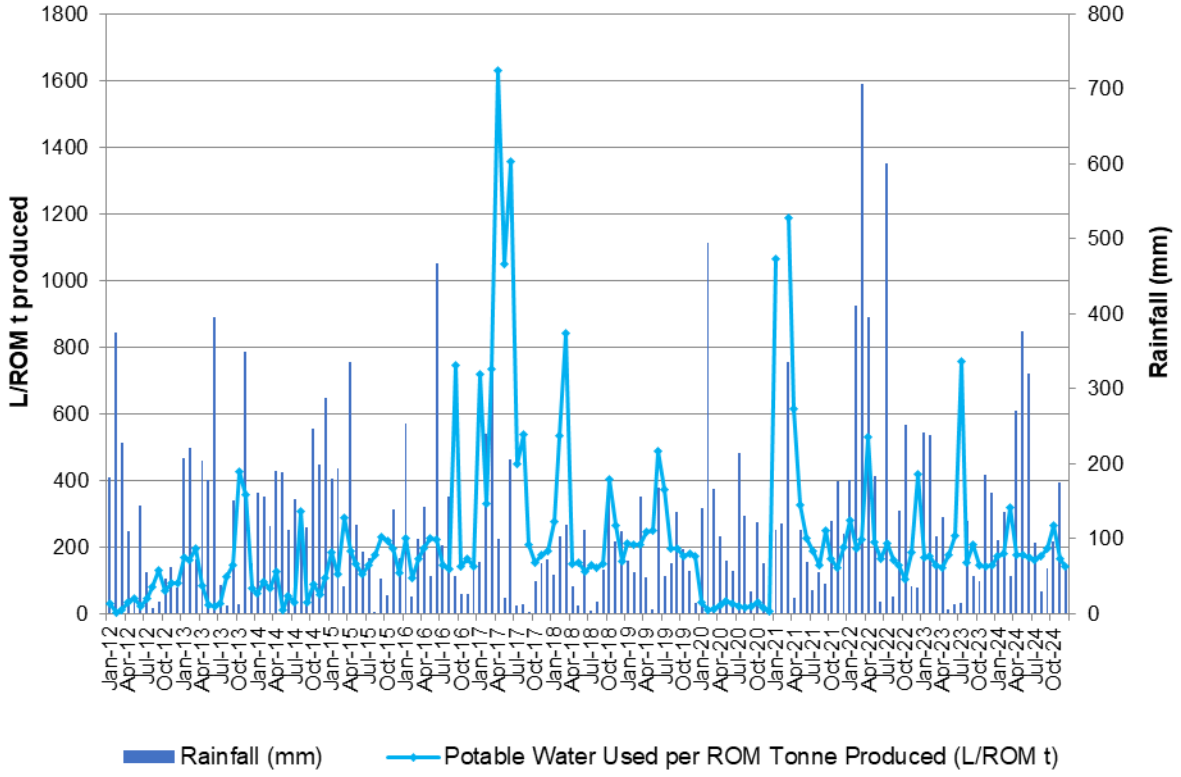


Chart 93 Potable Water Used per ROM Tonne Produced vs Rainfall

Licensed Discharge

Water discharged from the Water Treatment Plant to Camp Gully is monitored in accordance with EPL No. 767, which requires Metropolitan Coal to continuously monitor the volume (kilolitres per day) of water discharged from the clean water tank in the Water Treatment Plant to Camp Gully. The total amount of water discharged from the Water Treatment Plant to Camp Gully during the reporting period was approximately 57 ML, in comparison to 116 ML in 2023, 118 ML in 2022, 95 ML in 2021, 120 ML in 2020 and 55 ML in 2019.

Water Quality

Surface water quality monitoring of pH, oil and grease and total suspended solids is conducted at the Water Treatment Plant in accordance with EPL No. 767.

The water quality monitoring results indicate that pH levels (Mean of 8.33 pH) and total suspended solids (Mean of 8.8 mg/L) were within the water quality limits prescribed by EPL No. 767 (i.e. 6.5 to 8.5 pH and less than 30 mg/L for total suspended solids) during the reporting period. Similarly, no exceedances of the EPL No. 767 concentration limits were recorded by Metropolitan Coal in the 2011 to 2023 calendar years.

The Project EA predicted there would be no material effect to downstream water quality as a result of water releases from the major surface facilities area to Camp Gully (which are constrained by EPL No. 767). The monitoring results are consistent with the Project EA predictions in relation to water quality.

Overall System Integrity

Surface facilities water management items (such as pipelines and pumps, bunded areas, main water storages, signs of discharge of site runoff, upslope diversions and erosion control measures) are visually inspected by Metropolitan Coal and reported in accordance with the mine's maintenance system.

During the reporting period Metropolitan Coal continued to improve efficiency of desilting activities and completely desilted both the Turkeys Nest and Sediment Ponds dams.

Assessment of Environmental Performance

In accordance with the Metropolitan Coal Surface Facilities Water Management Plan, an assessment of the environmental performance of water management at the surface facilities area is provided in Table 12.

A summary of the water take during the water reporting period (1 July 2023 to 30 June 2024) is provided in Table 13.

Table 12
Assessment of Environmental Performance – Surface Facilities Water Management

Monitoring Aspect	Performance Indicator or Project Approval Condition	Indicator or Condition Met?	Comments
SURFACE FACILITIES WATER MANAGEMENT			
Water Use Performance Indicator	*The use of potable water (i.e. megalitres of town water used per tonne of coal produced) does not increase over time, after taking into consideration climatic conditions.* *Potable water has not been used in circumstances where there is a viable alternative.*	Yes	Ongoing site auditing during the reporting period has not identified incidences of potable water being used where there is a viable alternative.
Erosion Control Performance Indicator	*Inspections of the major surface facilities area and ventilation shaft(s) indicate the measures implemented are effectively controlling erosion.*	Yes	Weekly inspections of the surface facilities area and ventilation shaft(s) indicate that the erosion control measures implemented during the reporting period including sediment fencing and coir logs have effectively controlled erosion.
Containment of Contaminants Performance Indicator	*Effective containment and/or isolation measures are in place for potential contaminants on site.*	Yes	Weekly inspections have confirmed that effective containment and isolation measures have been in place for potential contaminants on-site.
Licensed Discharge Performance Indicator	*Surface water discharges comply with the requirements of EPL No. 767.*	Yes	All discharges through LDP7 were compliant with EPL No. 767. Two discharges also occurred through LDP8 during the reporting period as a result of heavy rainfall events in April and 2024.
System Integrity Performance Indicator	*Inspections of system components indicate the integrity of the system is not at risk of being compromised.*	Yes	Daily and weekly inspections of the water management system did not identify the need for maintenance of system components to reduce risk of compromise.

Table 12 (Continued)
Assessment of Environmental Performance – Surface Facilities Water Management

Monitoring Aspect	Performance Indicator or Project Approval Condition	Indicator or Condition Met?	Comments
SURFACE FACILITIES WATER MANAGEMENT			
Discharges (Project Approval Condition 14, Schedule 4)	*14. The Proponent shall ensure that all surface water discharges from the site comply with the discharge limits (both volume and quality) set for the project in any EPL.*	Yes	All discharges through LDP7 were compliant with the EPL. Two discharges also occurred through LDP8 during the reporting period as a result of heavy rainfall events in April and June.

Table 13
Cumulative Water Take (1 July 2023 to 30 June 2024)

Water Licence #	Water Sharing Plan, Source and Management Zone (as applicable)	Entitlement (ML/year)	Passive take / inflows (ML/year)	Active Pumping (ML/year)
10BL603595	Greater Metropolitan Region Groundwater Sources 2023 Sydney Basin Central Groundwater Source	182.5	27.8	0.0

9 CONSTRUCTION MANAGEMENT

A Metropolitan Coal Construction Management Plan has been prepared for surface construction works (excluding remediation or rehabilitation works) in the Woronora Special Area in accordance with Condition 11, Schedule 3 of the Project Approval.

As the requirement for surface construction works arise, Metropolitan Coal provide the specific details of the proposed surface construction works (in the form of a completed Surface Works Assessment Form [SWAF]) to the DHI and WaterNSW for comment. The Surface Works Assessment Form details the specific management measures that will be implemented to minimise potential impacts associated with surface construction works, including management measures relevant to vegetation, Aboriginal heritage, erosion and sediment control, fuel and spill management, transport, waste, bushfire preparedness, pest management and site clean-up.

In 2024 Metropolitan Coal lodged a SWAF for the installation of additional swamp groundwater and substrate moisture monitoring equipment in the Woronora Special Area over future longwall 317. After receiving approval from DPHI in February, Metropolitan completed installation of the monitoring equipment in November.

No other construction activities in the underground mining area were conducted during the reporting period.

10 REHABILITATION

In August 2023, a Rehabilitation Management Plan was prepared by Metropolitan Coal in accordance with the new standard rehabilitation conditions on mining leases imposed through an amendment to the *Mining Regulation 2016* under the *Mining Act 1992*. The Rehabilitation Management Plan is available on the Peabody website and addresses the rehabilitation requirements prescribed in the conditions of ML 1610, ML 1702, CCL 703, CL 379, MPL 320 and Condition 4, Schedule 6 of the Project Approval (08_0149).

Rehabilitation activities at the Metropolitan Coal Mine are conducted in accordance with the Rehabilitation Management Plan.

In accordance with clauses 9 and 13 of Schedule 8A of *Mining Regulations 2016* and Part 1 of the NSW Resources Regulator Form and Way – *Annual Rehabilitation Report and Forward Program for Large Mines* (2021), Metropolitan Coal has prepared an Annual Rehabilitation Report for the 2024 reporting period. The 2024 Annual Rehabilitation Report describes the rehabilitation and disturbance activities undertaken at the Metropolitan Coal Mine between 1 January to 31 December 2024 (i.e. the Annual Review reporting period).

To ensure consistency between the reporting of rehabilitation activities required by Metropolitan Coal's mining leases and Project Approval (08_0149), the Metropolitan Coal Annual Rehabilitation Report has been provided in Appendix O and is available on the Peabody website.

10.1 ASSESSMENT OF ENVIRONMENTAL PERFORMANCE

An assessment of the environmental performance of rehabilitation management during the reporting period is provided in Table 14.

Table 14
Assessment of Environmental Performance – Rehabilitation

Monitoring Component		Performance Indicator, Rehabilitation Objective and/or Project Approval Condition	Indicator, Objective or Condition Met?	Comments
Other land affected by the Project Performance Indicator		*Redundant equipment/infrastructure items have been removed.* *The site is neat and tidy (i.e. it does not contain any rubbish).* *No weed management measures are required.* *No erosion or sediment control measures are required.* *Where appropriate, native vegetation is naturally regenerating or active revegetation is establishing.* *No further active revegetation measures are required.*	Not currently applicable	Not applicable during the reporting period as no rehabilitation of surface distribution areas in the underground mining area has been conducted. Once a surface disturbance area is no longer being utilised, Metropolitan Coal will use the Rehabilitation Management Plan – Surface Disturbance Register to monitor the performance of the measures implemented to rehabilitate surface disturbance areas.
Stream Remediation Performance Indicator		*Analysis of water level recession rates for a pool indicates a similar pool behaviour to that which existed prior to being impacted by subsidence.*	To be determined	While stream remediation activities have been conducted at Pools A, F and G on the Waratah Rivulet, assessment against the rehabilitation performance indicator has not been made to date. Assessment following the stream remediation works was delayed until a significant period of drier climatic conditions had been experienced and an updated Stream Remediation Management Plan including proposed pool remediation success assessment criteria, which was approved in November 2019.
Rehabilitation Objectives (Project Approval Table 11, Condition 1 Schedule 6)	*Surface Facilities Area*	*Set through condition 2 below.*	Yes	The rehabilitation objective for the surface facilities area is addressed in the Metropolitan Coal Rehabilitation Strategy.
	Waratah Rivulet, between the downstream edge of Flat Rock Swamp and the full supply level of the Woronora Reservoir	*Restore surface flow and pool holding capacity as soon as reasonably practicable.*	To be determined	Metropolitan Coal will assess surface flow and pool holding capacity using the results of the assessment of the stream remediation performance indicator for the completed stream remediation activities at Pools A, F and G once a significant period of drier climatic conditions has been experienced. Additional stream remediation activities were undertaken at Pool A during the review period.
	Eastern Tributary, between the maingate of Longwall 26 and the full supply level of the Woronora Reservoir		To be determined	Metropolitan Coal is currently collecting monitoring data to inform assessment of the stream remediation performance indicator.
	Cliffs	*Ensure that there is no safety hazard beyond that existing prior to mining.*	Yes	No safety hazard associated with cliffs was identified during the reporting period.

Table 14 (Continued)
Assessment of Environmental Performance – Rehabilitation

Monitoring Component		Performance Indicator, Rehabilitation Objective and/or Project Approval Condition	Indicator, Objective or Condition Met?	Comments
Rehabilitation Objectives (Project Approval Table 11, Condition 1 Schedule 6) (Continued)	*Other land affected by the Project*	*Restore ecosystem function, including maintaining or establishing self sustaining native ecosystems:* • *comprised of local native plant species; with* • *a landform consistent with the surrounding environment.*	Not currently applicable	The Rehabilitation Management Plan – Surface Disturbance Register will be used to manage the implementation of rehabilitation measures. The performance indicator for other land affected by the Project will be used to monitor the performance of rehabilitation measures being implemented.
	Built features	*Repair/restore to pre-mining condition or equivalent.*	Yes	Assessed through the Metropolitan Coal Built Features Management Plans. No impacts to built features were recorded during the reporting period.
	Community	*Minimise the adverse socio-economic effects associated with mine closure including the reduction in local and regional employment.*	Not currently applicable	The socio-economic effects associated with mine closure will be addressed in the Metropolitan Coal Mine Closure Plan and will be considered in consultation with the local community (through the Community Consultative Committee [CCC]) when determining the final land use option.
		Ensure public safety.	Yes	Assessed through the Metropolitan Coal Public Safety Management Plan for the underground mining area and in the Metropolitan Coal Rehabilitation Strategy for the surface facilities area.
Rehabilitation Strategy – Surface Facilities Area (Project Approval Condition 2, Schedule 6)		*2. By the end of October 2011, the Proponent shall prepare a Rehabilitation Strategy for the surface facilities area to the satisfaction of the Director-General. This strategy must:* *(a) be prepared by a team of suitably qualified and experienced experts whose appointment has been endorsed by the Director-General;* *(b) be prepared in consultation with relevant stakeholders, including the WCC and the CCC;* *(c) investigate options for the future use of the area upon the completion of mining;* *(d) describe and justify the proposed rehabilitation strategy for the area; and* *(e) define the rehabilitation objectives for the area, as well as the proposed completion criteria for this rehabilitation.*	Yes	-

Table 14 (Continued)
Assessment of Environmental Performance – Rehabilitation

Monitoring Component	Performance Indicator, Rehabilitation Objective and/or Project Approval Condition	Indicator, Objective or Condition Met?	Comments
Progressive Rehabilitation (Project Approval Condition 3, Schedule 6)	*3. To the extent that mining operations permit, the Proponent shall carry out rehabilitation progressively, that is, as soon as reasonably practicable following the disturbance.*	Yes	-
Rehabilitation Management Plan (Project Approval Condition 4, Schedule 6)	*4. The Proponent shall prepare and implement a Rehabilitation Management Plan for the project to the satisfaction of the Executive Director Mineral Resources. This plan must be prepared in consultation with the relevant stakeholders, and submitted to DRE for approval prior to carrying out any second workings in the mining area.* *Note: In accordance with condition 12 of schedule 2, the preparation and implementation of Rehabilitation Management Plans is likely to be staged, with each plan covering a defined area (or domain) for rehabilitation. In addition, while mining operations are being carried out, some of the proposed remediation or rehabilitation measures may be included in the detailed management plans that form part of the Extraction Plan. If this is the case, however, then the Proponent will be required to ensure that there is good cross-referencing between the various management plans.*	Yes	-
Catchment Improvement Works (Project Approval Condition 5, Schedule 6)	*5. The Proponent shall:* *(a) pay SCA $100,000 by the end of 2011 to carry out catchment improvement works within the Woronora catchment area; or* *(b) carry out catchment improvement works within this area that have an equivalent value to the satisfaction of SCA.*	Yes	

Table 14 (Continued)
Assessment of Environmental Performance – Rehabilitation

Monitoring Component	Performance Indicator, Rehabilitation Objective and/or Project Approval Condition	Indicator, Objective or Condition Met?	Comments
Offsets (Project Approval Condition 6, Schedule 6)	*6. If the Proponent exceeds the performance measures in Table 1 of this approval, and either* *(a) The contingency measures implemented by the Proponent have failed to remediate the impact; or* *(b) The Director-General determines that it is not reasonable or feasible to remediate the impact,* *then the Proponent shall provide a suitable offset to compensate for the impact to the satisfaction of the Director-General.* *Note: Any offsets required under this condition must be proportionate with the significance of the impact.*	To be determined	In October 2016 Metropolitan Coal identified the subsidence impact performance measure for the Eastern Tributary, between the full supply level of the Woronora Reservoir and the Longwall 26 maingate in Table 1, Condition 1, Schedule 3 of the Project Approval had been exceeded in relation to iron staining. In early 2017 the same performance measure was identified as being exceeded in relation to pool drainage behaviour (refer to Sections 6.2 and 13.1). Metropolitan Coal proposed to conduct stream remediation measures on the Eastern Tributary in accordance with the Longwalls 23-27 Water Management Plan Contingency Plan. In 2018 Metropolitan submitted a Stream Remediation Plan to relevant stakeholders prior to commencement of any stream remediation. The plan was approved in November 2019 with remediation activities commencing in 2021.

11 COMMUNITY

Metropolitan Coal engages with the Helensburgh community and strives to maintain positive relationships with stakeholders given the extensive history shared between the mine and township. Generations of locals have worked at the mine and it is widely accepted that the operation is an integral component of the Helensburgh community.

The majority of workers reside in the local area or within 50 km of the mine. As far as practicable, the mine seeks to employ local contractors, supply companies and services during the course of its operations.

Metropolitan Coal has also continued to provide sponsorship and/or donations to the local community during the reporting period. Metropolitan Coal's proactive community engagement program aims to work in partnership with the community for mutually beneficial and sustainable outcomes achieving this through the development of specific community programs as discussed below.

11.1 COMMUNITY ENGAGEMENT ACTIVITIES AND INITIATIVES

Community Consultative Committee

Three CCC meetings were held during the reporting period (11 April, 30 July and 26 November 2024). These meetings facilitated Metropolitan Coal consultation and engagement with community members on matters of general business and the environmental performance of the operation. Discussions during the reporting period included the Longwalls 311-316 Extraction Plan, a proposed Longwalls 316-317 project modification, monitoring and remediation of the Eastern Tributary, surface water management, exploration licence ELA 5918, proposed project modifications, CWR management and community funding.

11.2 COMMUNITY CONTRIBUTIONS

In addition to the community engagement activities and initiatives discussed above, Metropolitan Coal has made a number of significant donations to support the community of Helensburgh and the greater Illawarra region throughout 2024. All donation requests were assessed on their individual merit and funding was distributed accordingly.

In total, community donations and sponsorship during 2024 amounted to over $190,000 and included the following:

- Donation to the Helensburgh Tigers Rugby League Club.
- Donation to the Helensburgh Tigers Junior Rugby League Club.
- Donation to Helensburgh Netball Club.
- Donation to Helensburgh Thistles Soccer Club.
- Ongoing sponsorship of the Helensburgh Public School and Holy Cross Primary School gardening and environment programs.
- Donation to Helensburgh Hope Church Community Pantry.
- Donation to the Illawarra Cycle Club.
- Donation to Helensburgh Mens Shed.
- Funding of "Carols in the Burgh" fireworks display.
- Donation to Helensburgh Bricks Fair

- A three-year sponsorship of Symbio Wildlife Park to assist with the reintroduction of the Southern Stuttering Frog to parts of its former range on the NSW south coast including the Royal National Park.

11.3 COMMUNITY COMPLAINTS

A protocol for the management and reporting of complaints has been developed as a component of Metropolitan Coal's Environmental Management Strategy. A dedicated telephone number for the provision of comments or complaints is maintained by Metropolitan Coal (1800 115 003) and is displayed on signage at an entrance to the mine. Metropolitan Coal records and responds to all complaints and maintains a complaints register on its website.

During the reporting period, three complaints were received, all pertaining to noise. One complaint pertained to a metallic clanging noise emanating from the stockpile area which was identified as a metal chute on the conveyor system. The chute was promptly lined to eliminate the noise and the complainant informed of the actions taken. A second complaint pertained to a high-pitched reversing alarm at the stockpile area. A full audit of all surface equipment failed to identify a source, but a number of broad-spectrum alarms were adjusted to a lower dBA level. Subsequently in early 2025 a high-pitched tipping alarm was identified on one of the site dump trucks which was promptly replaced with a broad spectrum alarm. The third complaint related to a loud banging noise from Metropolitan's yard area which the complainant thought was unreasonable on a Sunday morning, however it was a Monday. This fact notwithstanding, the need to minimise noise in the yard in the early morning was reiterated to yard personnel.

A summary of community complaints received since January 2006 is provided on Figure 23. Very few complaints have been received on an annual basis since the Project was approved in June 2009, and have typically related to noise, dust and/or traffic.

12 INDEPENDENT ENVIRONMENTAL AUDIT

In accordance with Condition 8, Schedule 7 of the Project Approval, an Independent Environmental Audit of the Project is to be commissioned by the end of December 2011, and every three years thereafter, and be conducted by a team of experienced and independent experts endorsed by the Director-General (now Secretary) of the DPE (now DPHI).

Metropolitan Coal commissioned the 2023 Independent Environmental Audit by 31 December 2023. In accordance with Condition 9, Schedule 7 of the Project Approval, Metropolitan Coal provided a copy of the Independent Environmental Audit to DPHI with Metropolitan Coal's response to the Audit recommendations upon completion.

Five Independent Environmental Audits have been completed to date (as reported in previous Annual Reviews). The next Independent Environmental Audit is to be commissioned by December 2026.

13 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

In accordance with Condition 4, Schedule 7 of the Project Approval (08_0149), Metropolitan Coal reviews, and if necessary, revises the Metropolitan Coal Management Plans within three months of the submission of an incident report under Condition 6, Schedule 7 of the Project Approval (08_0149).

13.1 EASTERN TRIBUTARY PERFORMANCE MEASURE

The Metropolitan Coal Project Approval (08_0149) requires Metropolitan Coal not to exceed the subsidence impact performance measures outlined in Table 1 of Condition 1, Schedule 3.

The subsidence impact performance measure for the Eastern Tributary watercourse is:

> *Negligible environmental consequences over at least 70% of the stream length (that is no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining and minimal gas releases)*

Monitoring conducted in accordance with the Metropolitan Coal Longwalls 23-27 Water Management Plan in 2016 identified that the Eastern Tributary watercourse performance measure for the Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26 was exceeded in relation to *minimal iron staining* in October 2016. The exceedance was reported to the Secretary of the DP&E and other relevant agencies on 14 October 2016 in accordance with Condition 6, Schedule 7 of the Project Approval and the Metropolitan Coal Longwalls 23-27 Water Management Plan Contingency Plan.

The *no diversion of flows, no change in the natural drainage behaviour of pools* component of the Eastern Tributary subsidence impact performance measure was exceeded in January 2017 and reported to the DP&E and other relevant agencies.

Since 2020 Metropolitan Coal has conducted stream remediation works in accordance with the Metropolitan Coal Stream Remediation Plan. PUR grout curtains to a depth of up to 10 m have been installed at pools ETAH, ETAK, ETAL, ETAM and ETAO with additional shallow pattern grouting to a depth of approximately 1 m also undertaken at Pools ETAQ and ETAR. Significant improvements in stream bed permeability and pool drainage behaviour have been noted, however an extended period of dry climatic conditions is needed to properly assess the efficacy of the remediation activities taken to date. Stream remediation activities will continue in 2025.

14 ACTIVITIES PROPOSED IN THE NEXT REPORTING PERIOD

In the next reporting period, Longwall 311 is expected to be completed in May 2025 and Longwall 312 is anticipated to commence in June 2025 and continue through the remainder of the reporting period (Figure 5).

In the next reporting period, the following activities will be conducted:

- Metropolitan Coal will continue to consult with stakeholders in relation to the next Extraction Plan.
- Metropolitan Coal will continue its ongoing consultation with the Wollongong City Council regarding the potential for coal rejects to be beneficially re-used at the Helensburgh Landfill.
- Metropolitan Coal will continue to investigate use of CWR in the production of chailings.
- The coal reject backfill emplacement project will continue in 2025.
- Metropolitan Coal will continue works to vegetate the outer batters of the Turkey's Nest Dam and Camp Creek Gully.
- Metropolitan Coal will undertake additional stream remediation at Pool A on Waratah Rivulet and within the performance measure zone of Eastern Tributary.
- Installation of swamp groundwater and soil moisture monitoring equipment in the Woronora Special Area.

15 ACTIONS FROM RECOMMENDATIONS OF THE INDEPENDENT ADVISORY EXPERT PANEL FOR MINING

In 2023, the then DPE (now DPHI) requested advice from the Independent Expert Advisory Panel for Mining's (IEAPM's) in regards to potential impacts of past and future underground mining on water quality and three large swamps overlying Longwalls 311-316. The IEAPM has prepared the following three reports in response to DPHI's request:

1. *Metropolitan Coal Mine: Independent review of environmental performance to 2022* (IEAPM, 2023a).
2. *Water Quality Performance Measures for Metropolitan Coal Mine* (IEAPM, 2023b).
3. *High Level Review - Large swamp environmental assessment requirements for the Extraction Plan for Longwalls 311 to 316* (IEAPM, 2023c).

In July 2024, the DPHI requested the IEAPM provide advice in relation to the Longwalls 311-316 Extraction Plan. On 9 September 2024, the DPHI provided the IEAPM's Advice Report to Metropolitan Coal, which outlined 42 recommendations pertaining to Longwalls 311-312.

As part of the Longwalls 311-316 Extraction Plan, Metropolitan Coal provided the DPHI with a number of commitments to address the IEAPM's recommendations. A number of these recommendations were proposed to be included in the 2024 Annual Review.

Metropolitan Coal has commenced investigations in response to the IEAPM's recommendations. A summary of the IEAPM's recommendation and the status of the commitment is provided in Table 15.

Table 15
IEAPM Recommendations and Commitment Status Update

Recommendation	Metropolitan Coal Commitment	Relevant Annual Review Section / Commitment Update
Performance indicators and associated trigger levels for water reaching the Woronora Reservoir should be assessed using total Fe, Mn and Al where sufficient baseline data exist. Both total and dissolved Fe, Mn and Al concentrations should be reported in six month and annual reports.	Longwalls 311-316 Water Management Plan includes total iron, total manganese and total aluminium monitoring at a number of key sites. Future six-month and annual reporting against the Longwalls 311-316 Extraction Plan will include both dissolved and total Fe, Mn and Al concentrations.	Section 6.2.4, Section 6.2.5 and Appendix B2.
An analysis of historical water quality trends in Woronora Reservoir and their relation to mining development should be included in the Metropolitan Coal 2024 Annual Review, and this should not be provisional on further suitable data becoming available.	An analysis of historical water quality trends in Woronora Reservoir and their relation to mining development is being undertaken by ATC Williams. These results would be presented in the 2025 Annual Review.	Section 6.2.5 and Appendix B2.

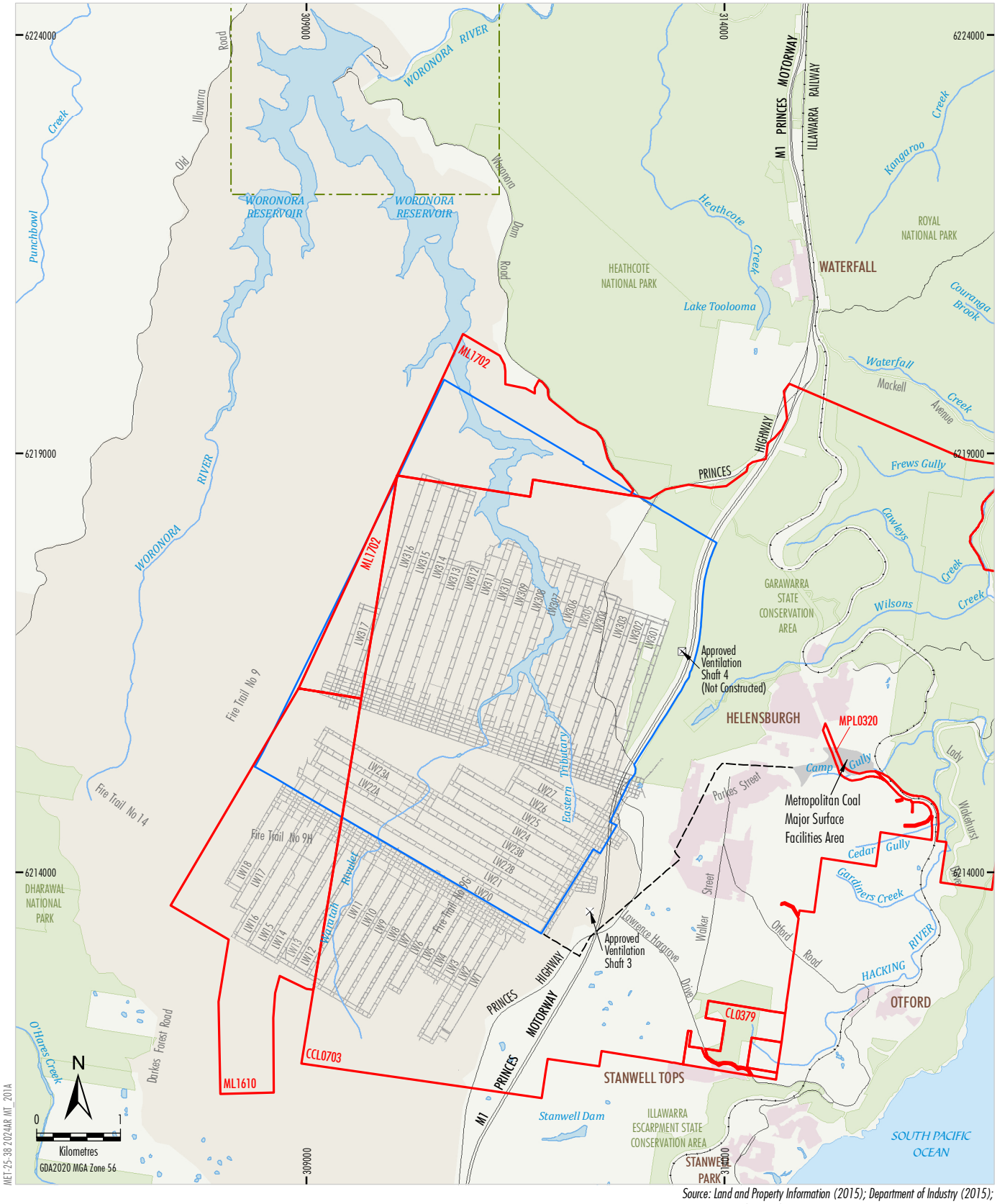
Table 15 (Continued)
IEAPM Recommendations and Commitment Status Update

Recommendation	Metropolitan Coal Commitment	Relevant Annual Review Section / Commitment Update
Water quality monitoring at the swamp S92-GS site including a baseline period as far as practicable.	Metropolitan Coal undertakes water quality monitoring from the Swamp 92 Gauging Station (S92-GS). The monitoring data has been included in the Surface Water Annual Review prepared by ATC Williams.	Appendix B2.
The conceptual models of the large swamps should be reviewed in 6-monthly reporting in the light of new monitoring data, and updated to represent vegetation communities.	Metropolitan Coal has incorporated a section within the Annual Review that provides a review of, and where necessary updates to, the 1-dimensional and 2-dimensional models for the Large Swamps in consideration of relevant new monitoring data where a subsidence consequence has occurred.	Section 6.2.12 and Appendix P
Further baseline surveys are required for threatened frog species, using appropriate survey methods and effort, conducted at a suitable time of year with survey locations targeting breeding habitat through the upland swamps (where present) and along suitable reaches of Tributaries P, R and S.	Metropolitan Coal has engaged Niche and approved Biodiversity Expert for Littlejohn's Tree Frog (*Litoria littlejohni*), Giant Burrowing Frog (*Heleioporus australiacus*) and Red-crowned Toadlet (*Pseudophryne australis*), Ross Wellington, to undertake additional baseline amphibian surveys using appropriate survey methods and assist with developing an updated amphibian monitoring program for the three large swamps and associated control swamps.	Due to unsuitable weather conditions and access, baseline surveys targeting the three threatened frog species are still being undertaken and will be reported in the Biodiversity Development Assessment Report being prepared for the Longwalls 317-318 Modification (for data collected to date) and with further updates to be reported in the 2025 Annual Review.
Additional surveys are required for Swamps 92, 77 and 76 using best practice methods. The Panel recommends the company engage with BCS in developing a suitable survey method.		
Re-analysis of the flow data including the most recent data. This analysis should be of the nature of HEC (2022) but also consider the possibility of increased flows being related to high groundwater or reservoir levels or errors in the modified AWBM model (Australian Water Balance Model).	Metropolitan Coal has engaged ATC Williams to analyse the flow data and consider the possibility of increased flow being related to high groundwater or reservoir levels or errors in the modified AWBM model.	The outcomes of the investigation will be included in the 2025 Annual Review.
Further reporting of the modelling in annual report appendices should contain details of the modified AWBM model and parameter values needed to allow independent assessment.	Following the re-analysis of flow data, ATC Williams will undertake further reporting of information relevant to the modified AWBM model.	The outcomes of the report will be included in the 2025 Annual Review.

Table 15 (Continued)
IEAPM Recommendations and Commitment Status Update

Recommendation	Metropolitan Coal Commitment	Relevant Annual Review Section / Commitment Update
Peabody should commit, subject to access permission, to monitoring the depth profiles of water quality of the Woronora Reservoir at WDFS1 or other suitable site including regular (at least bi-annual) sampling throughout the remaining mining period, plus sampling following level 3 triggers for water quality reaching the reservoir.	Metropolitan Coal has commenced water quality sampling and analysis for monitoring location WDFS1 (located at the confluence of Eastern Tributary and Waratah Rivulet). These results would be presented in the 2025 Annual Review in considered in relation to assessment of TARP *Negligible Reduction to the Quality of Water Resources Reaching the Woronora Reservoir*	The outcomes of the investigation will be included in the 2025 Annual Review.
Suitable methods for improving the extension of the Eastern Tributary rating curves to improve high flow measurement accuracy should be undertaken by Peabody. WaterNSW should review whether the extension of the rating curve at the Waratah Rivulet could be improved. Selected watercourses in future mining areas should have flow gauges installed with validated rating curves. Where it is impractical to extend rating curves to high flows, alternative methods of high flow estimation should be considered.	Metropolitan Coal has engaged ATC Williams to investigate suitable methods for improving the extension of the Eastern Tributary rating curve to improve high flow measure accuracy.	The investigation is ongoing and the outcomes will be included in the 2025 Annual Review.

FIGURES



Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025)

LEGEND

- Mining Lease Boundary
- Project Underground Mining Area
- Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)
- Woronora Special Area
- Railway
- Road
- Woronora Notification Area

Peabody

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Metropolitan Coal Longwall Layout

Figure 1



MET-25-38 2024AR MT_001A

Source: Aerial Photography (2005)

LEGEND

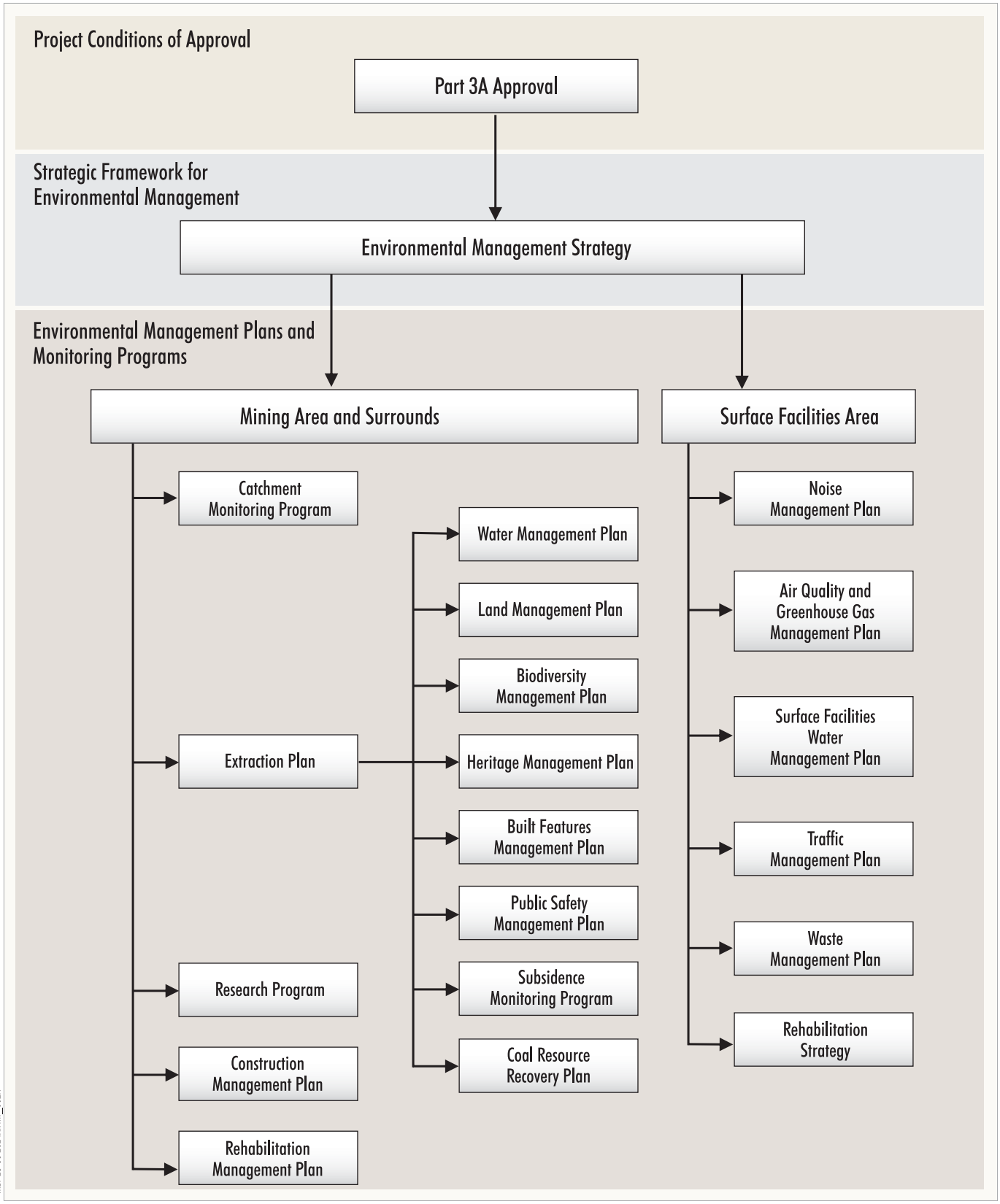
- Additional/Upgraded Project Infrastructure
- Approximate Extent of Major Surface Facilities Area

Peabody

METROPOLITAN COAL

General Arrangement of the Major Surface Facilities Area

Figure 2

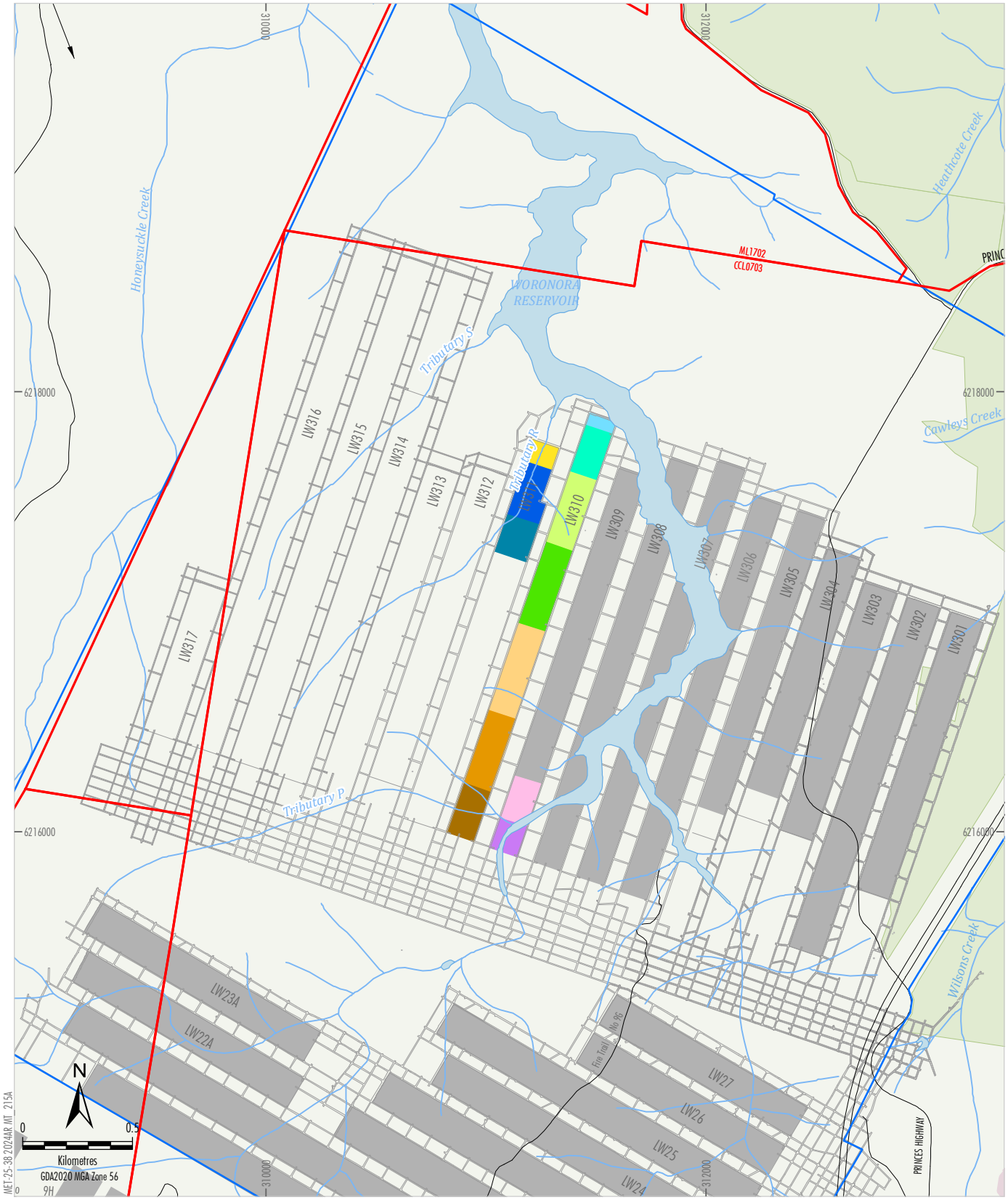


MET-25-38 2024AR MT_002A

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METROPOLITAN COAL

Environmental Management Structure

Figure 3



LEGEND

- Mining Lease Boundary
- Railway
- Project Underground Mining Area
- Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)
- Previous Extraction

Monthly Development 2024

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

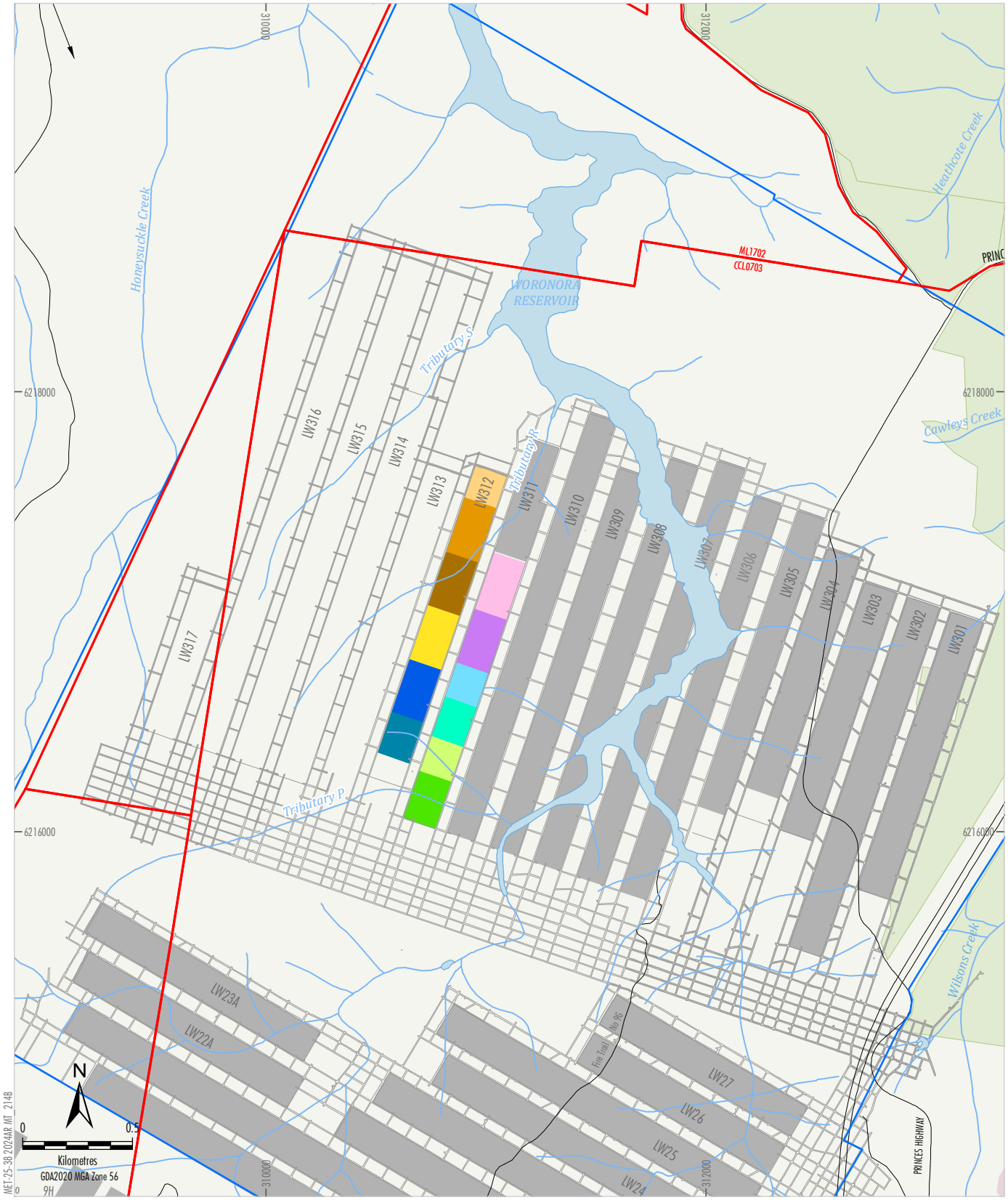
Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2025)

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METROPOLITAN COAL

Monthly Production Plan
January to December 2024

Figure 4



LEGEND

- Mining Lease Boundary
- Railway
- Project Underground Mining Area
- Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)
- Previous Extraction

Production Forecast 2025

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

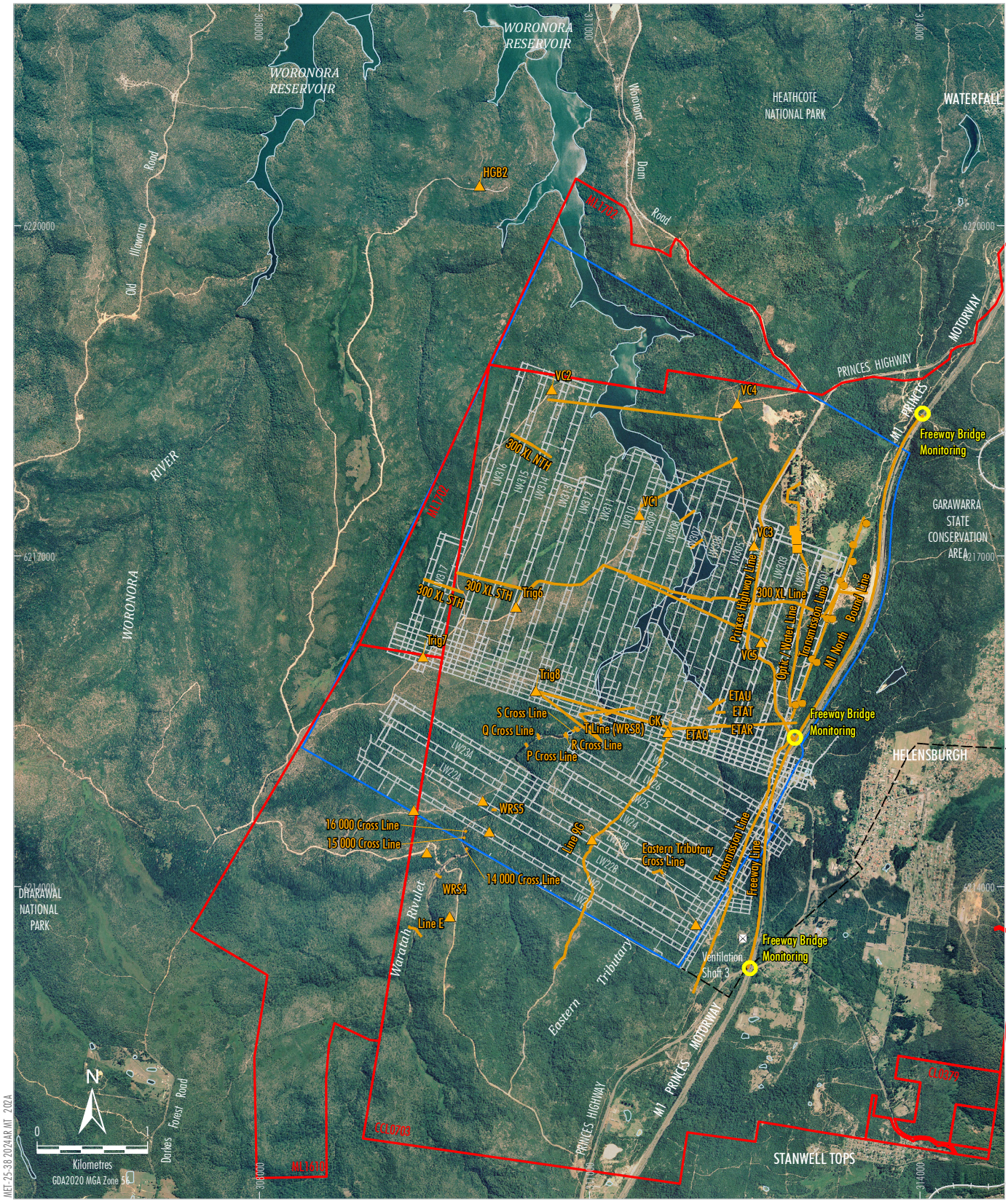
Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2025)

Peabody

METROPOLITAN COAL

Production Plan Forecast
January to December 2025

Figure 5



LEGEND

- Mining Lease Boundary
- Railway
- Project Underground Mining Area
  Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)
- Ridge Survey Point
- Subsidence Line
- Transmission Towers -
  Endeavour Energy and TransGrid
- Communications Towers
- Freeway Bridge Subsidence Monitoring

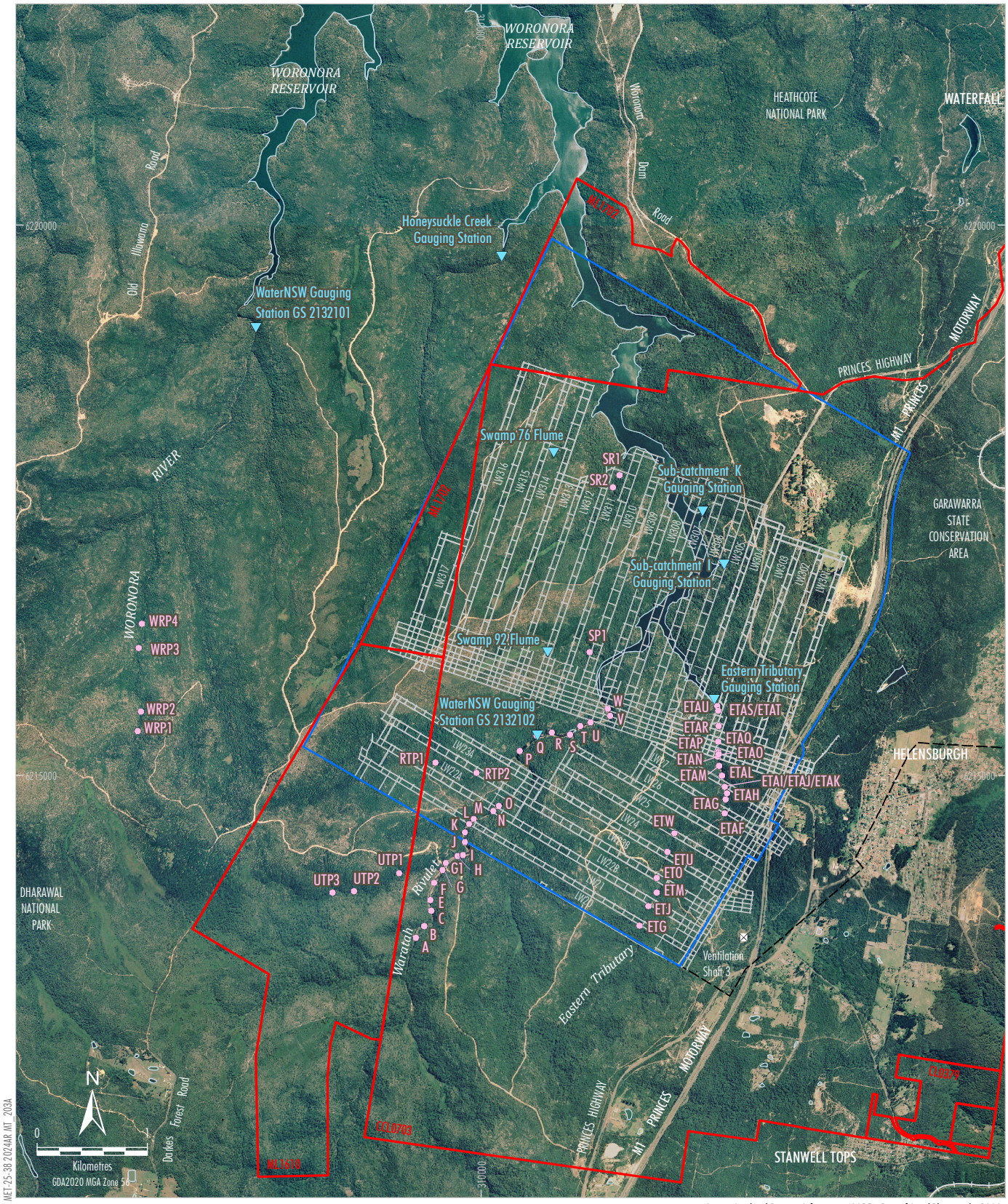
Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025)

Peabody

METROPOLITAN COAL

Subsidence Monitoring Locations

Figure 6



MET-25-38 2024AR MT 203A

Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025)

LEGEND

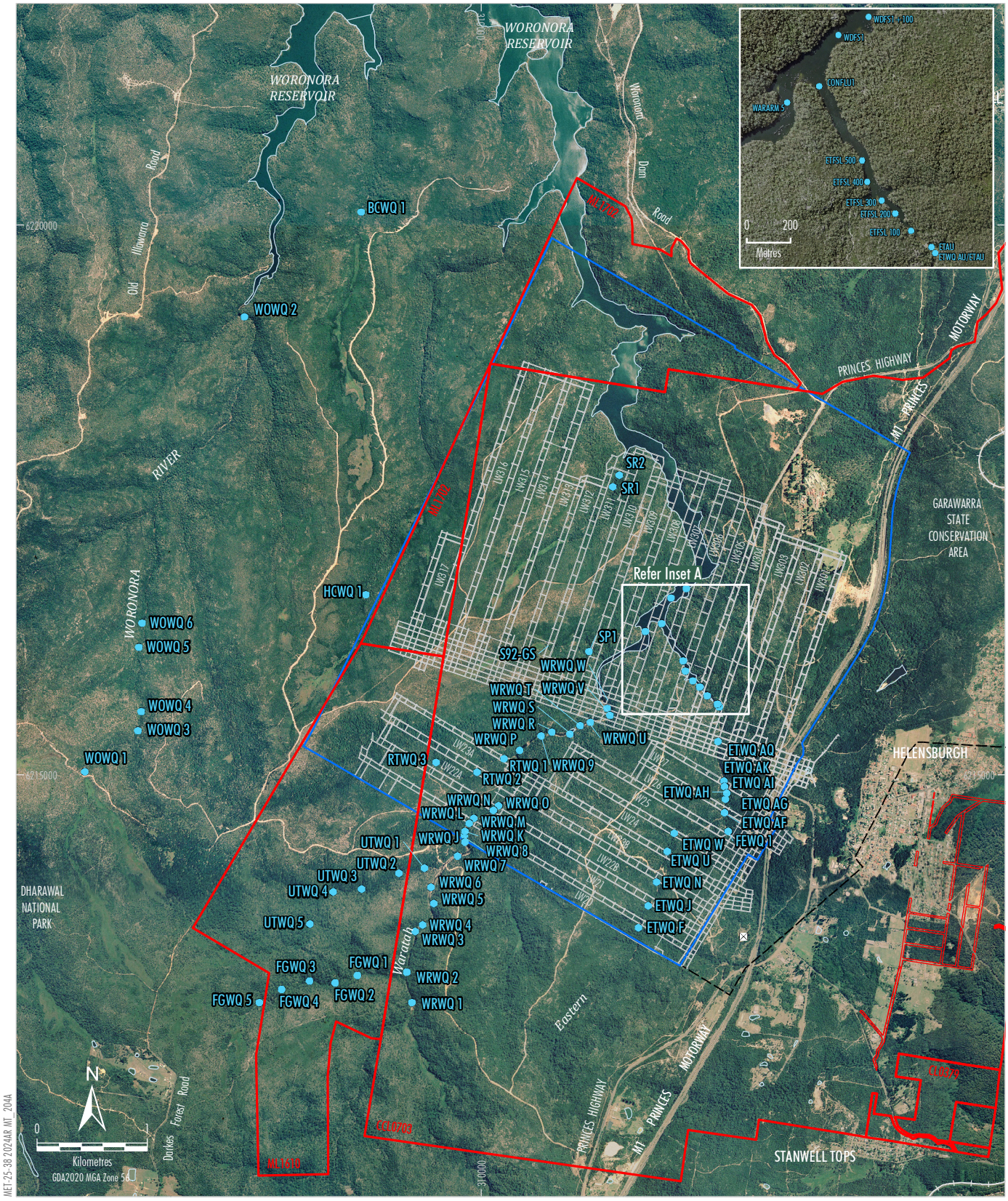
- Mining Lease Boundary
- Railway
- Project Underground Mining Area
  Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)
- Gauging Station
- Pool Water Level Site

Peabody

METROPOLITAN COAL

Surface Water Quantity Sites

Figure 7



LEGEND

- Mining Lease Boundary
- Railway
- Project Underground Mining Area
- Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)
- Surface Water Quality Site

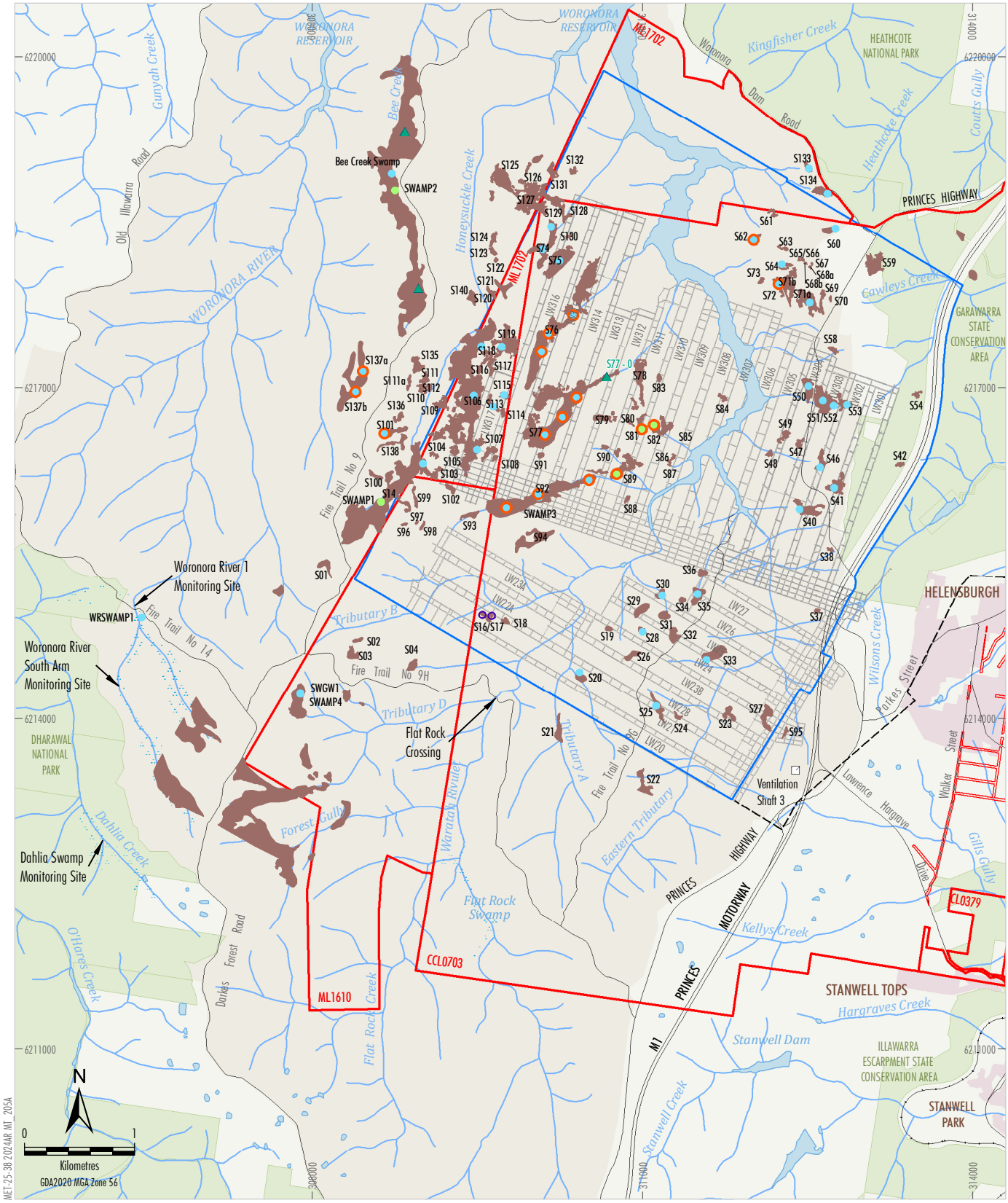
Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025)

Peabody

METROPOLITAN COAL

Surface Water Quality Sites

Figure 8



LEGEND

- Mining Lease Boundary
- Woronora Special Area
- Railway
- Project Underground Mining Area
- Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)
- Upland Swamp
- Swamp Substrate and Shallow Groundwater Piezometer
- Swamp Substrate Groundwater Piezometer
- Swamp Shallow Groundwater Piezometer
- Swamp Soil Moisture Probe
- Proposed Future Monitoring Sites

Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025); Niche (2025); NPWS (2003), Bangalay Botanical Surveys (2008); Eco Logical Australia (2015; 2016; 2018) and Ecoplanning (2021; 2023)

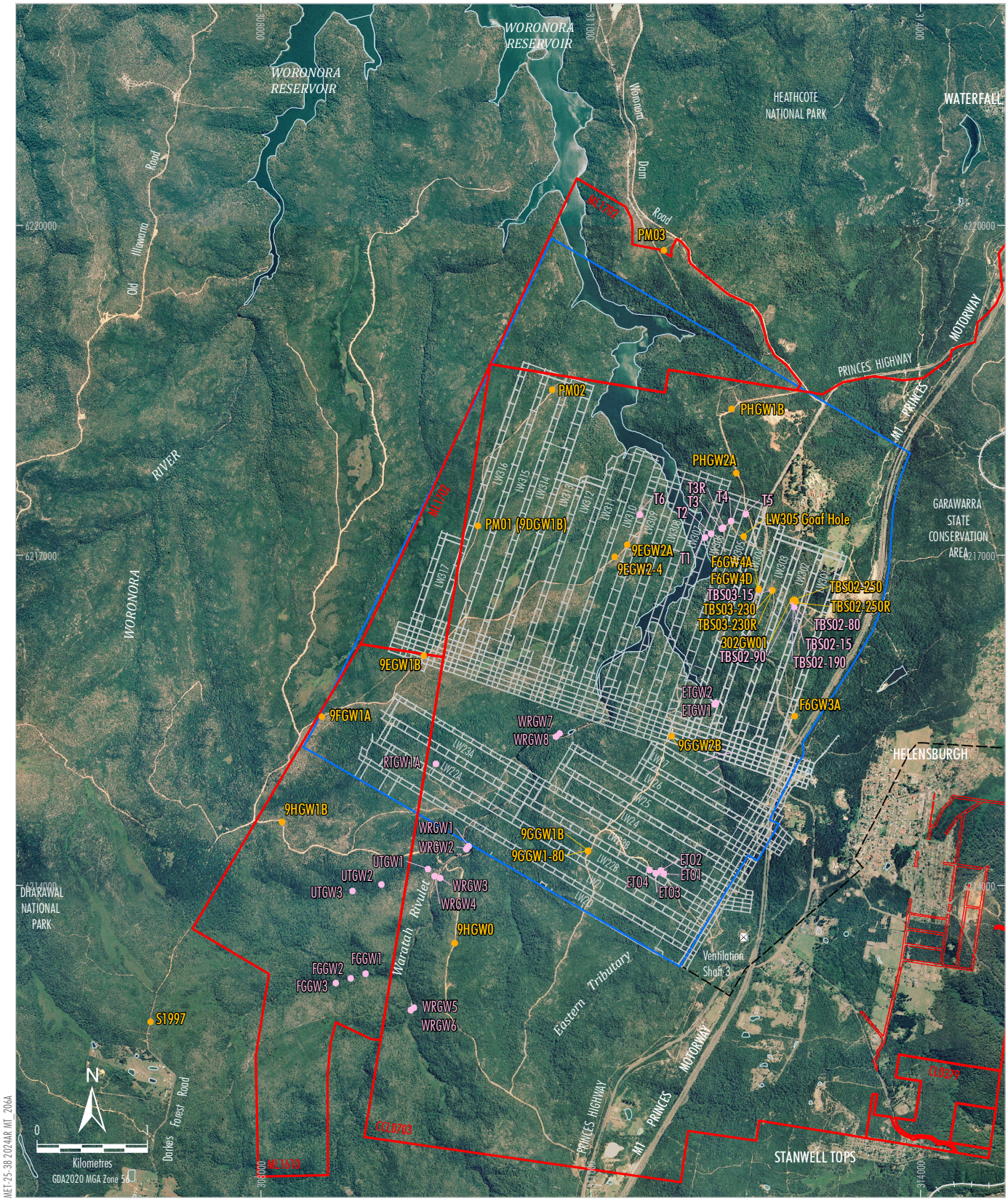
Note: Shallow Groundwater Piezometers at swamp monitoring site 92-1 and site 92-3 are planned for installation. Installation would be subject to suitable weather conditions and access to the Woronora Special Area. The future monitoring site locations in Bee Creek are indicative only and subject to change based on site access and swamp field investigations.

Peabody

METROPOLITAN COAL

Upland Swamp Groundwater Piezometer Locations

Figure 9



LEGEND

- Mining Lease Boundary
- Railway
- Project Underground Mining Area
- Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)
- Groundwater Level/Pressure Bore
- Groundwater Level Bore

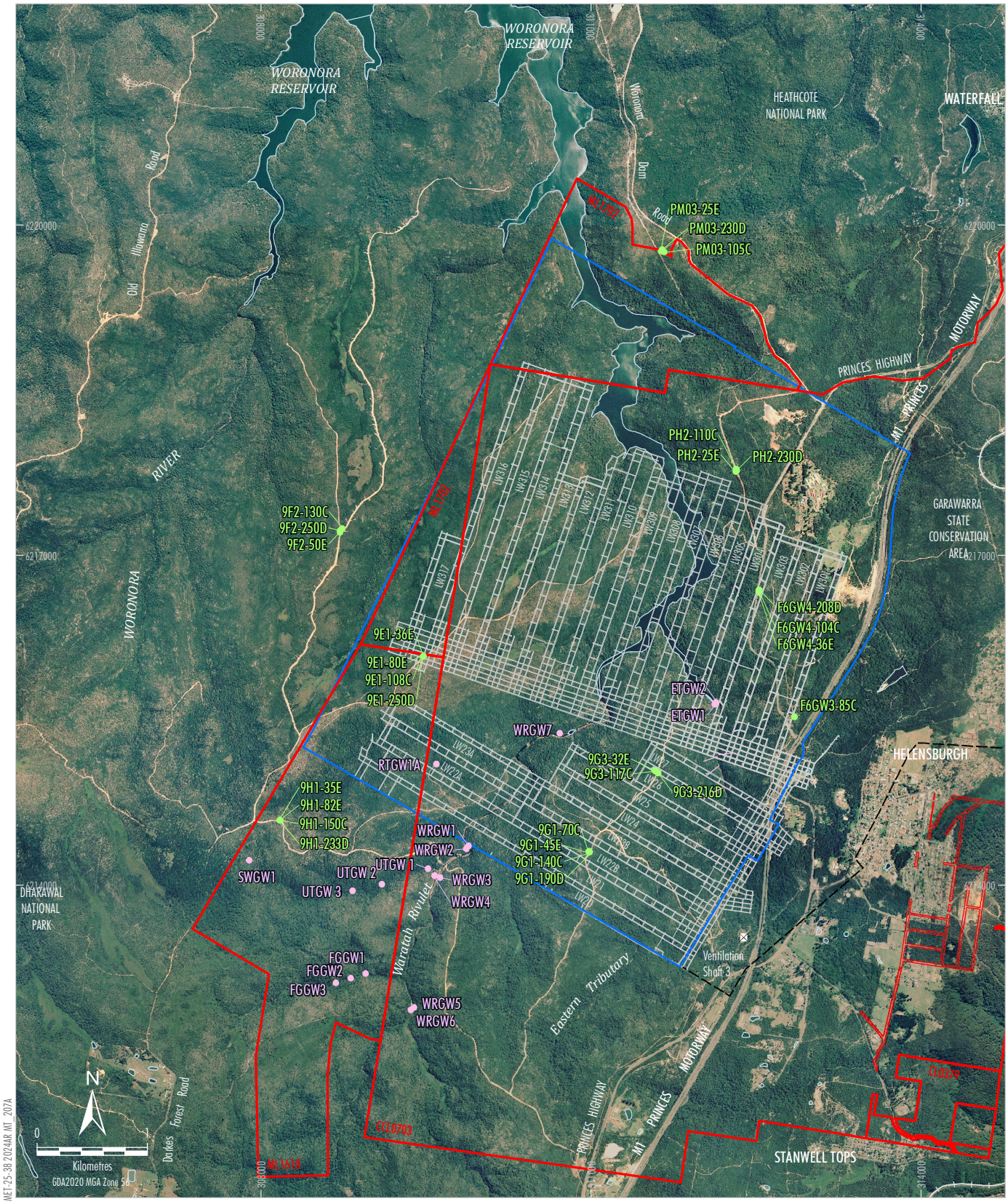
Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025)

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METROPOLITAN COAL

Groundwater Level and/or Pressure Bore Locations

Figure 10



LEGEND

- Mining Lease Boundary
- Railway
- Project Underground Mining Area
  Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)
- Deep Groundwater Chemistry Monitoring Site
- Stream Shallow Groundwater Quality Monitoring Site

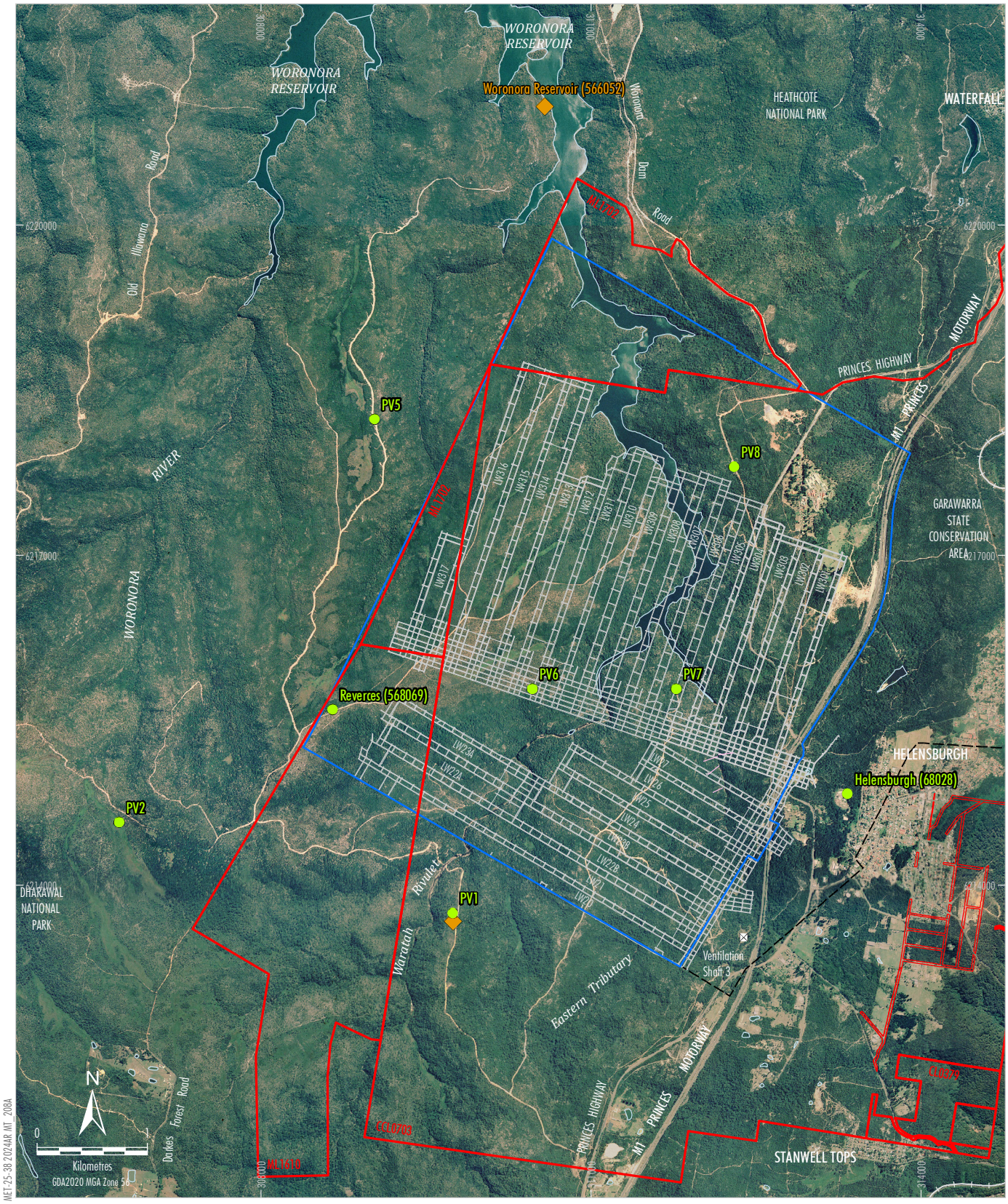
Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025)

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METROPOLITAN COAL

Groundwater Quality Sites

Figure 11



LEGEND

- Mining Lease Boundary
- Railway
- Project Underground Mining Area
- Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)
- Evaporimeter
- Pluviometer

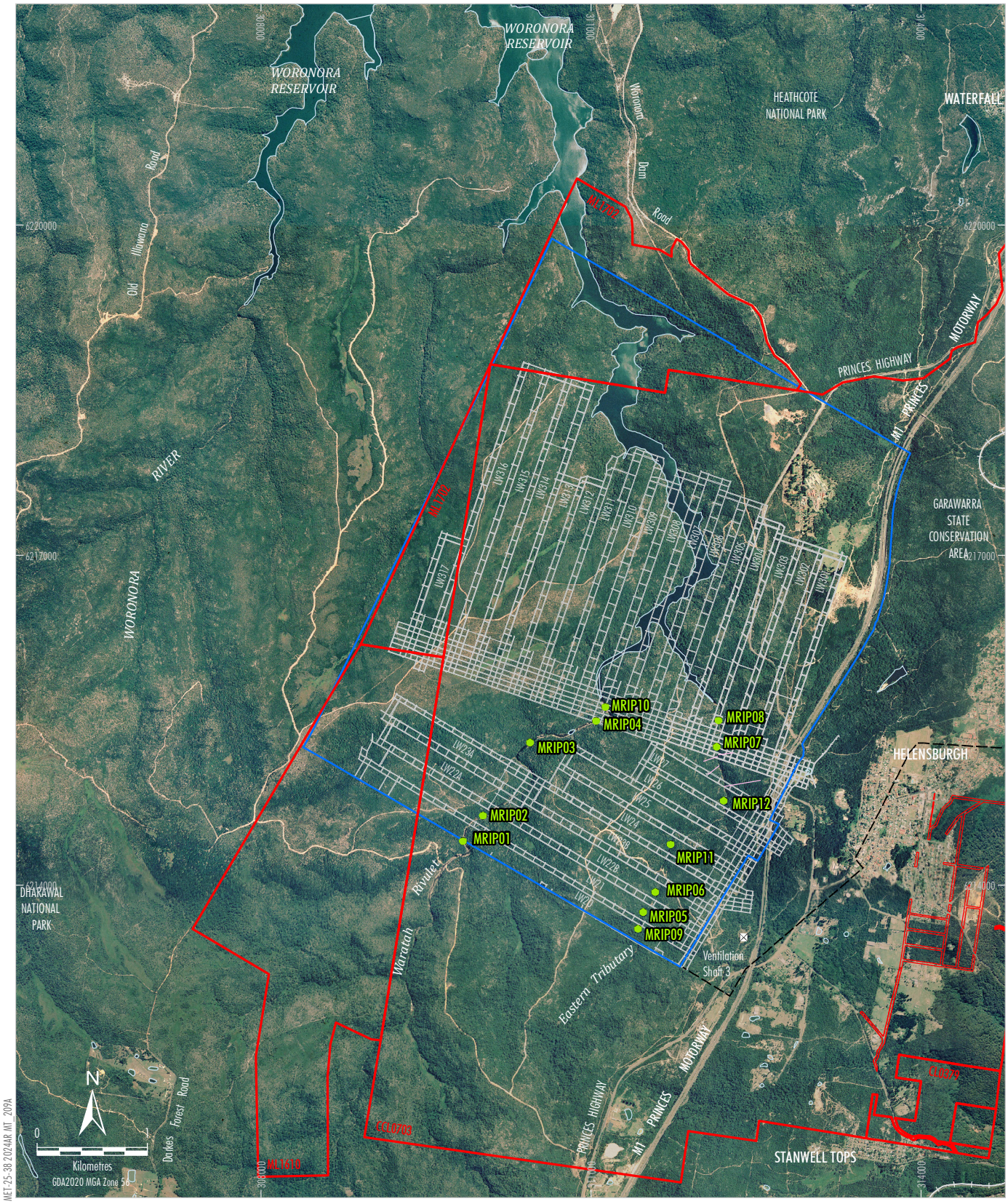
Notes:
1. The Bureau of Meteorology pluviometer at Darkes Forest (68024) is not shown. It is located approximately 3.75 km south of the Metropolitan Coal pluviometer (PV2).
2. The Bureau of Meteorology pluviometer at Lucas Heights (66078) is not shown. It is located approximately 12.5 km north of the Metropolitan Coal pluviometer (PV8).

Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025)

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METROPOLITAN COAL

Meteorological Sites

Figure 12



LEGEND

- Mining Lease Boundary
- Railway
- Project Underground Mining Area
  Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)

Monitoring Site

- Riparian Vegetation Monitoring Site

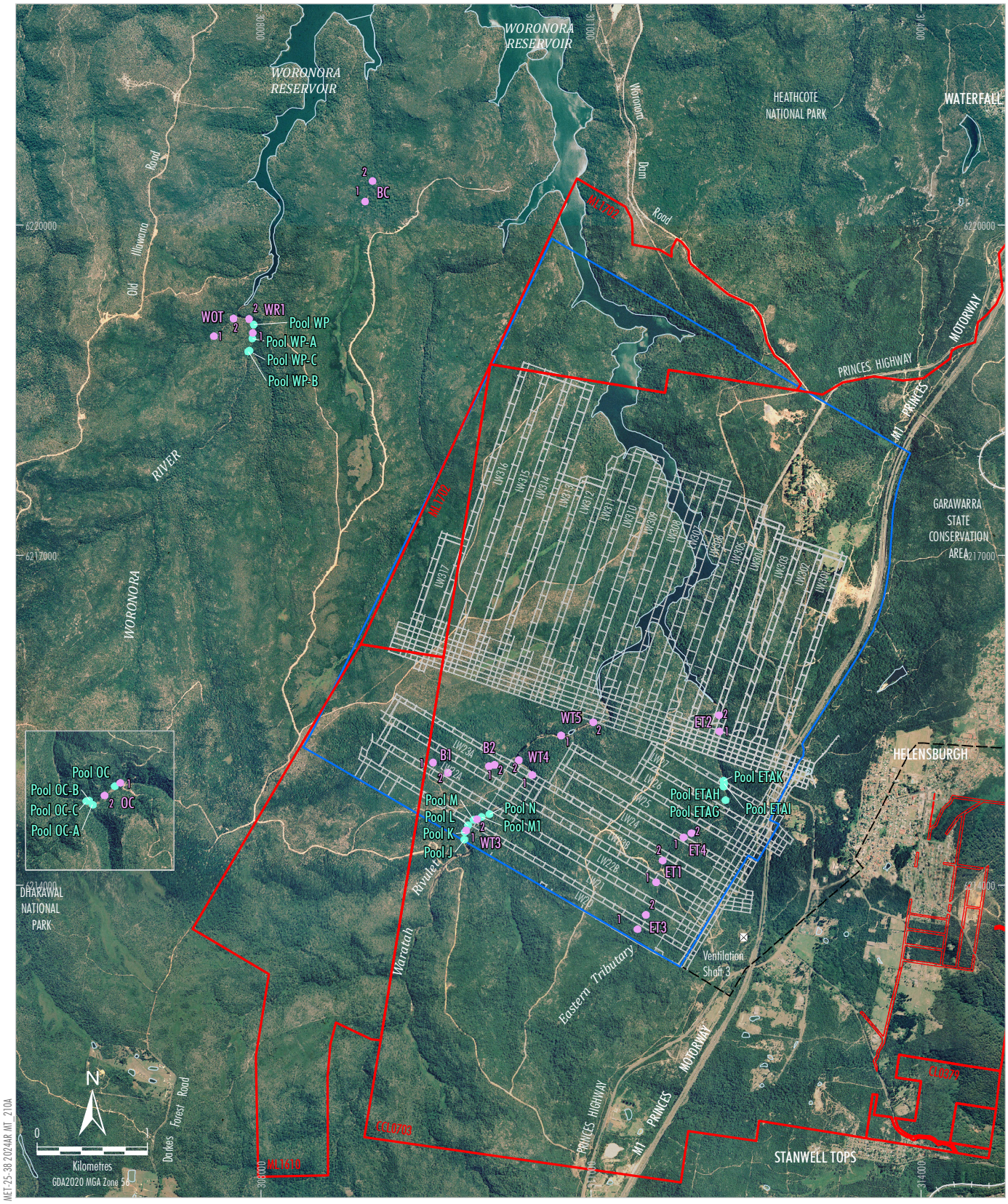
Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025)

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METROPOLITAN COAL

Riparian Vegetation Monitoring Locations

Figure 13



LEGEND

- Mining Lease Boundary
- Railway
- Project Underground Mining Area
  - Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)

Monitoring

- Pool Aquatic Ecology Sampling Site
- Stream Aquatic Ecology Sampling Site

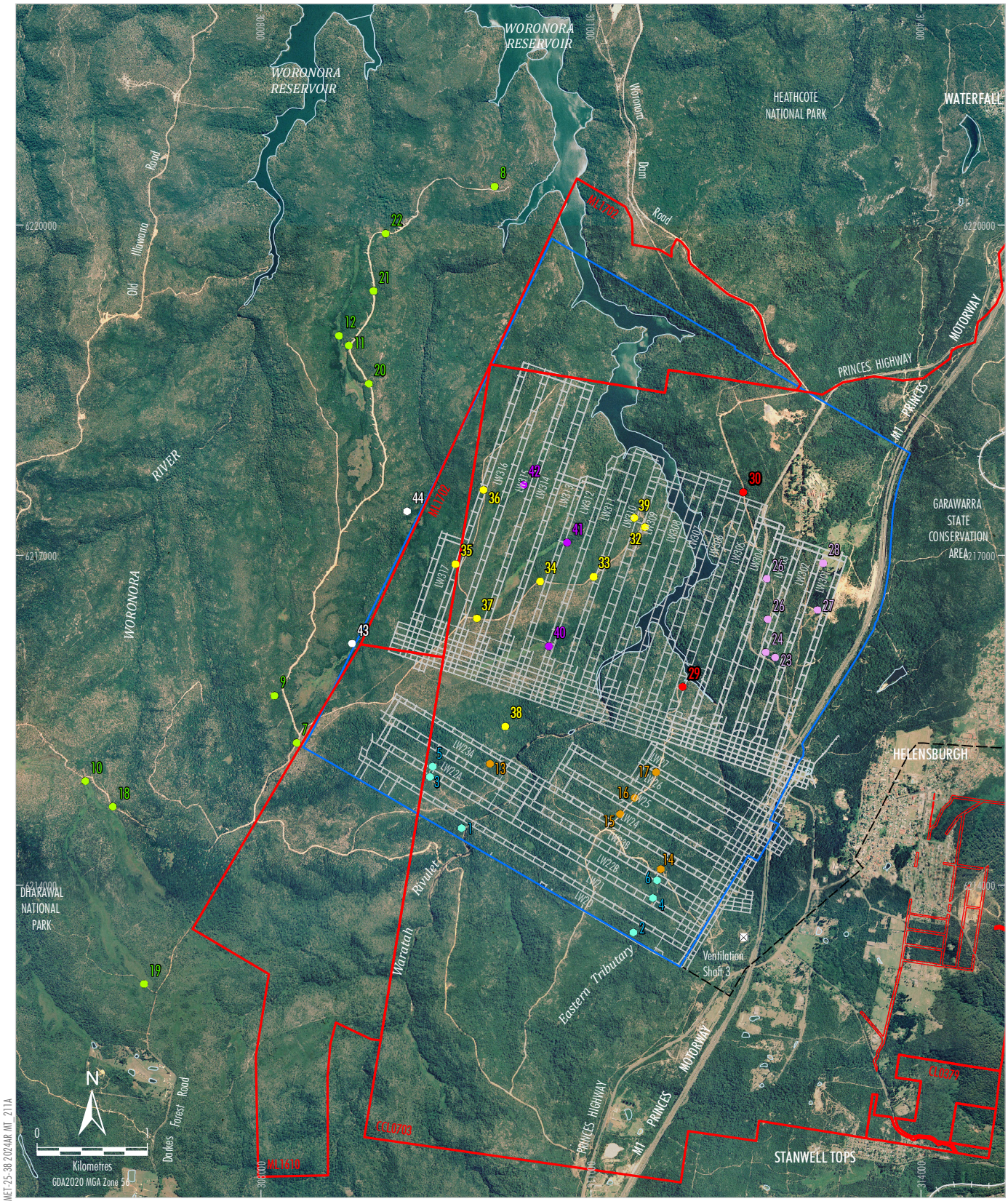
Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025)

Peabody

METROPOLITAN COAL

Aquatic Ecology Monitoring Locations

Figure 14



LEGEND

- Mining Lease Boundary
- Railway
- Project Underground Mining Area
  Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)

Monitoring Sites

- Longwalls 20-22 Amphibian Monitoring
- Longwalls 23-27 Amphibian Monitoring
- Longwalls 301-303 Amphibian Monitoring
- Longwalls 305-307 Amphibian Monitoring
- Longwalls 308-317 Amphibian Monitoring
- Longwalls 311-316 Amphibian Monitoring Site
- Honeysuckle Creek Amphibian Monitoring Site
- Control Site

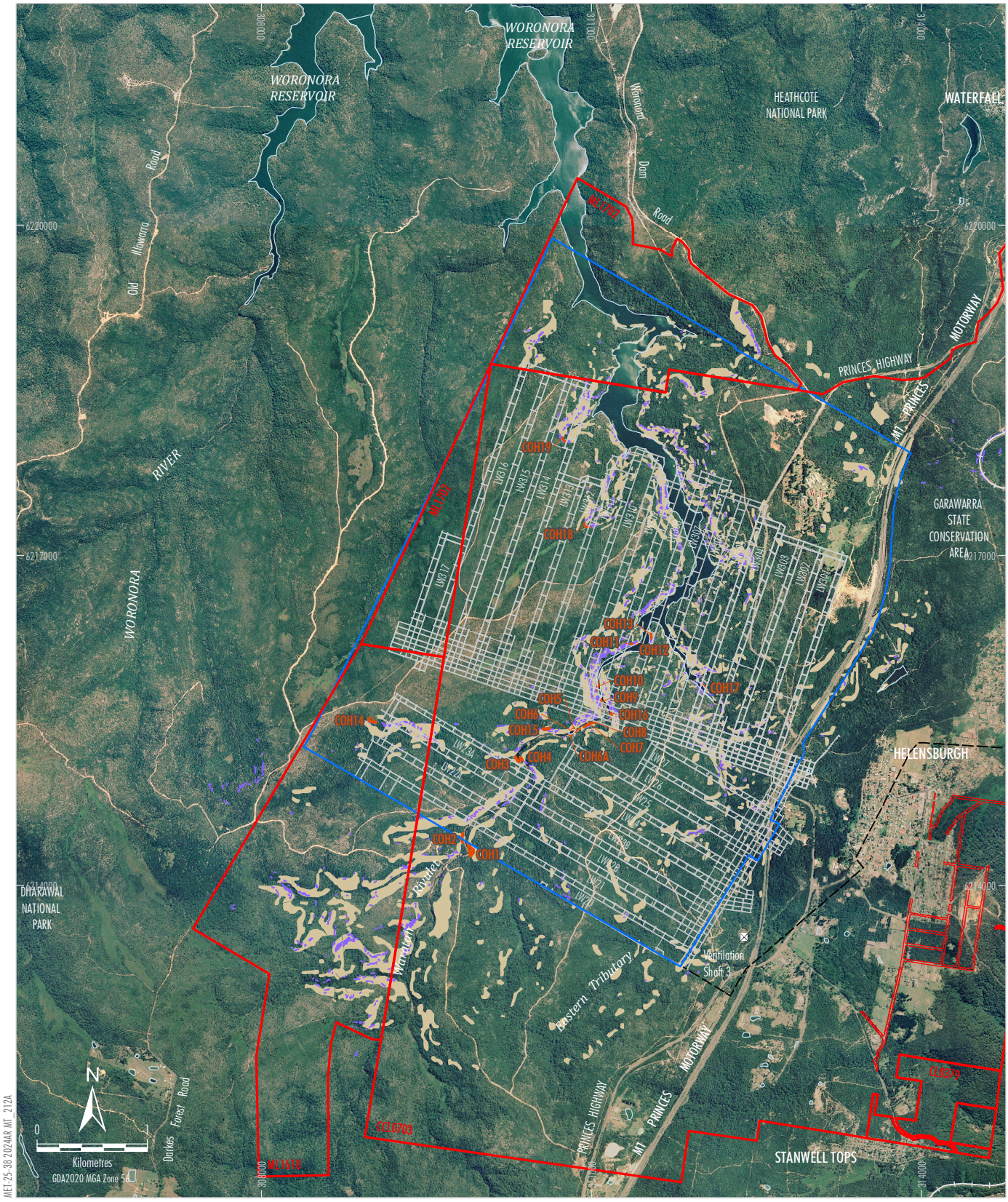
Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025)

Peabody

METROPOLITAN COAL

Amphibian Monitoring Locations

Figure 15



LEGEND

- Mining Lease Boundary
- Railway
- Project Underground Mining Area
- Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)
- Cliffs and Overhangs
- Steep Slopes (Project Approval)
- Steep Slopes (Project Environmental Assessment)

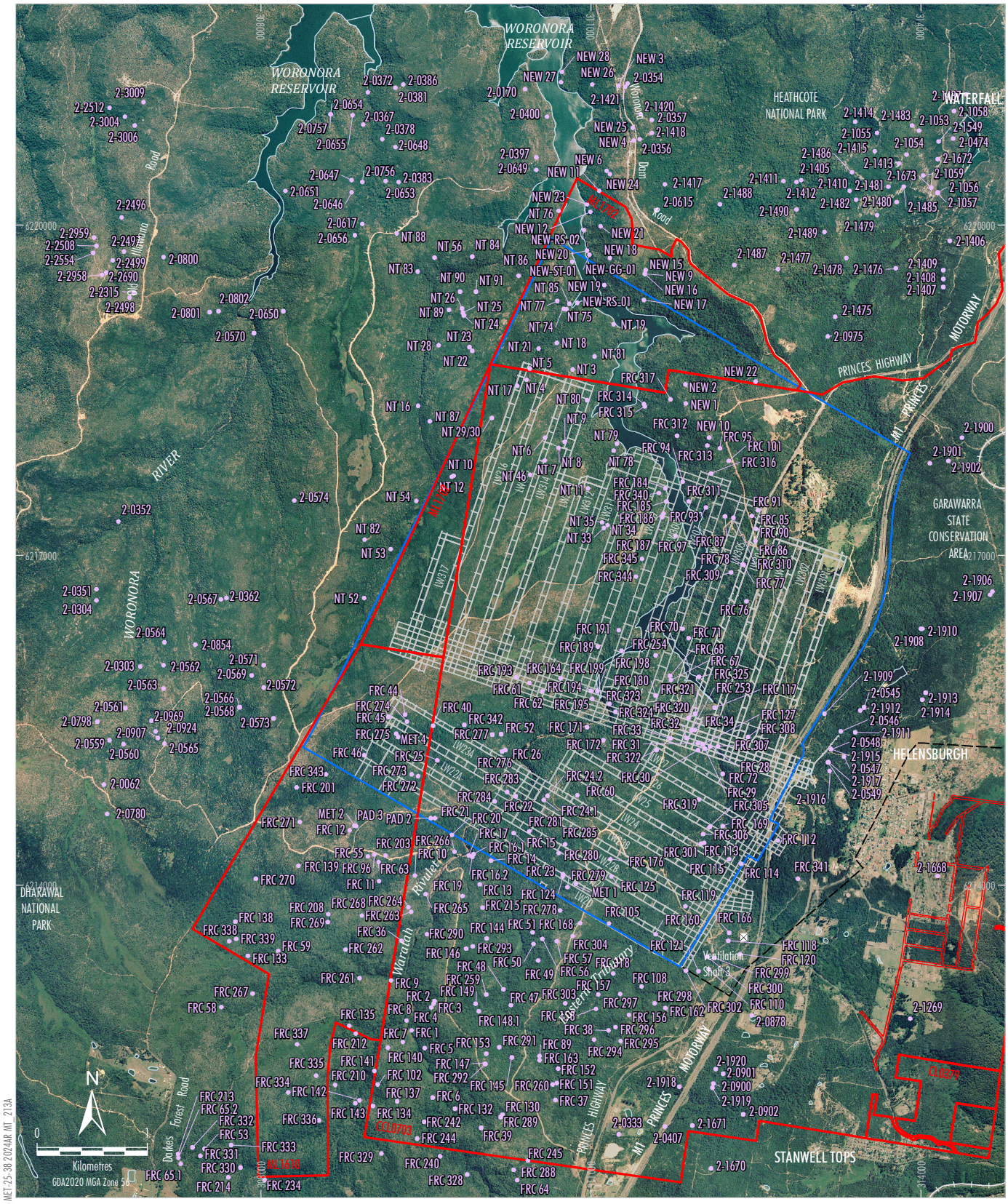
Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025)

Peabody

METROPOLITAN COAL

Cliffs and Overhangs, Steep Slopes and Land in General within the Project Underground Mining Area and Surrounds

Figure 16



LEGEND

- Mining Lease Boundary
- Railway
- Project Underground Mining Area
- Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)

Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2025); MSEC (2025)

Peabody

METROPOLITAN COAL

Known Aboriginal Heritage Sites Within Project Underground Mining Area and Surrounds

Figure 17



MET-25-38 2024AR MT_003A

Source: Aerial Photography 2005

LEGEND

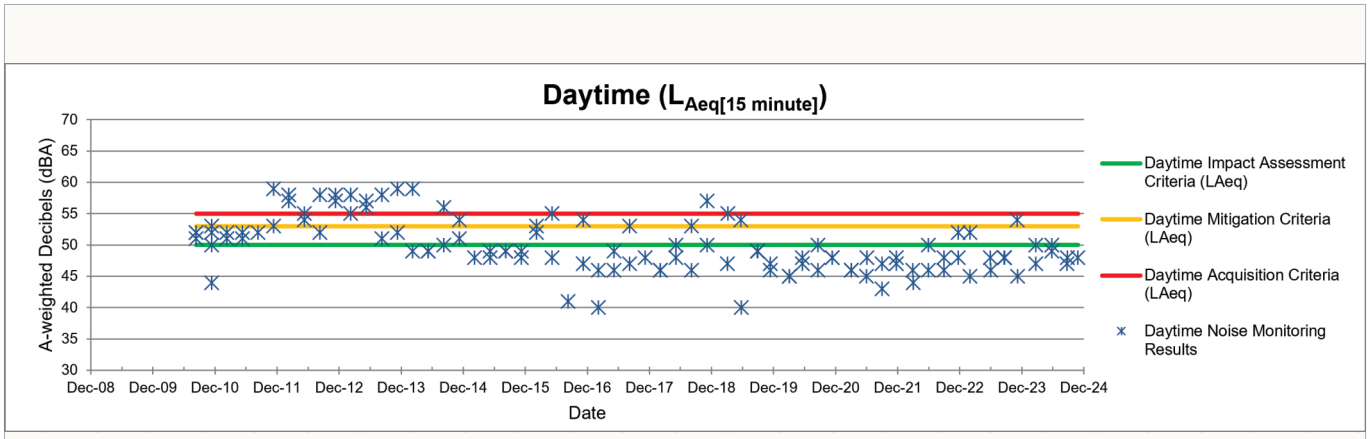
- P40 Receiver Location
- Approximate Extent of Major Surface Facilities Area
- Real-time Noise Monitoring Site
- Attended Noise Monitoring Site
- Automatic Weather Station

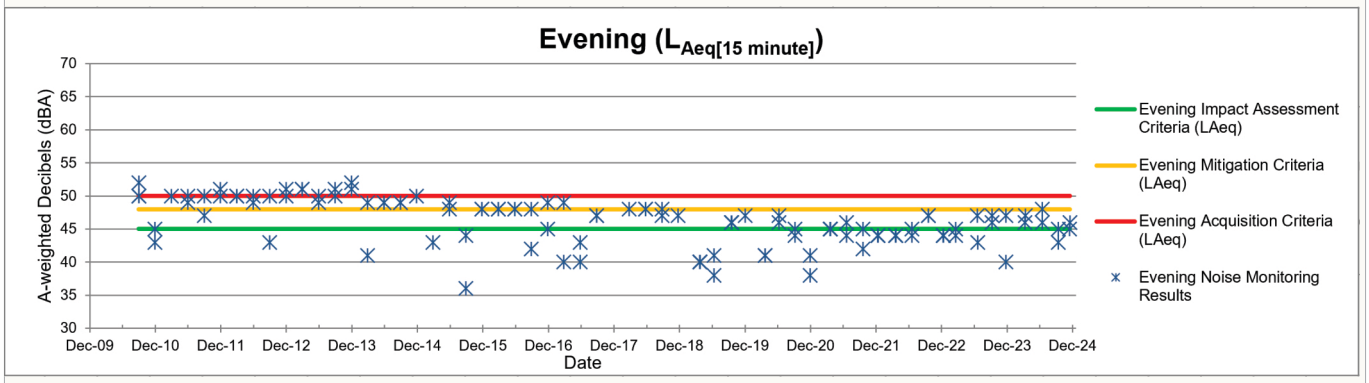
Peabody

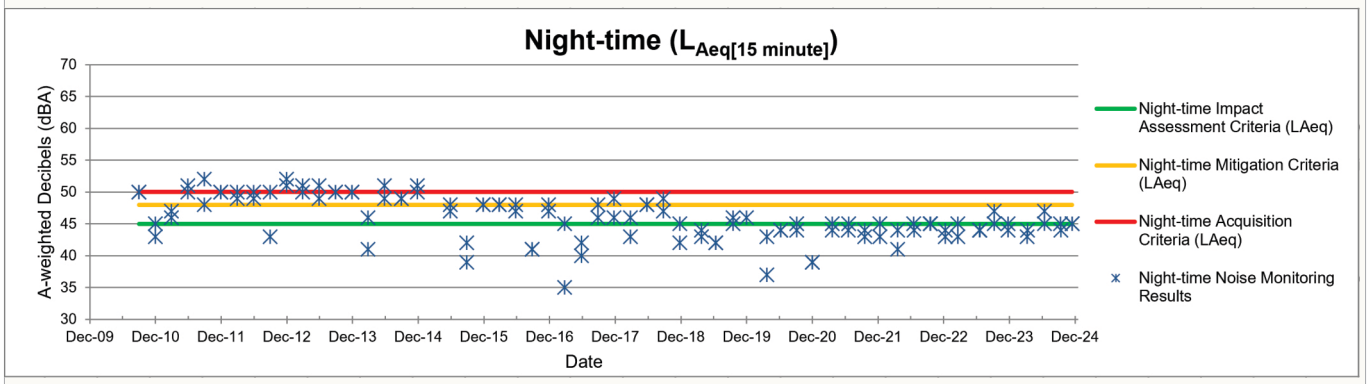
METROPOLITAN COAL

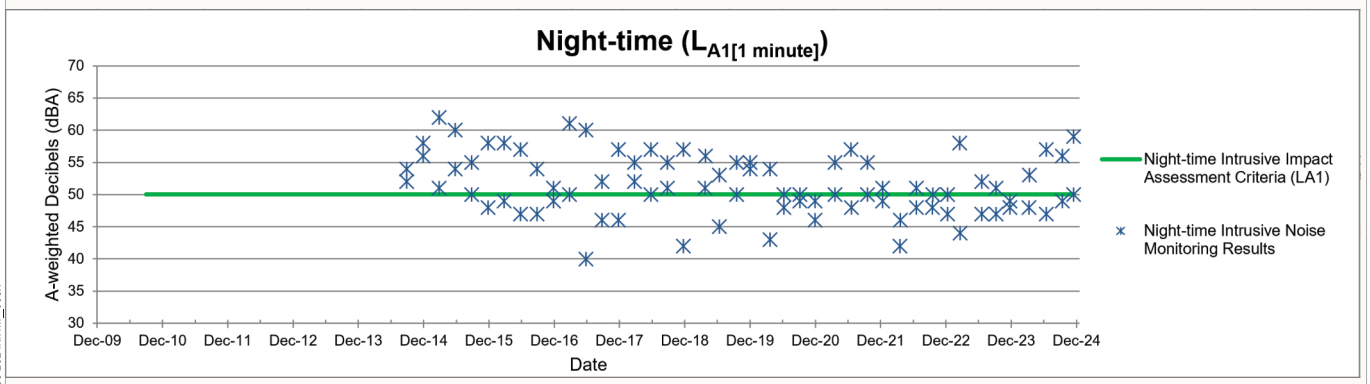
Noise Monitoring Locations

Figure 18









MET-25-38 2024AR MT_006A

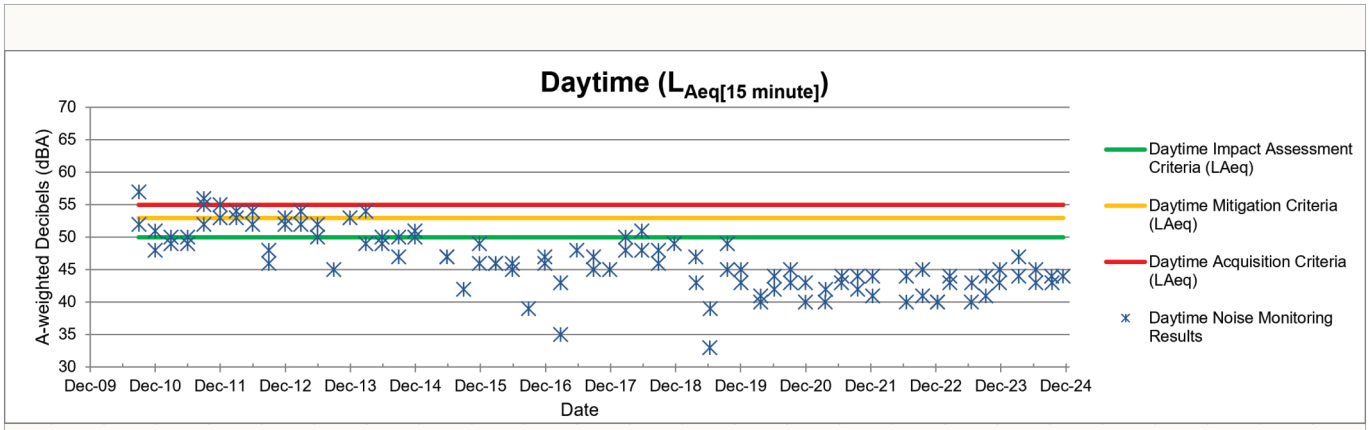
Note: In accordance with Conditions 1, 2 and 3, Schedule 4 of the Project Approval, the assessment, acquisition and mitigation criteria are only applicable from the end of 2014

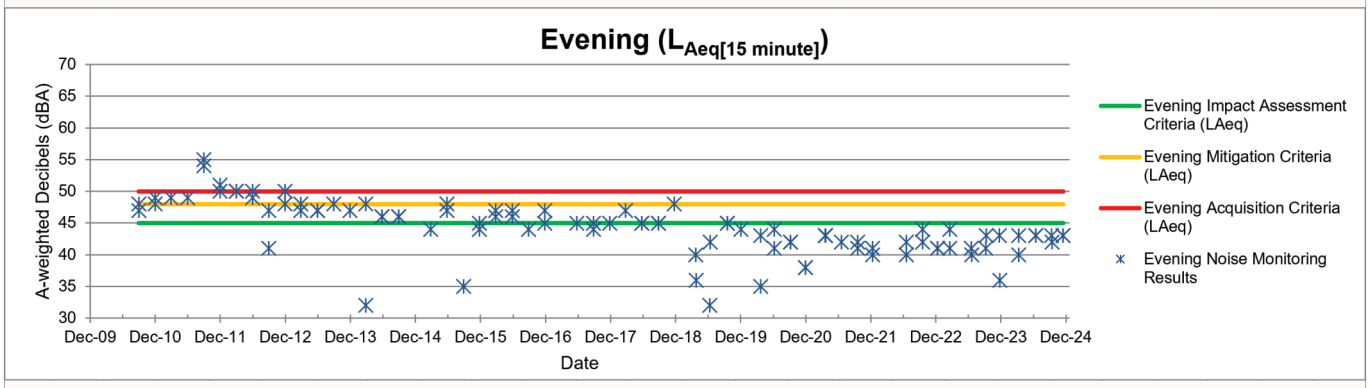
Peabody

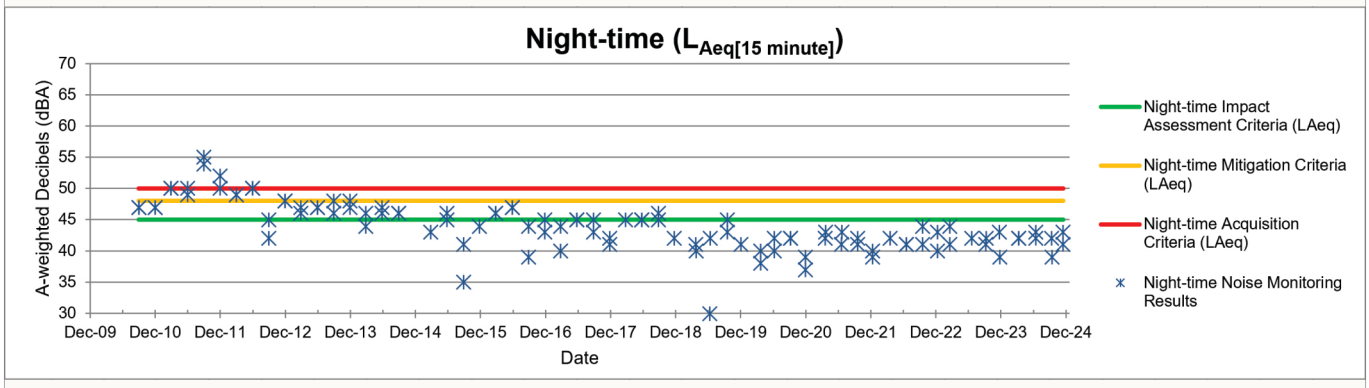
METROPOLITAN COAL

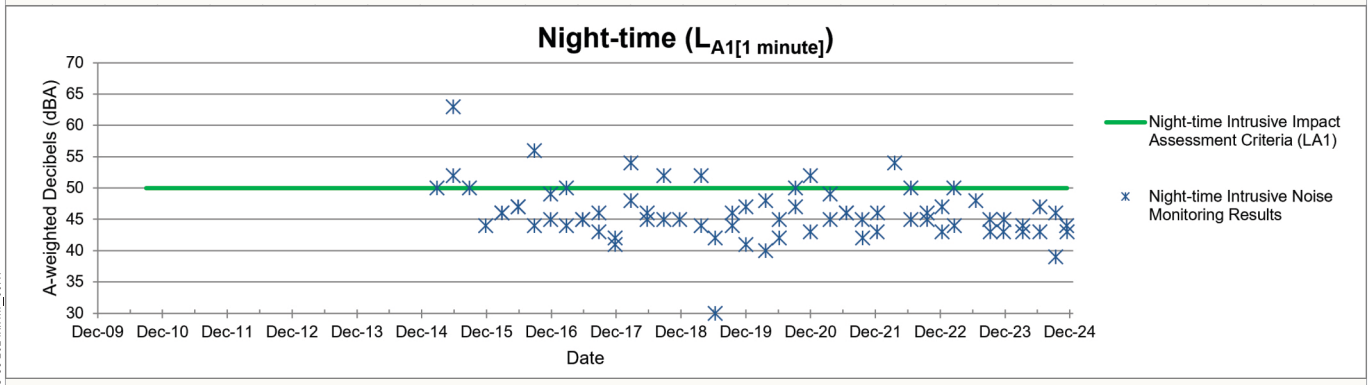
Quarterly Operator Attended Noise Monitoring Results at 16 Oxley Place (December 2010 to December 2024)

Figure 19a









MET-25-38 2024AR MT_007A

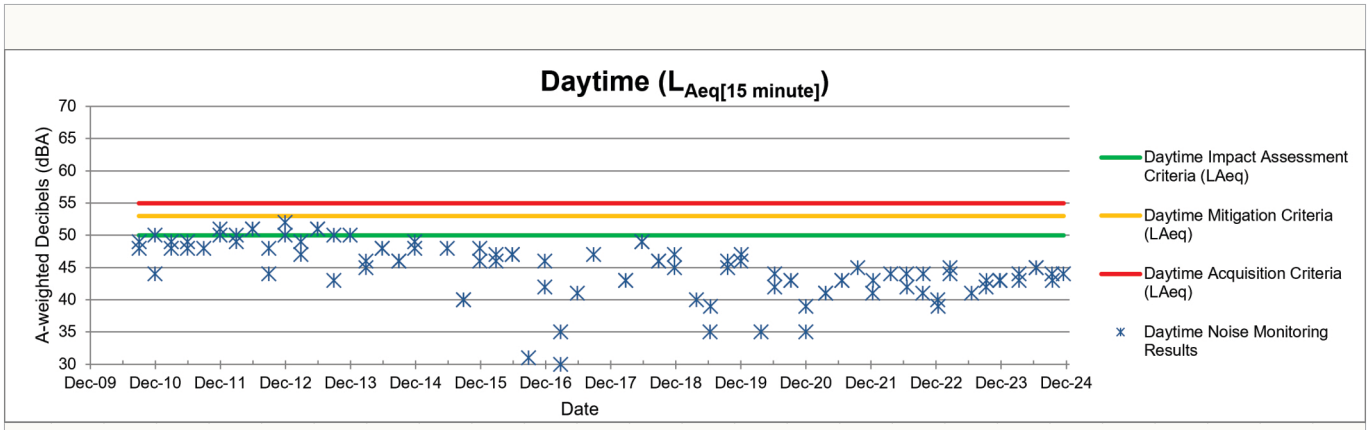
Note: In accordance with Conditions 1, 2 and 3, Schedule 4 of the Project Approval, the assessment, acquisition and mitigation criteria are only applicable from the end of 2014

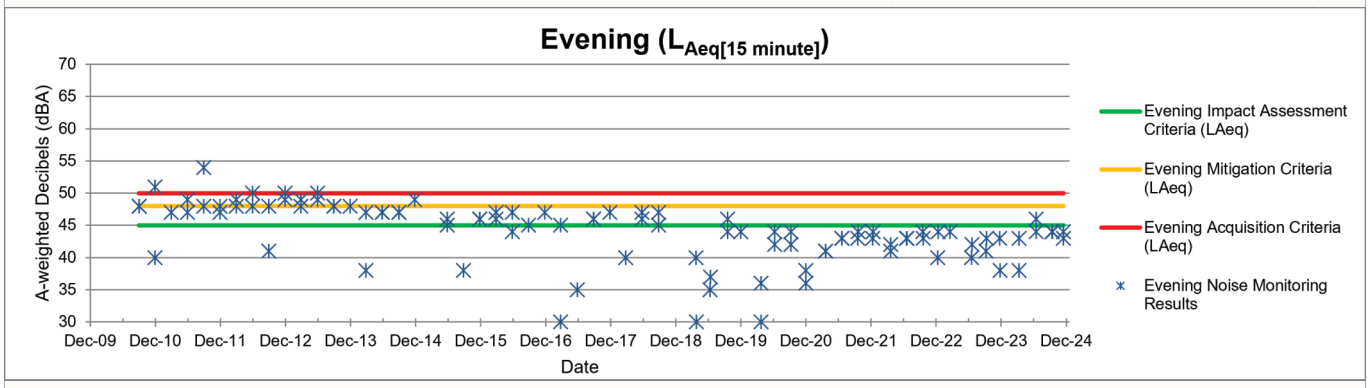
Peabody

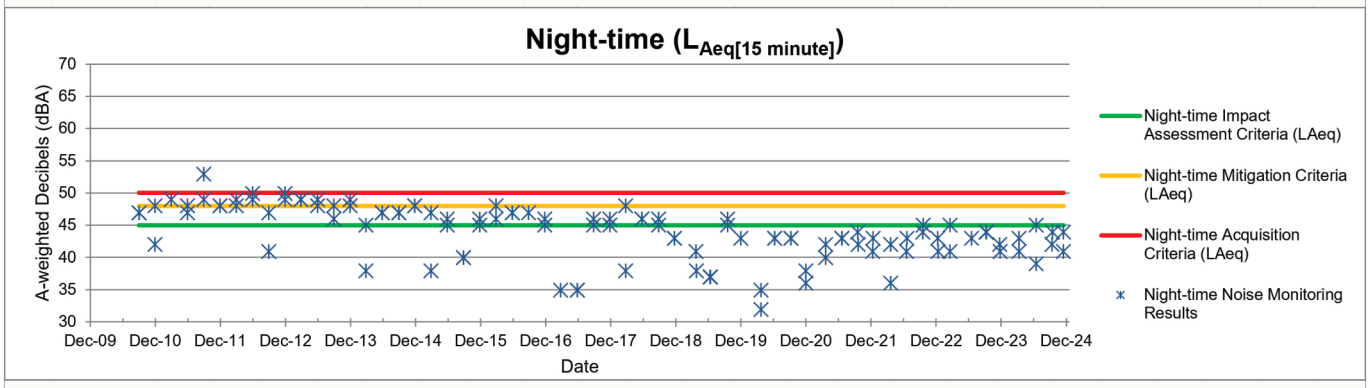
METROPOLITAN COAL

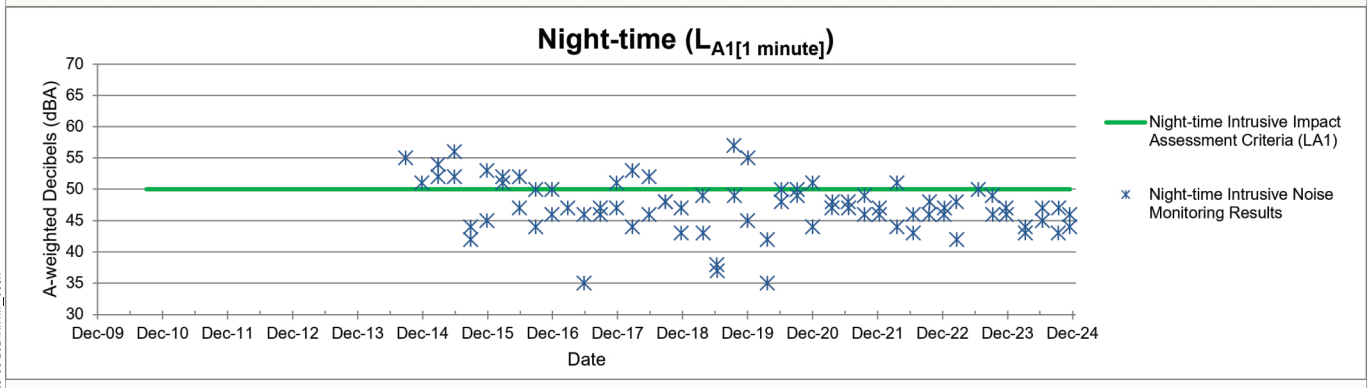
Quarterly Operator Attended Noise Monitoring Results at 53 Parkes Street (December 2010 to December 2024

Figure 19b









MET-25-38 2024AR MT_008A

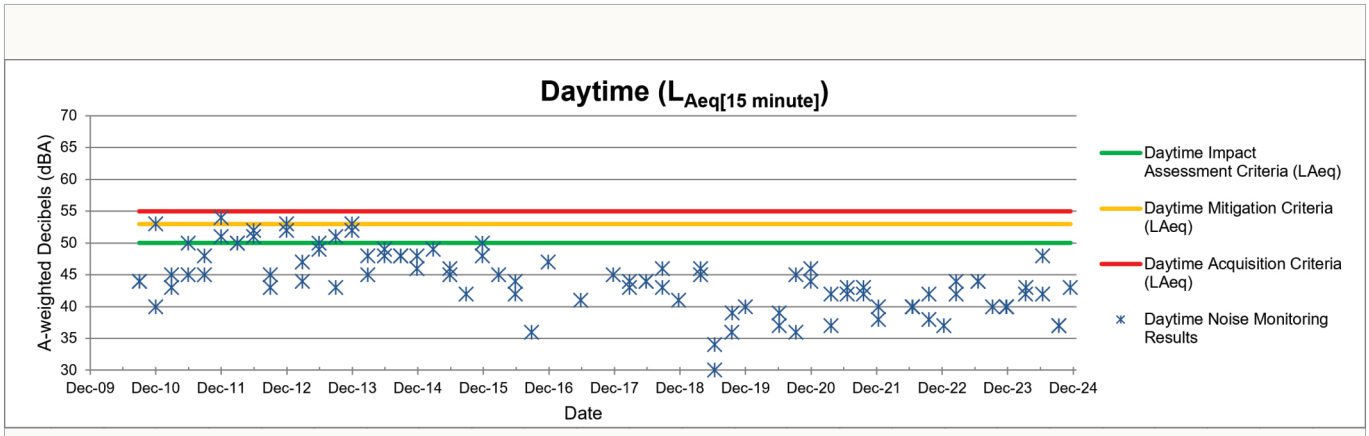
Note: In accordance with Conditions 1, 2 and 3, Schedule 4 of the Project Approval, the assessment, acquisition and mitigation criteria are only applicable from the end of 2014

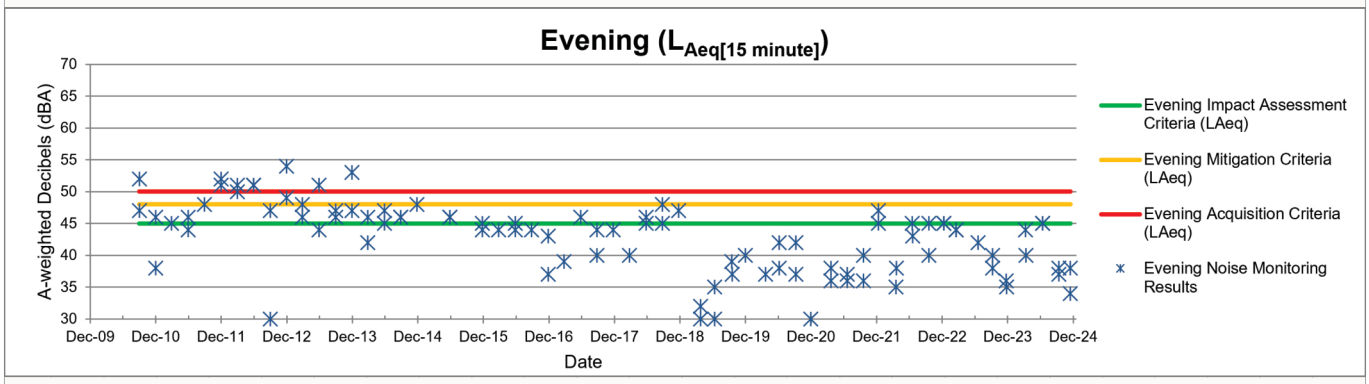
Peabody

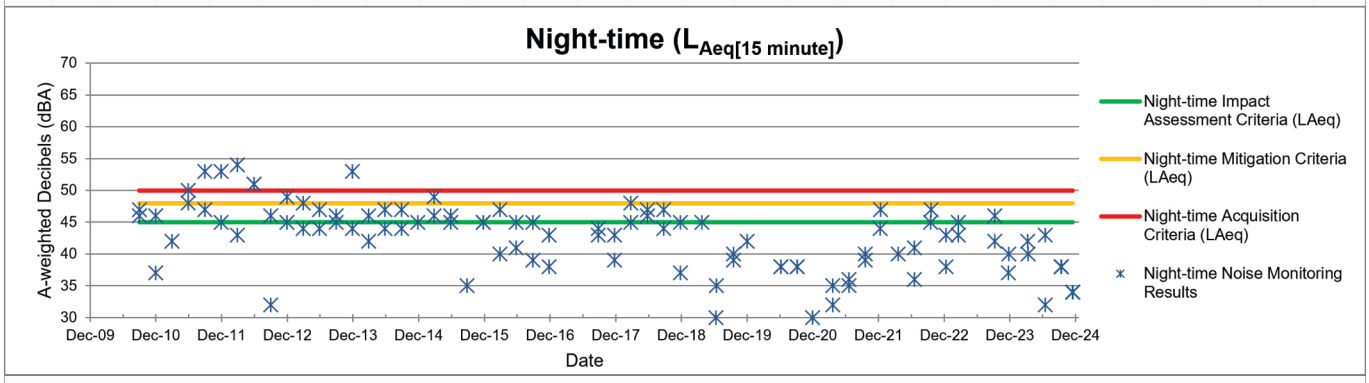
METROPOLITAN COAL

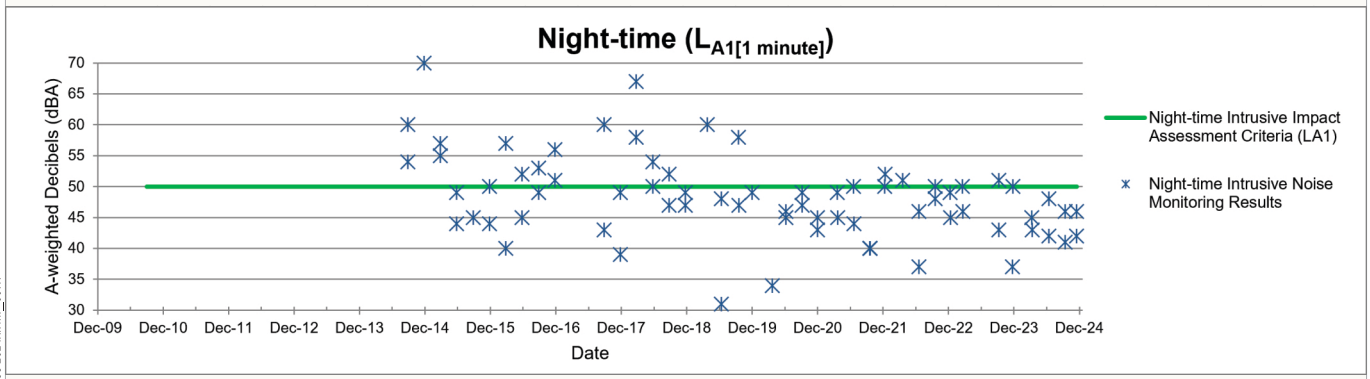
Quarterly Operator Attended Noise Monitoring Results at 50 Parkes Street (December 2010 to December 2024)

Figure 19c









MET-25-38 2024AR MT_009A

Note: In accordance with Conditions 1, 2 and 3, Schedule 4 of the Project Approval, the assessment, acquisition and mitigation criteria are only applicable from the end of 2014

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Quarterly Operator Attended Noise Monitoring Results at 36 Old Station Road (December 2010 to December 2024)

Figure 19d



MET-25-38 2024AR MT_004A

Source: Aerial Photography 2005

LEGEND

- Approximate Extent of Major Surface Facilities Area
- P40 Receiver Location
- EPA Licenced Dust Deposition Gauge
- Automatic Weather Station
- High Volume Air Sampler
- TEOM Real Time Dust Monitor

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Air Quality Monitoring Sites

Figure 20

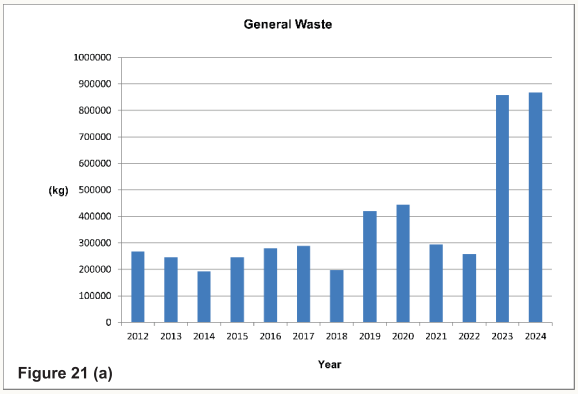


Figure 21 (a)

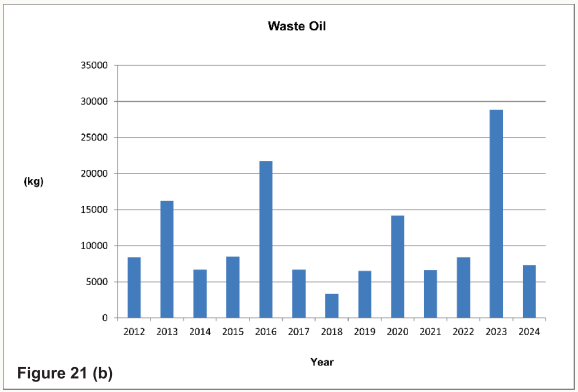


Figure 21 (b)

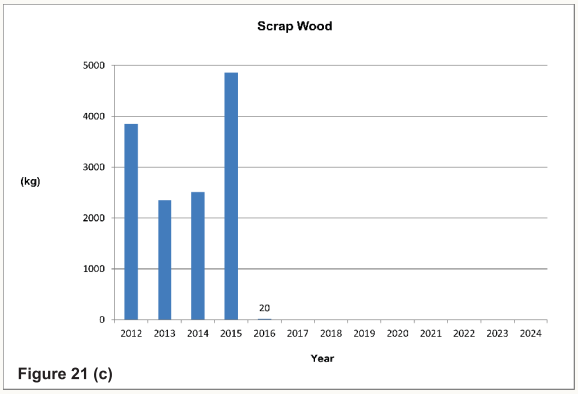


Figure 21 (c)

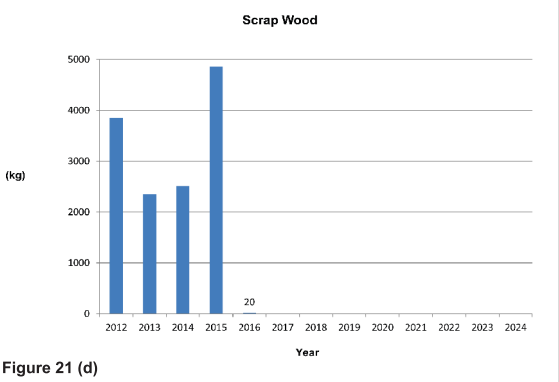


Figure 21 (d)

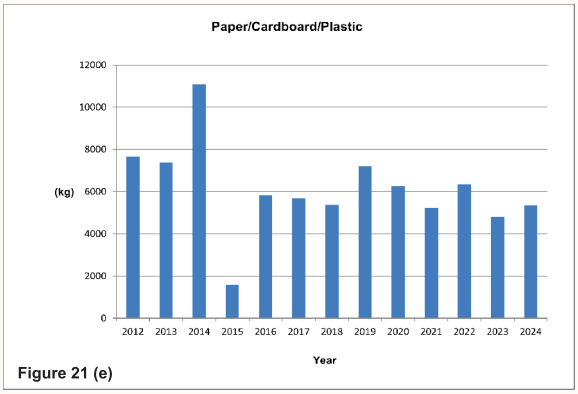


Figure 21 (e)

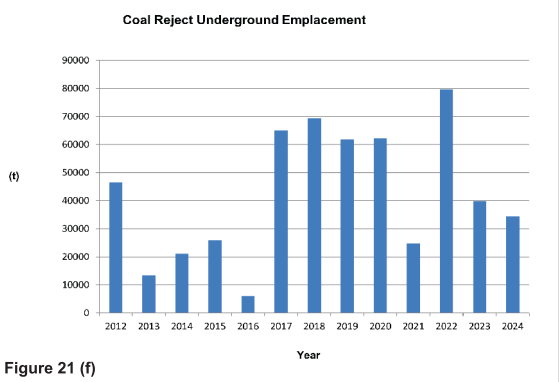


Figure 21 (f)

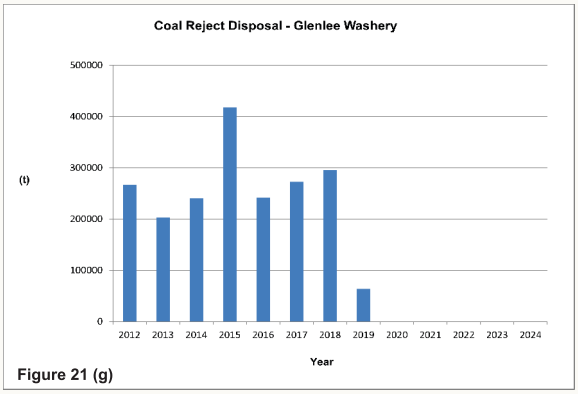


Figure 21 (g)

MET-25-38 2024AR MT_011A

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Comparison of Waste Generated and Recycled in 2024 with Previous Years

Figure 21



MET-25-38 2024AR MT_005A

LEGEND

- Water Pipeline
- Camp Gully Water Extraction Pipeline
- Licensed Discharge Point
- Water Quality Monitoring
- Volume Monitoring

Note: Site D is located approximately 2.3 km upstream of Site A

Source: Metropolitan Coal (2014) Date of Aerial Photography October 2014

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Surface Facilities Area
Water Monitoring Sites

Figure 22

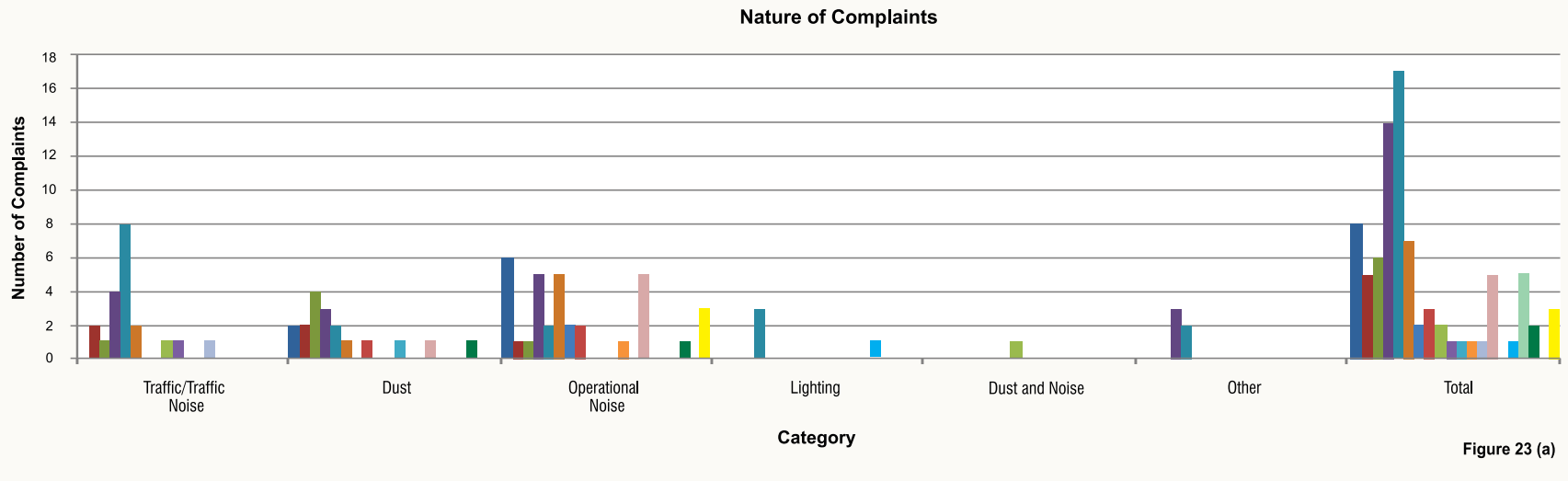


Figure 23 (a)

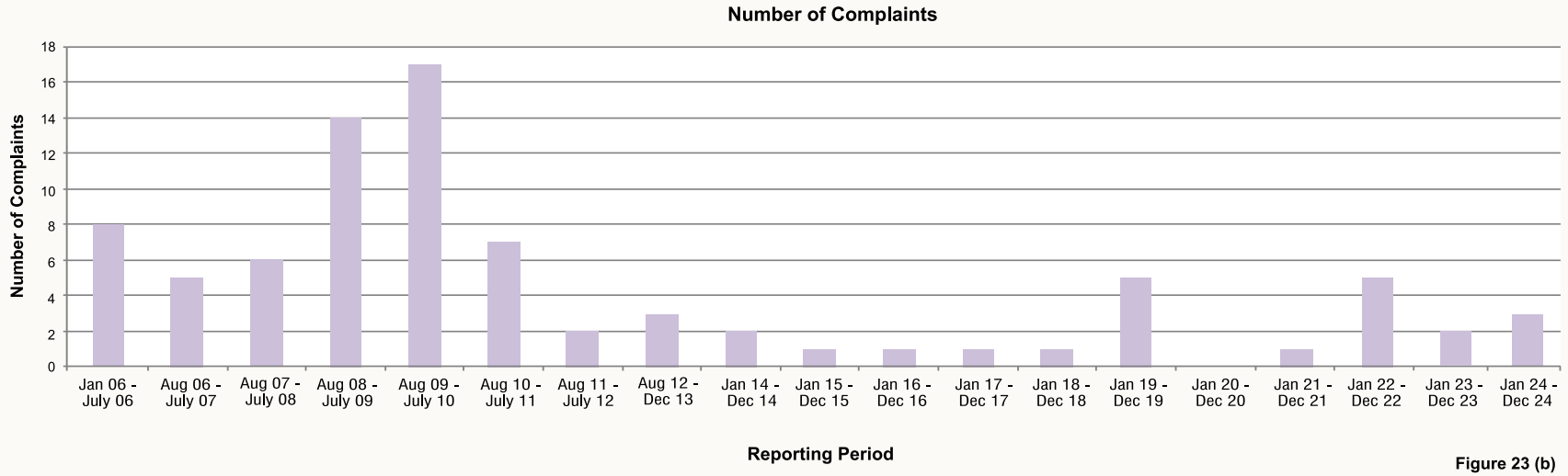


Figure 23 (b)

Note: No complaints in 2020

MET-25-38 2024AR MT_010A

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Summary of Complaints Recorded,
January 2006 to December 2024

Figure 23

APPENDICES

APPENDICES A TO P ARE AVAILABLE ON REQUEST (AS LISTED BELOW):

Appendix A	2024 Annual Review Subsidence Monitoring Results
Appendix B1	Surface Water Review 1 January to 30 June 2024
Appendix B2	Surface Water Review 1 January to 31 December 2024
Appendix C1	Groundwater Review 1 January to 30 June 2024
Appendix C2	Groundwater Review 1 July to 31 December 2024
Appendix D	Mapped Pool Locations on The Waratah Rivulet, Eastern Tributary, Tributary A and Tributary B
Appendix E	Assessments Against Gas releases at Pools P and U Performance Measure – January to December 2024
Appendix F	Assessments Against Water Quality Performance Measure – January to December 2024
Appendix G	Groundwater Transect Bores T2, T3 and T5 Investigation Report
Appendix H	Groundwater Performance Investigation November 2024 Bore 9EGW2A
Appendix I1	Longwalls 20-22 Spring 2023 Vegetation Monitoring Report
Appendix I2	Longwalls 20-22 Autumn 2024 Vegetation Monitoring Report
Appendix I3	Longwalls 23-27 Spring 2023 Vegetation Monitoring Report
Appendix I4	Longwalls 23-27 Autumn 2024 Vegetation Monitoring Report
Appendix I5	Longwalls 301-304 Spring 2023 Vegetation Monitoring Report
Appendix I6	Longwalls 301-304 Autumn 2024 Vegetation Monitoring Report
Appendix I7	Longwalls 305-307 Spring 2023 Vegetation Monitoring Report
Appendix I8	Longwalls 305-307 Autumn 2024 Vegetation Monitoring Report
Appendix I9	Longwalls 308-310 Spring 2023 Vegetation Monitoring Report
Appendix I10	Longwalls 308-310 Autumn 2024 Vegetation Monitoring Report
Appendix J1	Swamp 20 and Swamp 28 Threatened Flora Assessment
Appendix J2	Eastern Tributary and Waratah Rivulet Threatened Flora Assessment
Appendix J3	Swamp 20, Swamp 28 and Eastern Tributary Threatened Fauna Assessment
Appendix K1	Longwalls 20-27 Spring 2023 Aquatic Ecology Monitoring Report
Appendix K2	Longwalls 20-27 Autumn 2024 Aquatic Ecology Monitoring Report
Appendix L	2024 Amphibian Status Report
Appendix M	2024 Quarterly Attended Noise Monitoring Results
Appendix N	2024 Air Quality Monitoring and Environmental Performance Assessment Report
Appendix O	2024 Annual Rehabilitation Report
Appendix P	Large Swamp Hydrological and Hydrogeological Models